Alternatives for Long-Term Storage Of Digital Information

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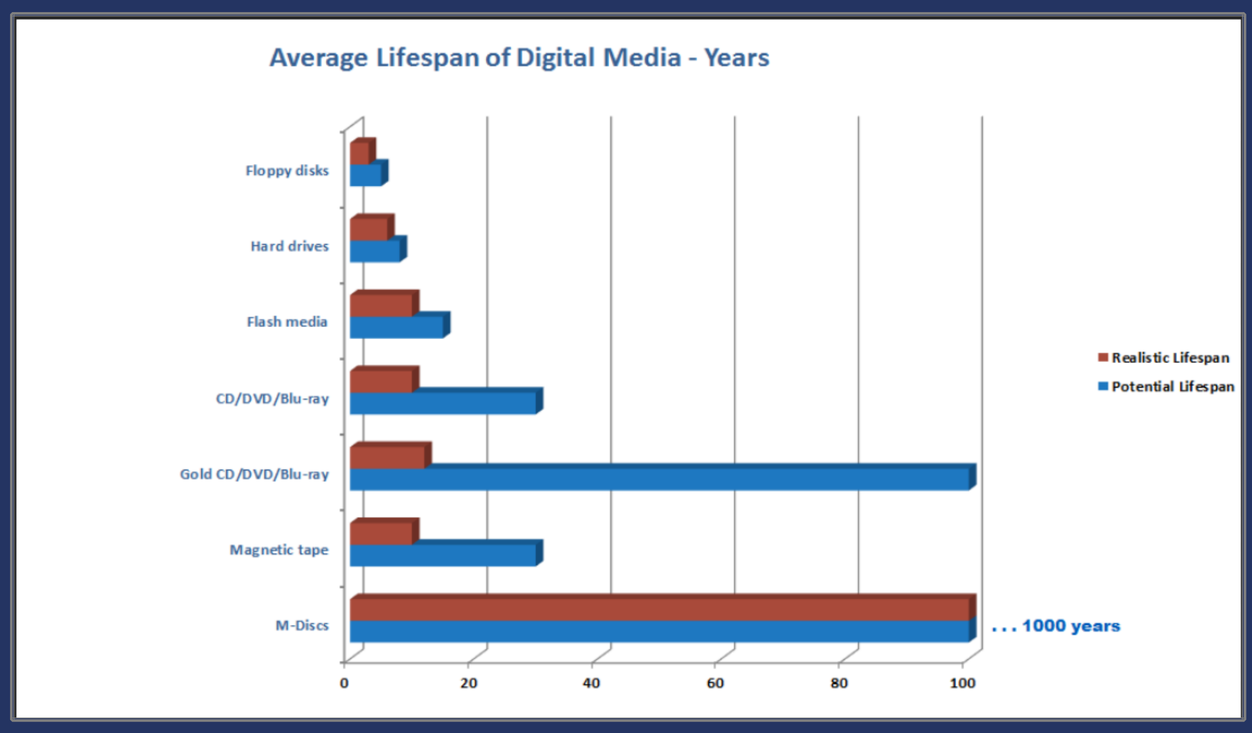
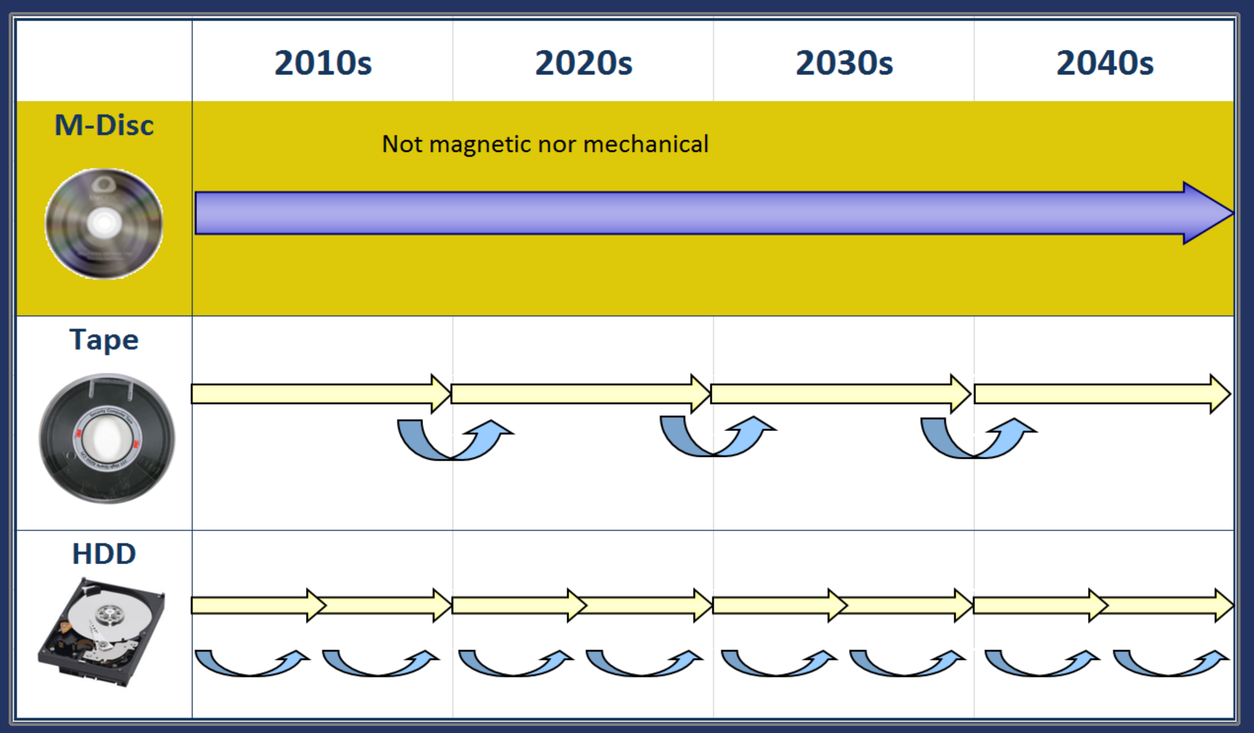
Which storage options are best for your Archive?

