Cloud Storage Committee Final Recommendations

Executive Summary

In March 2015, ITS and ITEC agreed to form a committee to determine requirements/use cases and evaluate potential cloud storage solutions for both sensitive and non-sensitive data. The Cloud Storage Committee (referred to as “the Committee” in the remainder of this document) consisting of approximately 30 people, was formed and met weekly for the remainder of the calendar year. Deliverables include a list of requirements/use cases (see Appendix A), a comparison of potential vendor solutions, and a recommendation to the Chief Information Officer for a strategy for addressing the storage needs of the University. The Committee evaluated and compared the three major cloud storage products available on the market at that time: OneDrive (part of the Microsoft Office 365 Suite), Box.com, and Dropbox. See Appendix B for a comparison of features between the three vendors.

The Committee recommends that Microsoft OneDrive be the primary collaboration tool for storage and sharing of University data, including sensitive information. Several factors support this decision:

- OneDrive is included in our current Microsoft licensing at no additional cost to the University.
- OneDrive is the only product that contains built-in security tools to better protect sensitive data on the end points as well as in the OneDrive environment.
- As part of the Microsoft suite, OneDrive integrates very well with other Microsoft Office products.
- OneDrive has unlimited storage capacity.
- OneDrive can be made available to the general campus almost immediately. Contracts and Business Associates Agreements have already been signed.
- Microsoft provides enhanced E-discovery tools across Exchange, OneDrive, and SharePoint.
- Many universities are migrating to Office 365, which includes OneDrive. Having a common tool will make it easier to collaborate with other universities.

IT should be noted that the final vote was not unanimous. The three members from the Kenan-Flagler School of Business felt very strongly that Dropbox should be included in the solution. Their opinion is included in Appendix D.
Overview
In March 2015, ITS and ITEC agreed to form a committee to determine requirements/use cases and evaluate potential cloud storage solutions for both sensitive and non-sensitive data. A committee of approximately 30 people was formed and met weekly for the remainder of the calendar year. Deliverables included a specific vendor recommendation, a list of requirements/use cases and a comparison of potential vendor solutions. The committee was tasked to report back to the Infrastructure Governance Committee, ITEC and ITS leadership. Next steps include a budget request proposal to the University budget committee and the formation of a smaller working group to formalize implementation planning of the selected vendor solution.

Evaluation Committee and Stakeholders
This evaluation was performed at the request of the Infrastructure Governance Committee, ITEC and ITS Executive Leadership. ITEC worked with ITS to identify a list of committee members with the goal of wide participation across departments. FITAC was also canvassed for users. Once the committee had a working knowledge of requirements and the capabilities of the solution, other representative groups were brought in to contribute to the findings.

ITEC Representation
- Georgia Allen (KFBS)
- John Garcia (FPG)
- Dave Maldonado (SOP)
- Roger Akers (SHEPS)
- Bryan Andregg (SPH)
- Janet Blue (Nursing)
- Peter Smith (KFBS)
- Tim Van Acker (CPC)
- Larry Fritsche (KFBS)
- Dennis Schmidt (MED)
- Manny Garcia (SSW)
- Mark Ingram (Development\Advancement)
- Brad Hemminger (SILS)
- Deric Freeman (SOP)
- Ray Reitz (F&A)
- Tim Shearer (Libraries)
- Ken Langley (SOM)

FITAC Representation
- David Van Duin (Faculty Rep)
- Dean F Duncan III (Faculty Rep)
- Brent Comstock (Student Rep)
The evaluation committee met weekly utilizing Blue Jeans conferencing technology. All documentation and file sharing was facilitated via the box.com solution.

**UNC Chapel Hill Requirements**
The evaluation committee has produced a series of requirements for a cloud storage solution.

**Mandatory**

- The solution must support sensitive data.
- The vendor must agree to sign a BAA.
- Data must be encrypted in transit.
- Data at rest in the cloud must be encrypted.
- Collaborate across UNC at both a departmental and individual level.
- Collaborate with external entities at both a departmental and individual level (no Onyen required).
- Collaborate with external entities sharing sensitive data.
- Vendor datacenters are located in the US.
- Vendor datacenters provide redundant active datacenters (no maintenance downtime).
- Offline access and synchronization of files.
- Video/Audio media “streaming.”
- Cross platform support (Windows, Mac, Mobile, Android, iOS, web browser).
• Large amount of available data bandwidth.
• Delegated departmental administration.
• Share sensitive data with users that are not in the US.

Preferred

• Ability to leverage Internet2 and a federated identity management model.
• Ability to encrypt synchronized files at rest on client machines.
• Ability to block synch to unprotected clients (i.e., local encryption enabled).
• Anonymous or sFTP type posts.
• Ability to remotely wipe an endpoint client.
• Ability to update users over email when files have changed.
• Mapped drives integration (note that this is not supported when utilizing SSO).
• Support for multi-user real time file editing.
• DLP/DRM Tools (Digital Leakage Protection and Digital Rights Management) – Added after Microsoft made these tools available to Universities at no additional cost.

**Evaluation Methodology**

When the Committee began their work, there were three major cloud storage vendors on the market: Microsoft, Box and Dropbox. At that time, only two of the vendors, Microsoft and Box, were willing to sign HIPAA Business Associate Agreements (BAA) to ensure the protection of sensitive information, including Protected Health Information. Since Dropbox was widely used “unofficially” by the campus community, the committee initially considered Dropbox, but, since Dropbox did not sign BAAs at the time, the committee focused their work on Microsoft OneDrive and Box.

