Goals of Proposal: To provide a common, reliable, and secure backup and storage solution for the BFTV Cluster and associated research units.

VEN and FST are in need of a unified storage solution. Current file shares are spread across several different pieces of hardware of varying ages, making maintenance difficult and time consuming, and increasing the risk of data loss. Off-site backup of data is absent for some systems, leaving us exposed to data loss in event of a catastrophe (fire, broken water pipe, leaking walls, etc).

Most departmental storage currently resides on aged servers, running an operating system that will be without support within the next two years. Furthermore, demand for digital storage has greatly increased since their deployment, and our servers are currently running at capacity or quickly approaching it. As more faculty take advantage of current technology, their need for data grows. A researcher who only needed to store the occasional word document a few years ago now regularly saves gigabyte-sized datasets. A suggested allowance for researchers working with genetic datasets is in the neighborhood of 10TB, and a small number of researchers are already requesting solutions of that size.

Current backup and storage plans vary from unit to unit and may not be consistent even within the same lab space. Many users are backing up to external hard drives that sit on their desk, vulnerable to theft, damage, and failure. Restoration of files requires interaction with tech support, delaying access to needed data, and costing the cluster paid staff time.

In April, a poll outlining possible pricing structures for a consolidated backup and storage solution for units affiliated with BFTV was put out to the faculty. This poll was meant to gauge the interest in a unified storage solution currently in the planning stages. Background information was kept intentionally vague in order to get a “gut reaction” to the pricing options. Response to the survey was overall positive, with almost half of the respondents, 10 out of 24, willing to buy in to such a system, based on pricing alone. Additionally, BFTV staff members have also been approached by individual faculty members expressing interest in more storage space.

The following is a proposal for a solution that provides a new, redundant hardware base for group storage, and a backup system that can be applied across multiple groups while respecting organizational boundaries.
**Hardware**

The infrastructure listed for both options includes main hardware and accessories, setup in two separate locations to provide off-site redundancy. Storage price includes 2TB of space to be added to the system. All components are covered by at least a three-year warranty. Both plans utilize a Storage Area Network (SAN) infrastructure, allowing additional storage devices to be added easily as demands increase.

**Option 1: Dell Solution ($34,000)**

**Storage Price: $900 for 2TB**

The Dell solution provides a unified management system with a long-lasting warranty, at an increased cost for expansion.

Dell R310 Economy $4,500

Provides 4TB of RAID 6 storage for BFTV Cluster, and acts as host for our backup solution, and gateway to SAN device. Device has redundant network interfaces and power supplies.

+ 2 Spare 2TB NLSAS Drives: $900

Dell NX3100 + 4 2TB NLSAS Drives $6,500

Provides 4TB of RAID 6 (expandable to 20TB). Initial space will be used to offer free storage space (200GB) to a limited number of smaller labs and to provide general overhead. Device has redundant network interfaces, and hot-swap power supplies. Device has a 5 year warranty.

2TB 7.2K RPM Near-line SAS 6Gbps 3.5” Hot-plug Hard Drive $450 ea

4 spares = $1800

**Upgrade Costs (not included in total)**

Expansion would require an MD1200 unit ($6000, for the base hardware) and provide another 20TB of possible total space.

Those looking a 10TB storage solution would purchase a separate Dell MD1200 (20TB total) to add to the SAN infrastructure. ($9,500 per unit, $19,000 for redundancy)
Option 2: Dell/Amax ($28,600)

Storage Price: $600 for 2TB

This mixed solution depends on a local vendor for the main storage unit, with a shorter warranty, but provides more possible space at a lower per-terabyte cost.

Dell R310 Economy $4,500

Provides 4TB of RAID 6 storage for BFTV Cluster, and acts as host for our backup solution, and gateway to SAN device. Device has redundant network interfaces and power supplies.

+ 2 Spare 2TB NLSAS Drives: $900

ServMax 42000 + 4 2TB Drives $6,000

Provides 4TB of moderate-speed RAID 6 storage (expandable to 68TB). Initial space will be used to offer free storage space (200GB) to a limited number of smaller labs (10-15) and to provide general overhead. Device has redundant network interfaces, and redundant, hot-swap power supplies. Device has dual RAID-controller cards, but failover is not automatic. Device has a 3 year warranty.

3.5" 2TB SATA Enterprise Hard Drive $300ea

3 Spare 2TB Drives: $1200 – For rapid replacement in case of hardware failure.

Upgrade Costs (not included in total)
Those looking a 10TB storage solution could just purchase enough drives to cover their needs. ($3000 for 10TB) Or they could purchase their own SAN unit if desired.

Once the ServMax reached capacity (68TB), we would need to purchase another SAN unit.

Accessory Costs

(Included in Totals for both Options)

Power Backup: APC Smart-UPS 2200 LCD - $1000 - Provides stable and continuous power for server and SAN unit, and possible expansion.

