

# Storage Backup and The “Cloud”

Keeping your data accessible and safe

# Overview- what will we be covering

- 1) Local devices- what you store your data on
- 2) Remote devices- more storage
- 3) RAID - what is it, do I need it?
- 4) Backup- keeping your data safe
- 5) Archiving- keeping older data around in a cost effective way



# Local Devices

- Spinning disks (hard drives)
  - Interface - SATA, SAS, SCSI
  - RPM (5400, 7200, 10K, 15K- higher is better)
  - Seek time (lower is better)
  - Enterprise vs Desktop
  - They will fail
- SSD
  - Interface (SATA II, III, M.2)
  - Speed (IOPS, MBps)
  - (Samsung or Intel)



# Local Devices- cont.

## Hard drive vs. SSD

	<b>Hard Drive</b>	<b>SSD</b>
<b>Price</b>	\$50/TB (4TB NAS drive)	\$400/TB
<b>Speed</b>	120 MBps	550 MBps Read
<b>Life- MTBF</b>	1 million hours	2 million hours
<b>Power Active/Idle</b>	4.5/3.3	3/0.4

# Remote device

- External Drive

- Interface

- USB 2 vs 3 (480 Mbps vs 5 Gbps theoretical)- huge variation between drives
    - Thunderbolt (20 Gbps theoretical)
    - USB 3.1/Type C (10 Gbps) (Type C is the connector, USB 3.1 is the standard)
    - eSata (6 Gbps)

- Commercial vs housing- what drive is in that box?

- Network “drive”

- Interface- network cable

- Make SURE you have gigabit ethernet, not WiFi for photos

- Lots of options from single bay wifi to RAID array



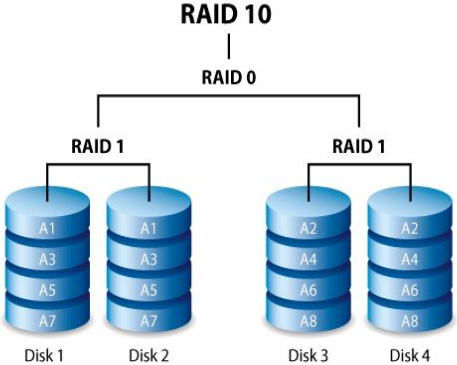
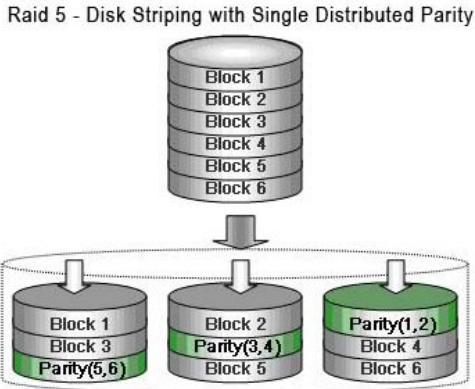
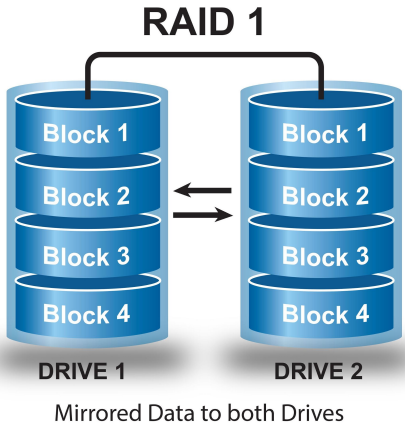
# What is RAID

- Redundant Array of Inexpensive Disks/Redundant Array of Independent Disks
- Levels
  - 0 - Striping. Speed with high risk. Uses multiple disks simultaneously
  - 1- Mirroring two drives. Duplicate your data to minimize risk. Can survive a single disk failure.
  - 5- Striping with Parity- Can survive a single disk failure.
  - 6- Striping with double distributed parity. Can survive multiple disk failure
  - 10- Hybrid of 1 and 0- striping across mirrored drives (0+1)
  - 50- Hybrid of 5 and 0- striping with parity across mirrored drives.
  - Hot spares- supported by higher level arrays



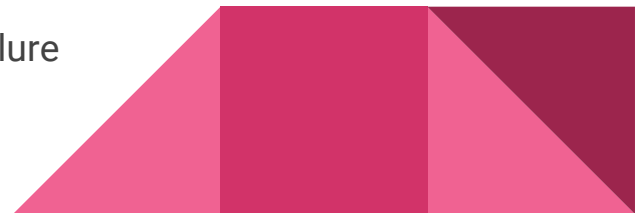
# RAID Comparison

RAID Level	5	6	10	50	60
1 TB drives x 8	7 TB	6 TB	4 TB	6 TB	4 TB
Drive fault tolerance	1	2	1(2)	1(2)	2(4)