The cloud storage market is fast moving. Vendors frequently add new features and capabilities (sometimes monthly), temporarily leapfrogging over their competition until another vendor le apfrogs over them with a new feature. This complicated the decision making process. In the fall of 2015, the Committee had picked one of the vendors to be the University supported cloud vendor. As the committee was finalizing their report, the other two vendors released new capabilities or enhancements that dramatically changed the landscape and caused the committee to reevaluate and reconsider them. In order to prevent itself from getting trapped in an endless upgrade cycle, the committee set December 31, 2015 as the final decision date. They invited all three vendors to appear before the committee in December to present a final pitch on their products. After the presentations, the Committee conducted an on line poll of its members. The results of the poll were:

<table>
<thead>
<tr>
<th>Which vendor is your first choice?</th>
<th>Response</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Box</td>
<td>2</td>
<td>10%</td>
</tr>
<tr>
<td>Dropbox</td>
<td>7</td>
<td>33%</td>
</tr>
<tr>
<td>OneDrive</td>
<td>12</td>
<td>57%</td>
</tr>
</tbody>
</table>
The committee held two meetings in December and January to discuss the three products and the poll results and to develop a recommendation. An initial recommendation was drafted that included two products, OneDrive for sensitive data and Dropbox for non-sensitive data. The committee met again on February 18, 2016 to review the proposal. At that meeting, several members expressed concern with offering two products instead of focusing on one product. The committee took a vote and decided 18-3 to recommend OneDrive as a single endorsed solution. The three members from the Kenan-Flagler School of Business felt strongly that Dropbox should be included as a solution. Their opinion is voiced in Appendix D.
Recommendations

The Committee recommends Microsoft OneDrive to be the primary collaboration tool for storage and sharing of University data, including sensitive information. Several factors support this decision:

- OneDrive is included in our current Microsoft licensing at no additional cost to the University.
- OneDrive is the only product that contains built-in security tools to better protect sensitive data on the end points as well as in the OneDrive environment.
- As part of the Microsoft suite, OneDrive integrates very well with other Microsoft Office products.
- OneDrive has unlimited storage capacity.
- OneDrive can be made available to the general campus almost immediately. Contracts and Business Associates Agreements have already been signed.
- Microsoft provides enhanced E-discovery tools across Exchange, OneDrive, and SharePoint.
- Many universities are migrating to Office 365, which includes OneDrive. Having a common tool will make it easier to collaborate with other universities.

Resource Request

The following resources will be required to implement this service. Note that this is a net new service and that there are no immediate savings in other storage offerings. However, the University will likely see cost savings in the next three years when there will be opportunities to offset future lifecycle costs for existing services. There are no forecasted savings in personnel.

Budget Requirements

Microsoft OneDrive

- $25,000 – Onetime Professional Services
- $15,000 – Onetime ITRC temporary help to assist in support ramp up
- $130,000 – FTE (including benefits) to administer the service

Totals

- $130,000 Recurring
- $40,000 Onetime

Potential Impacts and Concerns

Moving to an off premises cloud computing infrastructure presents some interesting challenges. The University must use a holistic approach in this decision with as wide as possible understanding of the implications.
The Committee faced a difficult decision. There are compelling justifications for all three solutions. In the end, there was an 80% majority vote to implement Microsoft OneDrive. Dropbox in particular was seen as providing a better user experience and there was a lot of debate on whether to recommend two solutions. In the final vote, providing a single solution is the better long term support strategy. The Committee is well aware that there is a massive amount of University data currently being stored “unofficially” on Dropbox in private accounts. (Dropbox reports that the University has the 24th largest higher education user population based on subscribers that have *.unc.edu email addresses.) Many researchers were/are in need of a tool that they could use to share data with and collaborate with other researchers within UNC as well as outside institutions. They moved to Dropbox because it was available, easy to use, and free or low cost. The following Dropbox benefits and obstacles were also considered:

**Benefits**

- It would allow the University to gain some control and management of University data that has leaked into space that has not been officially supported by the University.
- Since many University personnel have already chosen Dropbox as their preferred tool, there would likely be greater acceptance for purchasing the product.
- Dropbox provides capabilities for some groups that OneDrive does not currently offer for them. In particular, it allows delegated administration of accounts. Some units identified this as a critical function to provide them with greater agility to respond to their customers.
- Easier user migration/adoption.
- Ability to delegate full administration to University departments.

**Obstacles**

- **Additional Cost**
  - Initial licensing estimates from Dropbox are in the $200K per year range.
  - Adding a second product doubles the support requirements, requiring additional FTEs on both the front end and back end, adding up to $250K annually.
- Increased user confusion on which product to use under different circumstances.
- Diluted focus on a single product
- Increased risk of storing sensitive data in an environment that is not supported for sensitive data by the University. (Dropbox will sign a BAA, but it lacks built-in tools that provide needed protection on our endpoints. Third party products are available, but would add significant cost and support requirements.)
- Longer time to deploy
  - Budget request and approval
  - Contract negotiation
- Duplicate service support requirements
  - Help Desk
  - Security (E-discovery)
  - Public records requests
Networking/Security Intrusion Devices
The move to an off premises cloud storage solution will have significant impacts on the campus network and security infrastructures. A large amount of data that previously stayed within the local campus network will now traverse the campus borders. This may contribute to the saturation of the campus Internet2 network links. Also of concern, the data will pass through the campus intrusion prevention devices and a future planned campus border firewall. Similar demands are being introduced by the move to utilizing Office365 email and calendar services for faculty and staff. Note that students are already hosted in the solution but they are not currently offered SharePoint or OneDrive services. We anticipate that those services will be offered to students in the near future.

Data Protection
Microsoft and Dropbox are both willing to sign a Business Associate Agreement (BAA), so they would be responsible for the protection of University data from the point of view of their business practices. However, the University has the same responsibilities to protect the data from the point of view of our business practices. Extensive work will be required to build policies and business practices that meet customer requirements while satisfying the protections afforded by statute for sensitive data.

