

Staying Safe Online
Montpelier Senior Center

Week 6

Protecting Your Data

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<https://tinyurl.com/3b6p3h8s>


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Topics

- Definitions and Needs
- Backup Bloopers
- Strategies
- Archives, Maintenance and Retention
- Storage
- Disposal
- Costs
- Optimizing Frequency



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Definitions

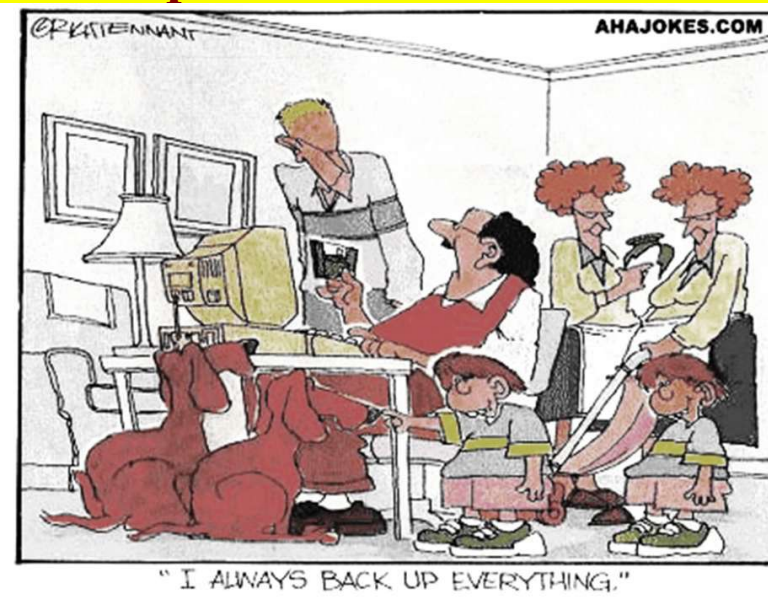
- Backups – copies of data files or records
 - ❑ Should be on different device
 - ✓ Tape, hard disk, CD, DVD, cloud...
 - ❑ May be on same disk (*.wbk, *.bak etc.)
 - ❑ Better to be separate as well
- Units & abbreviations
 - ❑ Kb v KB – kilobits v kilobytes (1 byte is 8 bits)
 - ❑ KB = kilobyte = 1024 bytes (characters)
 - ❑ MB = megabyte = 1024 KB = 1,048,576 bytes
 - ❑ GB = gigabyte = 1024 MB = 1,073,741,824 bytes
 - ❑ TB = terabyte = 1024 GB = 1,099,511,627,776 bytes
 - ❑ PB = petabyte = 1024 TB = 1.126 E15 bytes
 - ❑ EB = exabyte = 1.153 E18 bytes

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Backups



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Backup Bloopers (Just a Few)



- BerkshireNet
- Margot Kidder
- MIT
- Macomb County
- Electronic Voting Machines

These examples are not important in themselves: they're just to illustrate the importance of backups for avoiding serious trouble.

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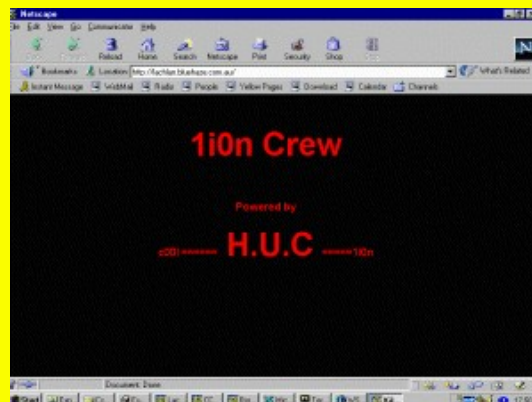
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BerkshireNet Backup Blooper



Feb 96 -- RISKS 17.83

- BerkshireNet, Pittsfield, MA
 - ❑ Swastikas and racist messages
 - ❑ Masqueraded as provider's administrator
 - ❑ Erased data on two computers
 - ❑ Shut down system
- Down 12 hours
 - ❑ no current backup
 - ❑ older deleted files restored
 - ❑ but several days of data lost



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Margot Kidder Backup Blooper



Sept 96 -- *People Online* via
RISKS 18.46

- Computer virus was last straw
- Led to nervous breakdown
- Unidentified virus apparently destroyed only copy of her book
- No backup



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 massachusetts institute of technology

MIT "Cheating Scandal"