# RAID considerations

- **Controller**
  - Software RAID- easy, not fast
  - Hardware- varies. If you want speed, get dedicated controller with cache
- **Disks**
  - Desktop drives are not made for RAID (sleep)
  - Faster disks = faster array
  - More disks = faster array (until interface becomes bottleneck)
  - SSD RAID for very high speed
  - SSD disk for read/write cache on system
- **Enclosures**
  - Standard or proprietary- recover in case of other hardware failure
  - Interface







Drobo **Mini**



Drobo



Drobo **5D**



Drobo **5N**



Drobo **B810n**



Drobo **B800i**



Drobo **B1200i**



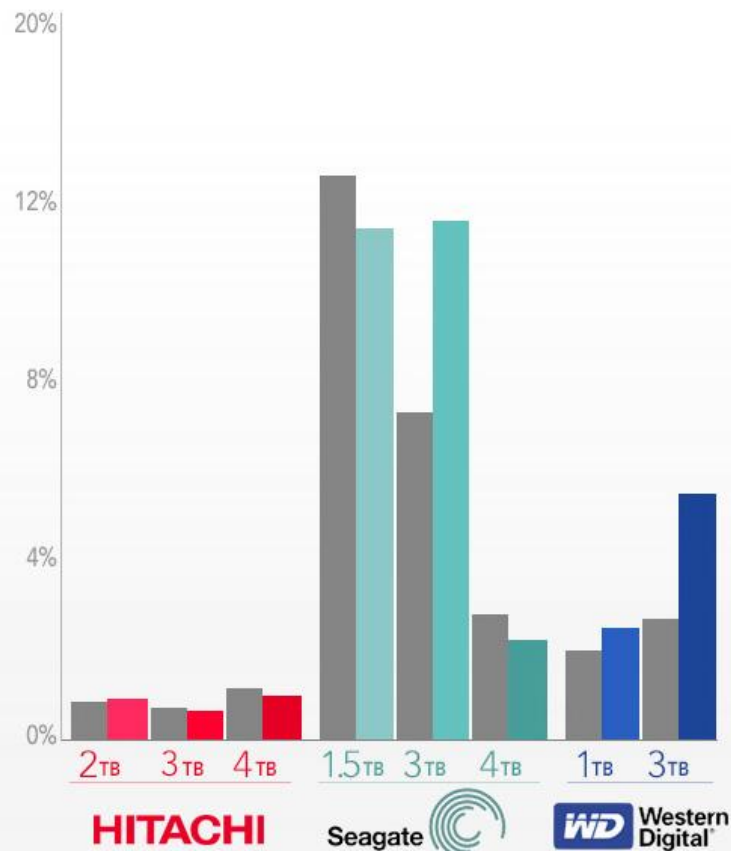
# Backup- keeping your data safe

Backblaze is a cloud storage provider. As of 2014 they had 34,881 drives spinning.

<https://www.backblaze.com/blog/hard-drive-reliability-update-september-2014/>

## Hard Drive Annual Failure Rate

Colored bars are as of Sept. 2014. Grey bars from previous analysis in Jan. 2014.



# Backup

- Backup vs Archive
  - Backup is duplicating data from one storage location to another
  - Archive is moving data from one storage device (typically expensive) to another (typically inexpensive) for long term storage
  
- RAID is not backup, but availability



# Why do you backup?

- Minor failures
  - File corrupted
  - File deleted by mistake
  - Hard drive failure
- Major loss
  - Theft of computer/drives
  - Destruction of computer/drives
    - Fire
    - Flood
    - Natural disaster



# RPO vs RTO

- Recovery Point Objective
  - How often do you backup your data to ensure you capture changes
- Recover Time Objective
  - How long will it take you to recover your data