Storing digital objects is the most fundamental component of digital preservation. Archival storage for digital objects and their metadata must be reliable, manageable and affordable. Every institution must evaluate the many storage options and choose the options that best meet their needs. The following criteria can help understand the best alternatives for Long-Term Storage of digital information.

Average Lifespan of Digital Media



Expected migration time frame



All digital media have a limited lifespan.
Marketing tells us the potential lifespan. Experience shows us the realistic lifespan of the same media. Average lifespan is 3 – 10 years, though most media could fail at any time. Comparisons of the lifespan for various digital media can help us understand our best options.

The M-Disc, developed at Brigham Young University, is the only method that makes an irreversible physical change to a digital medium. The M-Disc is highly resistant to any of the normal factors that degrade digital objects, such as light, heat, humidity, temperature change, magnetism, bit rot and bit flips. It is available in DVD and Blu-ray formats, and can be used in storage systems, such as the HLDS Optical Archive System.

The Migration Time Frame displays both the lifespan of the media and the migration costs.
Every digital medium and every digital system will eventually fail or become obsolete. Preserving digital objects beyond the expected lifespan requires the media to be refreshed or migrated regularly. Every round of migration has an added risk of data loss; repeated migrations increase the probability of loss. Migrating data is expensive with the cost of new media, systems, personnel, and process to manage and verify the digital objects.

The Library of Congress archiving website recommends refreshing or migrating media copies every five years, or when necessary to avoid media failure and data loss. The long-lived M-Disc is permanent and does not require refreshing or migration, thus adding to the security and cost savings.

Cost of Digital Storage

DIGITAL STORAGE COSTS - ESTIMATED

Digital Storage Costs. Simple projection only	1 TB First Year	1 TB Yearly Charge	1 TB 20 Year Projected	100 TBs First Year	100 TBs Yearly Charge	100 TBs 10 Year Projected	100 TBs 20 Year Projected	200 TBs First Year	200 TBs Yearly Charge	200 TBs 10 Year Projected	200 TBs 20 Year Projected
Campus Storage											
Data Center (5 yr replace)	$1,250	$0	$5,000	$125,000	$0	$250,000	$500,000	$250,000	$0	$500,000	$1,000,000
LIT (40 TB @ $7,500)	na	na	na	$18,750	$0	$37,500	$75,000	$37,500	$0	$75,000	$150,000
Cloud Storage											
Amazon S3 - Regular	$360	$360	$7,200	$35,406	$35,406	$354,060	$708,120	$70,812	$70,812	$708,120	$1,416,240
Amazon S3 & Dark copy in Glacier	$480	$480	$9,600	$47,406	$47,406	$474,060	$948,120	$94,812	$94,812	$948,120	$1,896,240
Amazon S3 Reduced & copy in Glacier	$288	$288	$5,760	$28,325	$28,325	$283,248	$566,496	$56,650	$56,650	$566,496	$1,132,992
Glacier storage only; no retrieval	$120	$120	$2,400	$12,000	$12,000	$120,000	$240,000	$24,000	$24,000	$240,000	$480,000
DuraSpace - Preservation	$1,875	$1,875	$37,500	$71,175	$71,175	$711,750	$1,423,500	$142,350	$142,350	$1,423,500	$2,847,000
DuraSpace -Plus. (S3+Glacier)	$2,875	$2,875	$57,500	$141,475	$141,475	$1,414,750	$2,829,500	$282,950	$282,950	$2,829,500	$5,659,000
DuraSpace - Enterprise Plus	$5,875	$5,875	$117,500	$67,750	$67,750	$677,500	$1,355,000	$135,500	$135,500	$1,355,000	$2,710,000
M-Discs											
DVD (@4.7 GB = 250 Discs / TB)	$596	$0	$596	$59,574	$0	$59,574	$59,574	$119,149	$0	$119,149	$119,149
BD (@25GB = 40 Discs / TB)	$160	$0	$160	$16,000	$0	$16,000	$16,000	$32,000	$0	$32,000	$32,000
BDXL (@100GB = 10 Discs / TB)	*$197*	*$0*	*$197*	*$19,650*	*$0*	*$19,650*	*$19,650*	*$39,300*	*$0*	*$39,300*	*$39,300*
HLDS Storage											
Quoted Purchase Price	na	na	na	$39,500	$0	$39,500	$79,000	$72,500	$0	$72,500	$72,500
(Including server, switch, and 1.2 uplift)	na	na	na	$56,400	$0	$65,400	$83,400	$96,000	$0	$105,000	$123,000
Remote Storage											
Digital Preservation Network (DPN)											
Annual 5 TB as part of membership	$4,000	$0	$4,000	na	na	na	na	na	na	na	na
Total DPN storage including free ****	5,500	0	5,500	467,500	0	0	467,500	935,000	0	0	935,000

Cost is probably the single most important factor when considering long term storage.
Archive storage costs must be affordable, else content owners will not submit materials for preservation. Storage costs, even if they are declining, may influence decision makers to select a low-cost storage option at the expense of essential preservation needs. This chart shows some of the alternate storage options we considered for our preservation archive.