Ethernet Switch: Unmanaged 16-port Netgear $200 - Provides connection between SAN and Head Server

Server backup software, OS licenses, etc - $500
Software Backup Solution

CrashPlan ProE

• Easy install and clean end-user experience.
• Clients available for Windows, Mac, Linux, and Solaris.
• User can self-restore files, even across systems. (I.E. – Pull a file from their Windows desktop backup to their Mac laptop.)
• Management groups allow for accountability.
• Users can only see their own files.
• Files are encrypted on the client using 448-bit encryption. Local client interface can be password protected.
• Can restore previous versions of files.
• Allows backup to local external drive, or other devices running CrashPlan PROe Client.
• Data is kept On-Campus, under BFTV Control at all times. No third party retention of data. Allows compliance with some grants.
• Proximity of data allows for faster upload and download speeds than an internet based solution.

Pricing for Faculty Recharge

Storage Costs
2TB for 3 years = Option 1) $900 or Option 2) $600

• Cost of hard drives may fluctuate over time. Actual cost will depend on current price of two compatible hard drives.
• Will not be prorated, and will need to be renewed in three years.
• A limited number of ‘slots’ available for purchase, depending on the model of the SAN unit. Once full, an expansion unit will need to be purchased.
• Purchased space can be divided into Storage Space and Backup Space, which will be enforced through quotas.

Backup Costs
Crashplan PROe Client License: $400 for 5 devices for three years

• A ‘device’ includes any Windows, Macintosh, or Linux system backing up to the server.
• Cost may be pro-rated to end of three year contract, on a yearly basis.
• Five – device minimum purchase, additional devices $80 for three years.
• This cost, combined with an offering of 200GB of free space, makes us cost-competitive to other third party, non-university hosted solutions. (See chart.)
<table>
<thead>
<tr>
<th>Service</th>
<th>Space (GB)</th>
<th>Devices</th>
<th>Users</th>
<th>Price</th>
<th>Price per GB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google Drive (200GB)*</td>
<td>200</td>
<td>Unlimited</td>
<td>1</td>
<td>$360</td>
<td>$1.80</td>
</tr>
<tr>
<td>BFTV Basic Plan</td>
<td>200</td>
<td>5</td>
<td>Unlimited</td>
<td>$400</td>
<td>$2.00</td>
</tr>
<tr>
<td>Carbonite</td>
<td>250</td>
<td>Unlimited</td>
<td>Unlimited</td>
<td>$687</td>
<td>$2.75</td>
</tr>
<tr>
<td>Google Drive Business</td>
<td>100</td>
<td>Unlimited</td>
<td>5</td>
<td>$720</td>
<td>$7.20</td>
</tr>
<tr>
<td>Backblaze Business</td>
<td>Unlimited**</td>
<td>5</td>
<td>Unlimited</td>
<td>$750</td>
<td>$0.38</td>
</tr>
<tr>
<td>Crashplan Hosted</td>
<td>100</td>
<td>5</td>
<td>Unlimited</td>
<td>$900</td>
<td>$9.00</td>
</tr>
<tr>
<td>Sugarsync Business</td>
<td>100</td>
<td>Unlimited</td>
<td>3</td>
<td>$900</td>
<td>$9.00</td>
</tr>
<tr>
<td>BFTV Advanced Plan</td>
<td>2000</td>
<td>5</td>
<td>Unlimited</td>
<td>$1,000</td>
<td>$0.50</td>
</tr>
<tr>
<td>SOS Business</td>
<td>250</td>
<td>Unlimited</td>
<td>Unlimited</td>
<td>$1,200</td>
<td>$4.80</td>
</tr>
<tr>
<td>MozyPro</td>
<td>100</td>
<td>5</td>
<td>Unlimited</td>
<td>$1,200</td>
<td>$12.00</td>
</tr>
<tr>
<td>Dropbox Teams</td>
<td>1000</td>
<td>Unlimited</td>
<td>5</td>
<td>$2,385</td>
<td>$2.39</td>
</tr>
<tr>
<td>Google Drive (2TB)*</td>
<td>2000</td>
<td>Unlimited</td>
<td>1</td>
<td>$3,700</td>
<td>$1.85</td>
</tr>
</tbody>
</table>

*Designed for personal use only.  **Calculated vs 2000GB of storage

### End of life plans

Head units should be replaced and repurposed after their three to five year warranties. Similar hardware means they would be ideal as a paired unit, one acting as a cold spare to the other. Replacement cost would be roughly the same as first deployment. Off-site head unit could be pressed into extended service using main unit for spare parts, or units could be sold to Bargain Barn to recover costs.

SAN Units have a three year warranty and should be replaced with next cycle. Old units may be pressed into extended service to provide low(er) reliability storage space for other groups or sold to bargain barn to recover costs.

UPS units will need replacement batteries after three years. Units could be used to provide stable power to less critical systems. Resale is not a viable option.

Software will be renewed for the units wishing to continue with this service. Price for five devices for an additional three years is estimated to be under $200 (using current rates).