# What do you backup

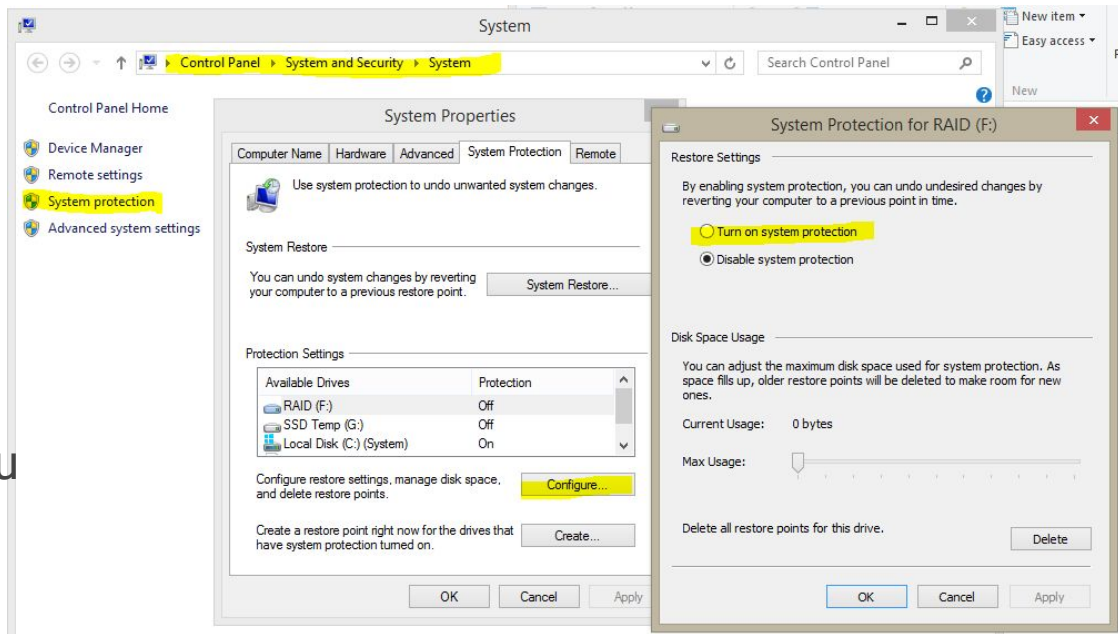
- Full system backup (image)
  - Locally for quick restore
  - Large local disk is great option
  - Frequently cannot restore individual files
- Personal files
  - Everything you create
  - This is what is irreplaceable
    - Pictures
    - Videos
    - Documents
  - Desktop, laptop, phone, tablet, etc.
  - NOT software
  - NOT system



# Individual file version backup - local

- Time Machine (Mac)
  - Stores versions of files on a different drive
- File Versioning (Windows)
  - Same thing

By having multiple versions, you can roll back. May not help if you delete a file.



# Off site backup

- Physically move backup media off site
  - Copy data to removable/external drive
  - Move drive to “safe” location
  - Requires dedicated, consistent user (anyone?)
- Cloud service
  - Software agent runs on computer
  - Identifies changed files
  - Moves them off site on timed schedule
  - Better systems encrypt files so cannot be decrypted if stolen from service
  - Requires bandwidth! Standard DSL is not going to cut it.





# Recommendation

- Three tiers
  - Local RAID to protect against single disk failure
  - Local system image backup (Clone) and personal files
  - Off site backup
- When traveling with a laptop (Copy, Clone, Cloud-Photofocus)
  - Copy files from card to computer
  - Clone files to a different drive (My Passport Wireless)- LR Import
  - Cloud- off site



<http://photofocus.com/2015/10/06/the-three-cs-of-file-management-copy-clone-and-cloud/>

# Cloud provider recommendations

May 5, 2015 PC Magazine Review Editor's Choice (all about \$60 per year)

<http://www.pcmag.com/article2/0,2817,2288745,00.asp>

**Crash Plan**- local in MN. Lots of options

IDrive

SOS Online Backup

(Amazon- free photo storage for Prime users)

(Amazon Glacier is very inexpensive and worth looking into)




# Test your Backup!

- Without a separate system, this can be very difficult.
- At least, test by restoring a “deleted” file.
- Need to monitor to make sure your system continues to work
- Update if you change around your system
  - When preparing for this, I found out my personal docs were not being backed up due to change I made on where My Documents is stored.
- This is the most neglected part. If you have not tested, assume it is not working.



# Archiving

- If you delete a file from your backed up computer, you will not be able to recover it from backup after some period of time as it will be deleted from the backup as well
  - Hard drives- 7-10 year retention
  - DVD/CDR- 100-200 year guestimate (but will you be able to find a DVD reader?)
  - BluRay- 50Gb per disk.
  - Save the most universal format (JPEG, DNG)
  - Cloud?
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# Pricing

Drobo 5D (Direct) - \$634, 4Tb HGST drive- \$170, fully loaded- \$1,484 with 14.5 TB usable storage- single drive redundancy, 10.9 TB with dual drive redundancy.

Drobo 5N (Network) \$519. Has app to work with Crashplan.