A few sample questions:

- What sensitive workstation controls will need to be implemented on customer machines? The campus SecNAS service requires the controls detailed here: http://help.unc.edu/help/workstation-controls-table. Most of the controls are managed by the campus AD group policy infrastructure. How will the University manage controls on mobile devices? Note that the campus security policy was recently updated to state that these controls are “preferred” but not mandatory. ITS Security strongly recommends that customers implement these preferred workstation controls.

- How does the University ensure that these same requirements are met on sensitive data that is shared with other entities?

- Will sensitive data be allowed to be synched to customer client computers and mobile devices? The committee identified the need for users with poor Internet connectivity to be able to collect and upload sensitive data OR download sensitive data for later use. Concerns were raised about the ability to ensure the protection of the endpoint device as well as for latest generation computer attacks to illegally retrieve this data from a synched local folder.

- How will the Microsoft security tools be implemented to improve security of the data on our user devices? Procedures will need to be developed and users will need to be trained to use them effectively.

End of Contractual Agreement and Migration Impacts
One of the most interesting facets of a cloud storage implementation is that the University is somewhat at the mercy of the vendors. In a service that offers unlimited storage, it is likely that customers will upload 500 terabytes of data in the next few years. If the contract ends, it is not a trivial matter to move 500 TBs of data, especially if the storage solution has become utilitarian in the daily business workflow.
of a department. ITS just announced the retirement of its AFS file storage service. That service has been in place for 19 years and is core to file sharing, web hosting, etc. To ease customer concerns, a 2-year horizon was stated as the goal for the retirement. In context, a decision to break the contract by either the University, Microsoft, Dropbox, or I2 will mean the likely migration of 500TBs of data in approximately 6 months.

There are several reasons why the contract may be terminated. There are no guarantees on the long term pricing model put forth by Microsoft and Dropbox. UNC may decide to implement a different solution—the potential migration would certainly weigh heavily in that decision. Microsoft or Dropbox may end the service. One of the vendors may be acquired and change its business model to one unfavorable to the University.

**Group Management**
Both Microsoft and DropBox have limitations on how well they integrate with existing campus methodologies on structuring file systems and associated security groups. Campus departments have strongly requested the ability to leverage existing departmental security groups. The implementation teams for both projects will be charged with determining the feasibility/workability of this concept. The heart of the issue is that departments want to replicate existing security groups into the cloud implementation.

The difficulty in leveraging legacy models arises from a fundamental change in architectures across all of the evaluated solutions. On campus today, departments use Active Directory tools to manage security groups. Active Directory allows for a concept called nested groups. Nested groups allow for security groups to be members of other security groups. A common practice is for users to be members of one or two groups and that these groups are members of other groups that grant access across the organization. All of the evaluated solutions do not support nested groups. Groups can contain users only. There is therefore no one to one mapping of groups from our existing infrastructure to the cloud solutions. Programmatically trying to address this issue will be difficult and open to ongoing support issues.

There are similar issues in the relationship between security groups and file systems. File systems in use today are hierarchical in nature. A department generally starts with a single top level directory that then branches out to address requirements of the individual units within the department. In the cases where a department needs to prevent Unit A from accessing the files of Unit B, a feature called inheritance blocking is utilized. As you progress downward through the file structure, inheritance blocking is utilized to prevent (if desired) permissions in a parent folder to be passed to a child folder. In practice, you wind up with a structure that looks like:

**Department**

- Unit A
- Unit B
All users in the department can be configured to see all the files in Department and in Common. Only users in Unit A can see the files in A. B can be configured likewise.

The cloud solutions do not currently support this principle. They are designed under the concept of a collaboration container and users in the container have rights to everything in the container. Rather than work in a hierarchical structure, you wind up with a flat structure where each collaboration group gets its own container.

The two approaches mean that it will be difficult for existing storage solutions to be ported “as is” over to the cloud solutions. The fundamental changes in approach to both file system design and security group design lead to a need to analyze how departments will be required to adapt to these changes.

Drive Mapping Not Available
None of the cloud solutions currently offer the ability to map drive letters. All of the vendors have this in their development path. Campus departments currently heavily rely on drive letters and will face customer adoption/training issues.

Microsoft Limitations Regarding Streaming
Video encoding, streaming and optimization is available through the Azure Video service which is freely available to us, but that service is separate from and not well integrated with OneDrive. We do know of a roadmap item to allow “publishing” from OneDrive to the Azure Video service but, we are still awaiting written guidance indicating that the native integration of Azure Video functions into OneDrive is on their roadmap.

Change Management of Vendor Features
There are concerns that the University may not have any leverage in the inclusion or deprecation of features/options within the solution. The solutions are relatively new in a very competitive market. The key to their success is innovation and new features. This may have large impacts on local IT support. More importantly, any deprecation of features will potentially have significant impacts on the Campus user community.
Appendix A – Use Cases

Doctoral student going home to Saudi Arabia for one year to collect her research data needs to collaborate on her research project with her faculty advisor.

I am writing a grant with faculty members and staff at several other institutions. We typically do this in Word docs that we send around. How can we do this more conveniently? How do I change/modify permissions on documents/folders? I have a folder that I’m working on with three other faculty. I’d like to add someone else (Elizabeth) who can edit and someone else (Ned) who cannot edit, but can view. And I’d like to change Sam from edit to view only. How does this play out for documents and folders. (From discussion with Brent, sounds like it is all inheritance driven from parent folder.

I'm writing a research paper with several students and I want to edit collaboratively, Google Docs style. How do I set this up? What if some collaborators are off campus (no Onyen)? I want to post a dataset from my experiment so that anyone with a URL to it can access it (not knowing beforehand who this might be).

I’d like to run a CMS like WordPress and have people from multiple units on campus (and potentially) off campus update the content (files).

Need a program directory with multiple files. Files need to be shared with different people, but not everyone gets the same access to the same files.