2000-03

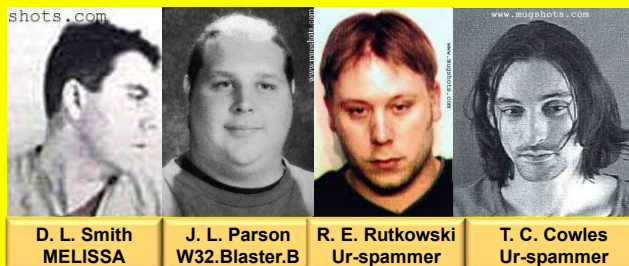
- Boston Globe reported "cheating scandal"
 - ❑ 22 students in cell bio class had wrong grades
- Turned out a grad student had sorted the names but not included the grades. . . .
- *No backups*, so no records of correct grades
- No logs, no tracking, no *nothing*

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Macomb County (Michigan) Sheriff's Dept



- 2002-05: RISKS 22.08
- Lost 50,000 photos of criminals
 - ❑ Hard drive crashed
- Had some pictures printed out as backups
- But had made no electronic backups at all on any medium



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Electronic Voting Machines




- 2004 election period saw growing concern about electronic voting machines
 - ❑ Entirely proprietary (secret) code
- Most had no audit trail of any kind
 - ❑ Trust the electronic counts without means of verification??
 - ❑ Documented cases of votes being switched to opposite party
- Demands growing for paper-trail BU
 - ❑ Print ticket to allow user to see vote supposedly registered by machine
 - ❑ Place tickets in ballot box as backup measure in case of recount
- Kabay testified 2002 before Vermont Govt Ctee about importance of paper trail
- 2025 – paper trails are normal now for almost all

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Backup Media

- Floppy disks (obsolete now)
- Optical Disks
 - ❑ CDs
 - ❑ DVD Types
 - ❑ Blu-ray Disks
- Hard drives
- Solid-state drives (SSDs)

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Floppy Disks (Obsolete Now)

- 1971 – IBM 8” floppy
@ 80 KB – 1.2 MB
- 1976 – 5.25”
@ 110 KB – 1.2 MB
- 1982 – 3.5”
@ 720 KB – 1.44 MB
- 1998 – Apple drops
all floppy drives
- 2000s – rapid decline due to CDs & USB drives
- 2010 – Sony ends production of floppy drives




Floppy-drive transfer rates were ~500 kbps or 0.5 MB/sec


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Optical Disks



- **CD (compact disk)**
 - ❑ 650 MB capacity
 - ❑ ~3 Mbps transfer rate
- **DVD “digital videodisk” → “digital versatile disk” → “DVD”**
 - ❑ 4.7 GB single-side single-layer
 - ❑ 8.5 GB single-side double-layer
 - ❑ 9.4 GB double-sided single-layer
 - ❑ 17 GB double-sided double-layer
 - ❑ Transfer rates ~200 Mbps

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DVD Types



Standards from the DVD Forum

- **DVD-R: DVD-Recordable**
 - ❑ Write-once, read-many
 - ❑ “DVD-dash-R” or “DVD-minus-R”
 - ❑ 4.7 GB standard
- **DVD-RW: DVD-Read-Write**
 - ❑ Write many, read many
 - ❑ “DVD-dash-RW” or “DVD-minus-RW”
 - ❑ 4.7 GB standard
 - ❑ Rewrite 1,000 times

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DVD Types (cont'd)



Standards from the DVD+RW Alliance

- DVD+R: DVD+Recordable
 - ❑ Write-once, read many
 - ❑ 4.7 GB
- DVD+RW: DVD+ReadWrite
 - ❑ Write many, read many
 - ❑ 4.7 GB
 - ❑ DVD+RW drives typically read DVD-R media as well



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Blu-ray Disks for Backups




- Developed in 2002 by Sony, Hitachi, Philips...
 - ❑ Same size as CDs and DVDs
 - ❑ Single-layer: 25 GB
 - ❑ Dual-layer: 50 GB
- Blu-ray Burners
 - ❑ Internal
 - ❑ External
 - ❑ In 2013, about \$60
- Blu-ray software
 - ❑ E.g., WinDVD, PowerDVD, Handy Backup
 - ❑ 25 - 128 GB/disk depending on layers (1, 2, 3, 4)
 - ❑ Speeds up to ~288 Mbps (may increase in future)



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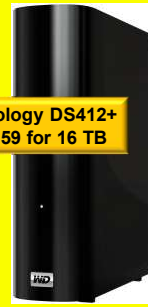
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Hard Drives for Backups

- For consumers: small external drives
- Types of USB drives
 - ❑ Solid-state drives (SSDs)
 - ✓ Fastest transfer rates
 - ❑ Hard-disk drives
- USB 2.0/3.0, Firewire
 - ❑ Maxtor, Seagate, Western Digital,
- In Dec 2025
 - ❑ 500 GB to 1 TB ~\$60
 - ❑ 10 TB ~\$225
- Transfer rates ~3Gbps