1) Security groups, users into groups, permissions assigned to groups

- Inheritance can NOT be broken in this model.
- Departments/Centers request from ITS to create the Security groups.
- No AD integration for group assignments
- Group admins
- Co-admins

2) Departments/Centers can assign permissions at the user level

- Box permissions allow you to see all permissions per user, unlike AD.
- Label directories with sensitive data

Collaborating with External (non-UNC) users

- UNC admin can invite External users.
- Security concern: once they have the invitation, they can download the info. Do we need to have policies in place regarding the security protocols on their local computers? Same issue exists for Managed (UNC) users and sync with machines at home that may be used by others (e.g., kids, roommates, used for gaming, etc.)

Student collaboration?

- Student Affairs moved from AFS to WordPress in last two years.
- This may also go through Student Affairs.
- Provisioning and de-Provisioning will be the sticky wicket.
Distributing and collecting "surveys" is a use case that should NOT be endorsed given the 1/9/2015 mandate that "Qualtrics is now the primary on-line survey tool for the University. Individual departments and schools should neither buy nor use other on-line survey tools" https://itsop.unc.edu/blog/qualtrics-survey-tool-free-and-approved-for-sensitive-information/

Scan to share
- No CIFS support
- WebDAV incompatible with SSO https://support.box.com/hc/en-us/articles/200519748-Does-Box-support-WebDAV-

Our Corporations and Foundations group routinely need collaboration file space with outside entities. For example, our Associate Director of Corporate and Foundation Relations for Health Affairs will work with the Keck Foundation and various medical research programs on campus for a grant proposal that involves large PowerPoint files. Dropbox has been the preferred method because there is no sensitive data being transferred and due to the ease of setup use between organizations.

File collaboration between Vice Chancellor for University Development, Director of Development Planning and Strategic Projects and the Executive Assistant across all types of devices (Mac Laptop, Windows Laptop/desktop, iPad, iPhone, Android). This small group is just one example of several small groups in the Development Office that would need to collaborate on special projects which would include the following file types: presentations, remarks, white papers, to-do lists, spreadsheets, Word docs. Notifications to all users in the workgroup when files are updated or uploaded is needed. Currently using Evernote for the Vice Chancellor’s team to facilitate this type of collaboration.

Departmental file storage - University Development Office currently uses a locally hosted windows CIFS share to store the majority of files (word, excel, etc.). Also, we use SecNAS, AFS, Myfiles, and ITS SharePoint for a small subset of files. If box were to be a viable replacement for one or all of these current file services, we would strongly consider migrating our file spaces.

Replacement for email attachments. User needs to share large attachments with others and generally relies on email. Would look for ability to share internally and externally. Would also want potential to put an expiration date on the file so it is deleted at some point.

Researcher that needs to periodically upload "sizeable" data to a static web site that is available to the world with no authentication. Do I use the sync tool? How hard to get the data into box, particularly in an automated methodology?

I have a home directory in box. I want to collaborate with another user – what’s the best way to set up local access so they get to see only the three files to which they need access?

I need to sync with files on Google Drive. Initial sync was ok. Seems to be problems syncing on an ongoing basis.

Continuing education department offers training materials that are no cost but can be used for CEUs should the viewer wish. Material is open to public but CE folks would like data about who uses it. Doable?
Sharing sensitive project data with faculty/staff who are overseas (for either short periods of time or while on sabbatical leave) and do not have reliable Internet access. Activities may include collaborative analyses and development of manuscripts.

Sharing sensitive project data with non-UNC project staff (external users) who are overseas and do not have reliable Internet access to be able to use secure SharePoint. **Upload syncing** (only) of research survey data being collected in the field where Qualtrics is not an option due to either the lack of consistent internet connectivity or the required off-line functionality is not available in Qualtrics (e.g., need to use CSPro on a Windows tablet or ODK on an Android tablet). Not all tablet data collection software has features to meet the needs of complex data collection instruments.

Storing and using UNC-related work files by faculty/staff while overseas who may not have access to reliable Internet connectivity (similar to above, but no sharing with others required in this scenario).

Administrative data and information needs to be collected for different scenarios: collaboration on a grant proposal that includes sensitive budget information, collection of sensitive information for individuals to participate in international workshops (e.g., passport numbers).

Researcher or student needs to watch or listen to large media files considered sensitive information based on content and code that media (de-identified) for use later in a separate computing location.

Research group regularly uses cloud storage to collaborate on study interventions with outside partners in county health departments. **KK SON has the same use case.**

Access files in multiple virtual machine environments (desktop, research computing, XenClient, etc.).

Faculty “team” needs to collaborate with internal (UNC) and external members (2U.com) to develop course material and coordinate class activity for multiple sections. The material needs to stay together as a collection of information across semesters and have the ability to add and remove contributors as instructors come and go.

Marketing and communications needs to store large amounts of raw media files over many years (stock photography/video archive). The material needs to be accessible to internal and external (consultants) users. Access will be controlled by mar/com end user. Version history or other use data needs to be tracked to keep individual media items from being overused.
## Appendix B - Evaluation Matrix

<table>
<thead>
<tr>
<th>Feature</th>
<th>Box</th>
<th>DropBox</th>
<th>OneDrive/SharePoint</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost</strong></td>
<td>$10k one time, $160k recurring (Another $10k (one time) if we implement a second secure instance). This covers 50k users.</td>
<td>Unofficial start of negotiation is $42 per faculty/staff. $10 per student. Additional funding required for third party applications to meet BAA.</td>
<td>“free” - The cost of this solution is covered as part of the yearly contractual money that the University already funds.</td>
</tr>
<tr>
<td><strong>Total Enterprise Size - Total Limit</strong></td>
<td>Unlimited</td>
<td>Unlimited</td>
<td>Unlimited</td>
</tr>
<tr>
<td><strong>Compliance and Security</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Security - Overall</strong></td>
<td>Very Good - Best of Breed?</td>
<td>Very Good</td>
<td>Very Good – Rights Management and Data Loss Protection available at no additional cost</td>
</tr>
<tr>
<td><strong>HIPAA Compliance</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Data stays in the United States</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Auditing</strong></td>
<td>Yes – But requires UNC to replicate to Splunk for access</td>
<td>Yes – But requires UNC to replicate to Splunk for access Partial - does not audit individual file actions</td>
<td>Yes – No additional splunk requirement.</td>
</tr>
<tr>
<td><strong>Encrypted at Rest &amp; Transit</strong></td>
<td>Yes - Customer controls local file system.</td>
<td>Yes - Customer controls local file system.</td>
<td>Yes - Customer controls local file system.</td>
</tr>
<tr>
<td><strong>Discovery and Reporting</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Remote Wipe</strong></td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Sensitive Data Alerts</strong></td>
<td>Yes, but lots of false positives.</td>
<td>No</td>
<td>Yes, with DLP</td>
</tr>
<tr>
<td><strong>Data Protection: Sensitive Data Filtering</strong></td>
<td>Yes</td>
<td>No</td>
<td>Yes, with DLP</td>
</tr>
<tr>
<td><strong>Administration and Management</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Enterprise Installation and Configuration Management</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
## Administrative Features and Management

<table>
<thead>
<tr>
<th>Administrative Rights Delegation</th>
<th>Yes</th>
<th>Yes</th>
<th>Limited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permissions Administration Delegation</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Integration: Authentication Options</td>
<td>UNC SSO/UNC Shib</td>
<td>UNC SSO/UNC Shib</td>
<td>ADFS</td>
</tr>
<tr>
<td>Integration: AD Groups &amp; Synchronization</td>
<td>Concern: No AD int or synchronizations, no nesting available with AD groups. Will use api’s to synch groups.</td>
<td>Concern: No AD int or synchronizations, no nesting available with AD groups. Will use api’s to synch groups.</td>
<td>Yes</td>
</tr>
<tr>
<td>AD integration</td>
<td>3rd party or API programming</td>
<td>3rd party or API programming</td>
<td>Yes</td>
</tr>
<tr>
<td>AD API’s</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>External Security Groups</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>File structure/features</td>
<td>Concern: Can build the file structure but cannot block inheritance where needed</td>
<td>Concern: Can build the file structure but cannot block inheritance where needed</td>
<td>Concern: Can build the file structure but cannot block inheritance where needed</td>
</tr>
<tr>
<td>Administrative Sync Management</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

## End User Experience

<table>
<thead>
<tr>
<th>User Experience</th>
<th>Strength/Customizable UI</th>
<th>Recognized as industry leader</th>
<th>Subjective - but not positive across committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single File - Size Limit</td>
<td>5GB</td>
<td>None</td>
<td>10GB</td>
</tr>
<tr>
<td>Ubiquitous Access to Files</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>HTTPS</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SFTP</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>WebDAV</td>
<td>No (not with SSO)</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Mapped Drives</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Feature</td>
<td>Manual Only?</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>--------------</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Create as Document Library in Windows</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Android/iOS Clients</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Application integration / API's</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Versioning / Backup Retention</td>
<td>Yes - customizable to any numbers we want</td>
<td>Yes - unlimited</td>
<td>Yes</td>
</tr>
<tr>
<td>Selective Sync - End User</td>
<td>Yes, Manual via Right-Click</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Collaboration</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peer to Peer Collaboration</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Collaboration with External Entities (without Onyen)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Collab: In-Program Document Creation and Editing</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes with Office 365 integration</td>
</tr>
<tr>
<td><strong>Video</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large Video (100MB Test)</td>
<td>Yes, Syncs in 3 minutes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sync Video with Mobile Apps</td>
<td>Yes</td>
<td>Yes</td>
<td>More testing required.</td>
</tr>
<tr>
<td>Physical Drive Ingest</td>
<td>Yes (additional cost)</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Appendix C - Interviews with Other Institutions Running Box

University of Michigan

**Size of service and how long in production?**
Early adopter in the Net+ evaluation, back in early 2012. They have about 50k active accounts; actually more accounts in enterprise that are disabled, but haven’t deleted those accounts yet. Part of the de-provisioning process. Very soft launch as they figured it out, first to IT staff around campus. With experience an ironing out SSO and webpages for communications by April 2012, opened in summer to faculty and staff. Big promotion to students in the fall term. With every move to production there were more accounts. Don’t really promote now, communicated as part of the IT resources are available. Waves as groups start to use Box: start of terms, groups start using. Big adoption with signing of BAA.

**Service reliability?**
As long as Michigan has used Box, they’ve had no notable downtime. Not to say there aren’t problems occasionally with web response or other small problems. Access to data is still available in some fashion.

**Box rated for SI?**
Everything but PCI and FISMA is allowable. Both have their own requirements. Make a difference between Box.com core apps (provided by Box) and non-core (3rd party). Non-core is an end user agreement between individual and that app, so not permitted for SI.

Box console allows permitting or not of 3rd party apps. Some schools permit nothing and then vet. Other schools allow all on by default, but clear that not to be used for SI. Can’t tell how many 3rd party apps are in use, Box.com can provide a report about app usage.

**Box and Alternatives (Google, SharePoint, OneDrive)?**
Don’t official support OneDrive, but it’s available through the MS contract. Treat OneDrive like a consumer app. Have everything from AFS to campus wide Windows based NAS. Storage in the LMS. This is kind of a problem. Great at turning stuff on, but not off. Common request “just tell me where I should put my stuff.” Google Drive is tied into Google Mail/Calendar solution. Attempt to turn off AFS (listening Brent) but not met with success; has a real niche where it’s useful, popular, and successful (Engineering, CS, Linux, home dirs). Internet Architects are starting to write lifecycle and horizon plans. Soft effort to use more strategic data stores so others can be retired.