Synology DS412+
\$1159 for 16 TB











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Cloud Backup (1)

- Once connected to 'Net
 - ❑ Backup from anywhere
 - ❑ Retrieve from anywhere
- Warnings:
 - ❑ Confidentiality
 - ❑ Shared folders may result in accidental deletion or sabotage
 - ❑ Xfr rate depends on 'Net bandwidth

Company	Price	Storage	Score
	Free (Limited Time)	Unlimited	98% Rate
	\$4.95	250GB	96% Rate
	\$2.95	Unlimited	96% Rate
	\$6.66	50 GB	93% Rate
	\$9.99	60 GB	92% Rate
	\$9.99	50 GB	91% Rate
	\$7.95	Unlimited	91% Rate
	\$7.99	125GB	91% Rate
	\$9.99	25 GB	90% Rate
	\$4.95	250GB	90% Rate

<http://www.thetop10bestonlinebackup.com/cloud-backup>

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Cloud Backup (2)



- Consider for organizations too
- See “Why Cloud Backup: Top 10 Reasons”*
 1. Achieve disaster recovery with secure offsite cloud backup
 2. Freedom from manual and complex tape backup tasks
 3. Predictable costs for simpler budgeting
 4. Reliable and guaranteed data recovery
 5. Minimized risks and costs of downtime
 6. Fast data restores
 7. Take advantage of service provider’s expertise and resources
 8. Offload regulatory compliance requirements to service provider
 9. Well-managed cloud more secure than your own
 10. Ease of setup and use, set-and-forget, no training required

* http://www.ironmountain.com/arma/docs/top_ten_reasons.pdf

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Strategies



- Exclusive access
- Types by coverage
 - ☐ Full
 - ☐ Differential
 - ☐ Incremental
 - ☐ Delta
- Types by target
 - ☐ System
 - ☐ Application
- Testing

Everything

Everything
changed since
the last *full* BU

Everything
changed since the
last BU of any type

All the records
that have changed
since the last BU

WARNING:
Always ask for a *definition* of
“Daily” or “Partial” BU

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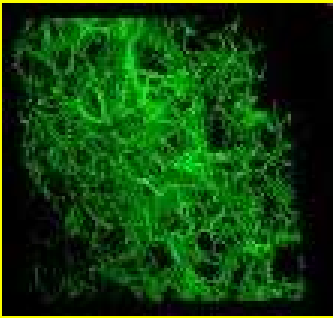
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Archives, Maintenance and Retention

- Retention policies
- Rotation of media
- Media longevity and technology changes
 - ❑ Media degradation (e.g., fungus*)
 - ❑ Software and hardware changes
 - ✓ Application programs
 - ✓ Operating systems

What to keep?
How long?



* See Mendham, S. (2005). A little care goes a long way. *PC World*.
<http://www.pcworld.idg.com.au/index.php/secid;3;id;461315701>

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Storage for Backups

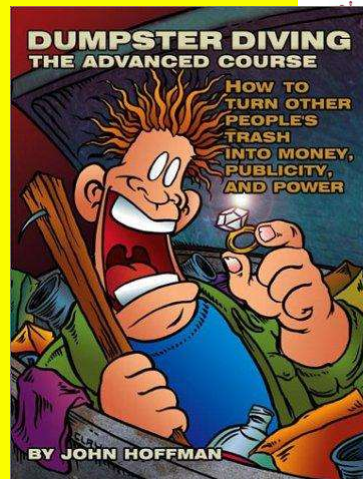
- Online storage secure (see slides 18 & 19)
- Safes for the home
 - ❑ Size depends on what you want to protect
 - ❑ Fireproof helpful (e.g., 3 hours insulation in fire)
 - ❑ Water resistant helpful (e.g., protect against fire hoses)
 - ❑ Physical security: combination lock, thick walls, secure hinges
- KEEP A RECORD OF YOUR COMBINATION!
 - ❑ Can be in secure entry in OUTLOOK or other email software
 - ❑ External to home: bank safety-deposit works

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Disposal

- Scavenging
 - ❑ Dumpster® Diving
 - ❑ Scratch tapes
 - ❑ Diskettes, cartridges
- Data and media destruction
 - ❑ Erase ≠ destroy
 - ❑ Reformatting inadequate
 - ❑ Degaussers inadequate
 - ❑ Random overwrites
 - ✓ Military-grade = 7 passes
 - ❑ Smashing with hammer works too!