**Managing delegated administration for departments?**
All centralized, Auto-enrollment helps with this. Where there are department or unit needs, regulatory reasons for tighter control of the data, can have separate instances but enrollment gets complex. Can satisfy these request by showing what’s done for auditing and securing. Offer shared accounts, Box accounts not associated with individuals but groups. Create top level folder and make the requestors co-owners of the folder then let them manage (similar to IU). No control over service account, but control over shared folder.

**Help Desk support load?**
**Existing Box account migration?**
**Multiple Box accounts?**
Auto provisioning with SSO process. Claiming of the domain is a project. Michigan rolled Box.com out starting with a report of account with umich identities. Communicated with all of those users to let them know that an agreement was signed with advantages over the free account. No forced repatriation. Some schools do force. Michigan didn’t because alumni and retirees are entitled to hold umich email address, so this doesn’t mean your active faculty, staff, student. So, there are light accounts with umich IDs as it should be. Interesting, can’t tell people are umich accounts based on ID. Graduates and employees can be rolled back into a light account with 50 GB and keep access with same IDs.

Med.umich.edu don’t get to retain id’s when leave, so forced repatriation for those specific accounts.

Still have people who call help desk with light account trying to use SSO credentials. Support load is pretty small - 20 tickets per week. More get escalated to Tier-3 than would like rather than help desk can work it out. Often a Box problem is a pretty difficult problem otherwise people work it out themselves. Volume is very small. Until recently the request was a ticket to the help desk, but this has been automated and cut down on tickets.

Biggest pain point is Box Sync - especially true in the past, but Sync 4 has improved. Some Sync 3 still problematic. Supported a number of services that do synching but synching is always a problem.

Problem with collaboration when “owner” of material leaves. Easy to lose sight of shared folders not belonging to the sharee. This is a problem if someone has rolled into a light account. Quitters are easier because help desk can restore access to account for dept. to move the files into a different space.

**Syncing of large files or datasets?**
Have one group with a 50 TB account - archived video research. Box move to unlimited storage is coming. UMich is at 25% under current contract but waiting for ink to dry. Just starting to work with really large files and datasets. School of Education - video of student teaching experiences (classrooms of children) so this is SI. Have been storing on local NAS, running out of space, captured on grants funded while grant was current, and no money to maintain data. Box isn’t designed to be a video archive solution, and there are problems, but it’s a place to store the content and retrieve for local use if needed. Price is right. Box offers a service where you can ship hard drives - haven’t done it but talked to about it. Experimenting with FTP.

**Making files available in virtual environments?**
Stream is coming to meet this need. Don’t want to push data to virtual environment that will just disappear when the apps are done. Stream looks like shared drive. Recommend the IU product.

**Network traffic monitoring?**
No. Interesting idea.

**Indiana University**
**Service reliability**
3 years, 80k accounts. Production April 2012. Advertise 100% reliability. In 3 years they’ve had 2 outages ~ 1 hr. Variety of mitigating issues, like early experience with security cert. update, earlier this week the collaborators page wasn’t loading (404, other service fine), few egregious outages, twice a year have something. I2 connection a little fragile for IU. Pretty solid, but not 100%. If the network goes down
there are bigger issues than you getting to your Box files. Still have hold outs from adoption because it’s a different way of working. Box purchased Stream last year (mapped drive to desktop). This will lead to a bump in adoption.

Box not rated for SI?
In fact, have 4 data classifications (public, uni internal, restricted, critical). Approved Box for restricted data (sensitive). Getting ready to approve Box for PHI. Setting up a mechanism for people to request accounts - co-ownership of a folder that’s a sub folder in a tree managed by clinical IT department. Locked down in various way and recommendations for behavior. Making the best of what Box provides. Every folder has a naming convention. Visual indicator on every folder. Invite collaborators but no write, delete, sync, folder controls (viewer-uploader). Only owners-crowners can create shared links. Have heard it’s announced Box has unlimited quota on Net+ contract. So no quota for clinical affairs IT who own the top level. No-one owns the account, only Box admin. Two co-admins for day to day managing (group accounts tied to a single individual). Deliberate attempt to admin the system with those accounts. Explicitly prevented from sharing credentials. Using another process for restricted data.

Evaluating DLP providers. I2 community folder in Box. Eval of DLP providers there crowdsourced by I2.

Box and SharePoint?
IU is the intersection of the two. IU hasn’t rolled out O365. One requirement is that IU wants to use Box on the back end; not OneDrive. Needs to message community the request to echo Box for backend of O365. O365 is anything but “just a replacement for Office.” O365 is a big, complex, mess of services, storage, and collaboration. Works great if everything - EVERYTHING, is Microsoft. Took 18 months to get Box through compliance. All users want to know is “where do I put stuff” and every new opportunity is confusing and problematic.

SharePoint doesn’t allow storing certain file types. Box has built in preview for ~1k file types. Mixed OS and activity world is a huge problem.

Permissions in SharePoint/OneDrive aren’t as cleanly ownable by departmental accounts. People leaving take files with them - this is problem for Google as well. Dropbox not really built for collaboration (no viewing only, shared quota, etc.). OneDrive has issues with ownership and permissions because these live in SharePoint really. Facing demand for O365 so continue to pursue Microsoft to consider integrating with Box.

Using external security groups (LDAP or AD)?
Box is kind of an island there right now. One request of advisory board was a concept of groups that maps to IU’s idea of groups. Groups can be collections of people or a non-personal entity (departmental account). Mistake: not having something like that in place day one (Spanish dept. needs “its” own Box account). Two types organization (school) vs. small team accounts. Will send admin instructions for manual creation. For a long time Box could tie to AD if you give access to LDAP, but no-one does this. Box is working on a solution to tie Box groups to your “source of truth” (AD, grouper, registrar, combo).
Fundamental problem that a scholastic class can’t be tied to a Box group. Getting close though. Also getting close to Security Groups (controls on a user can be applied to groups of users. IE uncheck desktop sync). Don’t (rare) make someone a group admin - too much power. Very few groups in Box after 3 years. One is IT support for executives.

Managing delegated administration for departments?
Told distributed IT departments that this would run centrally, no way to delegate. Organizational account (College of A&S example). Gave A&S an account with top level folder and gave co-admin to two accounts. Build world underneath. Create dept. folder add co-owner there and continue on down. By policy their responsible for their organizations data, much like local file server. No actual admin tool access. Anyone with admin rights has to go through HIPAA training.

The day to day work in Box isn’t particularly technical.

Help Desk support load?
Remarkably small. 80k users, even during finals, had 45 tickets. 135k users, 24x7x365. Those 45 tickets, about half are inquiries. 1/3 sync issues.

Existing Box account migration?
Multiple Box accounts?
IU has 9 top level domains, 8 campuses + IU.edu. Also have two subdomains, but Box treats separately (M$, Gmail) for students. Suggestion from President that any organization uni. wide should change email. This lead to new Box accounts being created and a support nightmare because people thought their files (old account) were missing. Students create free Box account with IU email address, this leads to repatriation and includes people who aren’t eligible for iu.edu accounts anymore who would lose accounts. Part of process to pre-provision and back fill is to push in every possible email aliases across those 11 domains to the correct accounts.

Syncing of large files or datasets?
Desktop sync is the spawn of the devil. The full Box experience is in the Web UI and only the Web UI. The desktop sync client intentionally syncs nothing. Wants you to make an intentional sync decision for desktop. Why give everyone unlimited quota and then sync everything to desktop. How much data is going to be on the computer that doesn’t need to be? Stream looks really good. Flagging for offline use is coming but maybe not this year. People use this because they want local folder, but local folder and local copy are different things. People think Box is syncing without turning it on.

IU Cloud Storage Solution for Citrix apps?
IU developed a tool that’s entering the Net+ program Kumo which handles the IU Cloud Storage Solution for mapping any number of cloud storage tools (enterprise or personal) to Citrix experience. I.E.
File picker includes the cloud storage, SharePoint, mapped drives, etc. Also provides through login to lab computer (Windows only). Kumo is for managed computers. Unmanaged computers would use Stream.

Use Box for whatever you want. We don’t care. Especially with unlimited quota.

No other way to consider this but as campus wide roll out. Another university wants to only roll to faculty and staff (no students). This is throwing away money. You have to incorporate it into the fabric of the university. Then it goes viral.

Off shoot of the Kumo project (transitioning to Canvas for LMS). New tool in Canvas to “Broadcast” a folder of files from faculty to class of students. Pushes copy of the folder to the students accounts so they have that work day 1. Business school has a 2000 student class that do this manually, but transitioned to this tool and everyone is set Day 1.

Going to start pre provisioning IU accounts for students. Then broadcast tool won’t report errors about missing Box accounts.

FTE’s: 1 guy Tier 2, slice of Bob’s time. Good documentation.

Good community list. Strong I2 advisory board, meets three times a year. Strong relationship. Super vendor. Love the product. Really tying it into infrastructure. Pushing new online community that looks good, including dedicated higher-Ed space.

No market plan needed. Like a snowball, kick it and it’s off.

It’s clear they’re burning a lot of cash. But, getting a lot of customers. Strongest player in health care with BAA. I2 shares concern about Box being bought. But, their credibility is rising.

Here are the items I mentioned as well as a couple other things I thought might be helpful. Let me know if I forgot anything.

- **Departmental Accounts**
  - Documentation [https://kb.iu.edu/d/bdhb](https://kb.iu.edu/d/bdhb)
- **OA Creation steps** [https://iu.box.com/s/09vey9e3tlhtikph6yhj](https://iu.box.com/s/09vey9e3tlhtikph6yhj)
- **IU General Box documentation**
  - IU Box website [https://box.iu.edu](https://box.iu.edu)
- **Main Box menu** [https://kb.iu.edu/d/bbro](https://kb.iu.edu/d/bbro)
- **Kumo documentation:**
  - [https://iu.app.box.com/kumodocs](https://iu.app.box.com/kumodocs)
  - [http://cloudstorage.iu.edu/partner](http://cloudstorage.iu.edu/partner)

Follow-up answers to questions:
1. MS Exchange for faculty staff. Gmail for students. (There is some residual stuff around the edges of both populations, but they are winding down.)

2. We did not do any baseline when Box was launched, but just a few days ago we had a presentation from Skyhigh Networks who evaluated a week’s worth of our network data (early April) to give us a picture of all of the cloud services being used on our network. There is still a lot of Dropbox usage, but it’s hard to say how much it has changed. Heck, I still use Dropbox (though less than before). To be honest, we don’t care if people use Dropbox as long as it’s not with university data. We try to make Box more attractive, but the reality is that they will lose their Box account when they leave the university and that will always play a role in users’ decision-making.

UNC Greensboro
Service reliability?
Great.

Box not rated for SI?
UNCG is limited by their policy definitions for sensitive information and what they call “lock systems.”


Box is rated for 2-lock because 3-lock is required to be on campus.

They’ve rated Office365 as a 1-lock solution and didn’t seek a BAA with either vendor at this time, but are re-evaluating the need with Box.

Box and SharePoint?
UNCG is a Google Apps campus, so their only need in the Office365 space was Office ProPlus. They just don’t need SharePoint/OneDrive.

Using external security groups (LDAP or AD)?
Jeff Whitworth has a PowerShell library for manipulating Box API’s and use this to such groups from AD into Box. Still experimenting with how exactly they want to endorse usage of groups in Box. Working on POC’s.