<http://tinyurl.com/6dhnu2y>

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Disposal (cont'd)

- Physical destruction works
 - ❑ Recommended: specialized shredders
 - ❑ Incineration (special types)
- Secure collection points
 - ❑ Lockbox magnetic garbage
- Mobile data destruction services
 - ❑ Paper shredders
 - ❑ Special facilities for tapes

Royal Media Shredder



<http://tinyurl.com/24mwtb>

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Secure Data Destruction

- Equipment for destroying documents:
 - ❑ Paper shredders (crosscut ONLY – see oval)
 - ❑ See “Cross Cut Shredders – 5 Reasons Why They Are Better” < <http://tinyurl.com/65cuw52> >
- Considerations when evaluating services
 - ❑ Costs
 - ❑ Types of media processed
 - ❑ Onsite vs offsite
 - ❑ Chain of custody assurance
 - ❑ Regulatory compliance
 - ❑ Environmental protection






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Personal Notes on Kabay BUs

- Two ~identical computers: MAIN & SPARE
- 5 1-TB portable USB drives for alternate-day use
- ViceVersa synchronization software
- PM at end of workday:
 - ❑ Daily incremental BU
 - ❑ Synch MAIN → USB (including Backups)
- Synch BU to SPARE every week
- Monthly FULL BU MAIN → TB drive
- Archives on 9 multiTB drives in fire safe
- EXCEL file for tracking BU dates & drives

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Keeping Track of BUs (1)



BACKUP as of 2025-11-30									
By Date				By Drive				By Content	
DATE	Drive	Type	Notes	Drive	Date	Type	Notes	Type	Date
2024-08-31	3B	F	c.tb	3B	2024-08-31	F	c.tb	F	2024-08-31
2024-09-30	7	F	(c.o).tb	7	2024-09-30	F	(c.o).tb	F	2024-09-30
2024-09-30	3A	P		3A	2024-09-30	P		P	2024-09-30
2024-12-31	8	F	(c.p).tb[x]	8	2024-12-31	F	(c.p).tb[x]	F	2024-12-31
2024-12-31	8	P		8	2024-12-31	P		P	2024-12-31
2025-01-31	10	F	(o.p).tb	10	2025-01-31	F	(o.p).tb	F	2025-01-31
2025-01-31	11	F	c.tb[x]	11	2025-01-31	F	c.tb[x]	F	2025-01-31
2025-01-31	11	P		11	2025-01-31	P		P	2025-01-31
2025-02-28	6	F	(c.o.p).tb	6	2025-02-28	F	(c.o.p).tb	F	2025-02-28
2025-03-31	9	F	(c.o.p).tb	9	2025-03-31	F	(c.o.p).tb	F	2025-03-31
2025-03-31	9	P		9	2025-03-31	P		P	2025-03-31
2025-04-30	9	F	(c.o.p).tb	9	2025-04-30	F	(c.o.p).tb	F	2025-04-30
2025-04-30	9	P		9	2025-04-30	P		P	2025-04-30
2025-05-31	2	P		2	2025-05-31	P		P	2025-05-31
2025-06-30	9	F	(c.o.p).tb	9	2025-06-30	F	(c.o.p).tb	F	2025-06-30
2025-06-30	9	F		9	2025-06-30	F		F	2025-06-30
2025-06-30	9	P		9	2025-06-30	P		P	2025-06-30
2025-07-31	9	F	(c.o.p).tb	9	2025-07-31	F	(c.o.p).tb	F	2025-07-31
2025-07-31	9	P		9	2025-07-31	P		P	2025-07-31
2025-08-31	9	F	(c.o.p).tb	9	2025-08-31	F	(c.o.p).tb	F	2025-08-31
2025-08-31	9	P		9	2025-08-31	P		P	2025-08-31
2025-09-30	9	F	(c.o.p).tb	9	2025-09-30	F	(c.o.p).tb	F	2025-09-30
2025-09-30	9	P		9	2025-09-30	P		P	2025-09-30
2025-10-31	6	P		6	2025-10-31	P		P	2025-10-31
2025-10-31	6	F	(c.o.p).tb	6	2025-10-31	F	(c.o.p).tb	F	2025-10-31

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Keeping Track of BUs (2)



FREESPACE as of 2025-11-30			
DRIVE	Capacity (GB)	FREE (GB)	Freespace
1A	465	363	78%
1B	465	194	42%
2	931	381	41%
3A	465	28	6%
3B	465	73	16%
6	1853	674	36%
7	1393	369	26%
8	465	181	39%
9	5581	1987	36%
10	465	45	10%
11	186	54	29%
TOTALS	12548	4348	35%

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OK, STAY SAFE!



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