Managing delegated administration for departments?
No. IT is very centralized so no real demand or resources for such delegation. Think that admin UI is not very well setup for creating virtual organizations to manage in absolute a subset of population. You can farm out admin tasks but applicable across whole organization.

Help Desk support load?
Existing Box account migration?
Multiple Box accounts?
Support load is trivial. Turn-on auto-enrollment through SSO which also prevents creating duplicate accounts.

Had to go through the exercise of claiming their Box domain, and deal with 200-300 public accounts using UNCG email. Box was very helpful in generating necessary reports to find users and outreach. Majority were no longer active, no longer affiliated with Uni., or didn’t have contact information for. All in all 1 complaint about an account pulled into UNCG space that wanted to remain in public space.

*Syncing of large files or datasets?*
No comment.

**Interesting Partner Implementations**

- Implement common use cases
  - [http://box.psu.edu/use-cases/](http://box.psu.edu/use-cases/)
- Scan to email: workaround for inability to map drive
  - [https://kb.iu.edu/d/bbyn](https://kb.iu.edu/d/bbyn)
- [https://itservices.stanford.edu/service/box](https://itservices.stanford.edu/service/box)
- stanford.box (non-sensitive) and stanfordmedicine.box (sensitive). Membership is mutually exclusive.
- [https://box.duke.edu/security-and-usage/](https://box.duke.edu/security-and-usage/)
- 'Data Types' table; would be interesting to find out Security Office workflow. File organization, inventory, endpoint compliance check?
- Moving personal account to non-university address [http://oit.duke.edu/comp-print/storage/box/faq.php#faq-4](http://oit.duke.edu/comp-print/storage/box/faq.php#faq-4)
- Backup & Restore; sounds like it self-service
- CMU advises "Files do stay on the Box servers for short period of time after the Trash is emptied; however, a ticket will need to be opened with Box to determine whether a file or folder is actually recoverable." [http://www.cmu.edu/computing/accounts/storage/options/box/faq.html](http://www.cmu.edu/computing/accounts/storage/options/box/faq.html)
• Trash retention, 30 days [http://oit.duke.edu/comp-print/storage/box/faq.php#faq-18;](http://oit.duke.edu/comp-print/storage/box/faq.php#faq-18) configurable by admin?

• Tasks Feature

• [https://kb.berkeley.edu/sharedservices/page.php?id=23773](https://kb.berkeley.edu/sharedservices/page.php?id=23773)

• Apps approval procedure

• [https://oit.duke.edu/comp-print/storage/box/boxapps.php](https://oit.duke.edu/comp-print/storage/box/boxapps.php)
Appendix D - Additional Input on Cloud Storage Solutions & Decisions – Kenan-Flagler Business School

Response to Executive Summary

It is the recommendation of the Kenan-Flagler Business School that two cloud storage options be offered to the campus community given the diversity of need across the many professional units.

- **Dropbox and Google currently hold the majority of UNC’s data in the cloud.** The vast majority of our data stored at Dropbox and Google reside with their free consumer offerings without contractual agreements between UNC and these vendors. When asking clients to adopt a new enterprise tool, it is often most successful when you can meet them where they already are with a tool they are comfortable using. This approach is also an important factor when trying to regain business IP currently in the consumer space and outside of UNC administration and support.

- Offering two solutions recognizes both the need for stronger security controls for high sensitive data and as well as the business/student administration storage especially when file storage is the only need.

- Cost mitigation can be approached in several ways rather than the all-or-nothing offered in the current recommendation. There are several examples of this where ITS provides the contract and vendor management services leveraging the enterprise to drive down cost, but the charges and support are distributed.

- The long-term support requirements will be no different than what is currently supported. Enterprise storage teams and support organizations already manage many diverse solutions for data storage including AFS, SecNAS, Storage.unc.edu and they cloud options listed above.

- OneDrive was developed with a focus on individual or personal file storage in mind. It is not robust for business management and group files storage controls.

- OneDrive has limited external collaboration with those not using the platform.

- OneDrive does not support distributed administration needs of the Kenan-Flagler Business School.

- There was a lack of a clear deployment plan for OneDrive particularly in regards to business and group management.

Highlights for why Dropbox should be considered

- **Meets all of the current campus security requirements including a willingness to sign a BAA.** The recently added required data security requirements outlined in this document and used as deciding factors for cloud storage (DLP/DRM related) are not consistent with any other production storage solutions & services provided by ITS, including the production SecNAS.
Their sole business is the business of file storage, and they continue to be the market leader in consumer file storage. They understand and continually improve this type of service, including security, collaboration, and administration. They specialize in business file management.

The Dropbox user experience is the most intuitive and user-friendly of any of the products tested. This is an important consideration for successful user adoption.

It has a superior migration tool - Dropbox has migration automation to move content to the enterprise and reclaim domains.

Dropbox can be made available in a short timeframe.

Dropbox also has easy-to-use integration with Office, Windows default applications, video and Office 365. They are a Microsoft partner.

They have a mobile application for easy commuting.

Supports distributed administration with separate databases for professional units

Supports in-app video streaming.

Integrates with our LMS.

Unlimited storage capacity.

Is superior in data syncing for large files, OneDrive is known to have difficulties with this.

Supports collaboration with external partners at the file, folder, and group level not just those users within the enterprise.

They support remote wipe of data with detailed audit trails and status. This is important when accounts are expired or disabled.


The collaboration includes inline editing similar to Google Docs.

**Input: Topics & Considerations**

Google is another topic that was not addressed by the committee and is an important piece of the current and future picture in EFSS. Google-provided cloud storage is a production service at UNC for a group of customers and was not evaluated for all faculty and staff. UNC Computer Science: [http://cs.unc.edu/help-article/new-accounts/](http://cs.unc.edu/help-article/new-accounts/)