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## Developments in Media *“The Revival of Optical Storage”*

Ken Wood  
Hitachi Data Systems  
CTO of Technology and Strategy  
Global Office of Technology and Planning

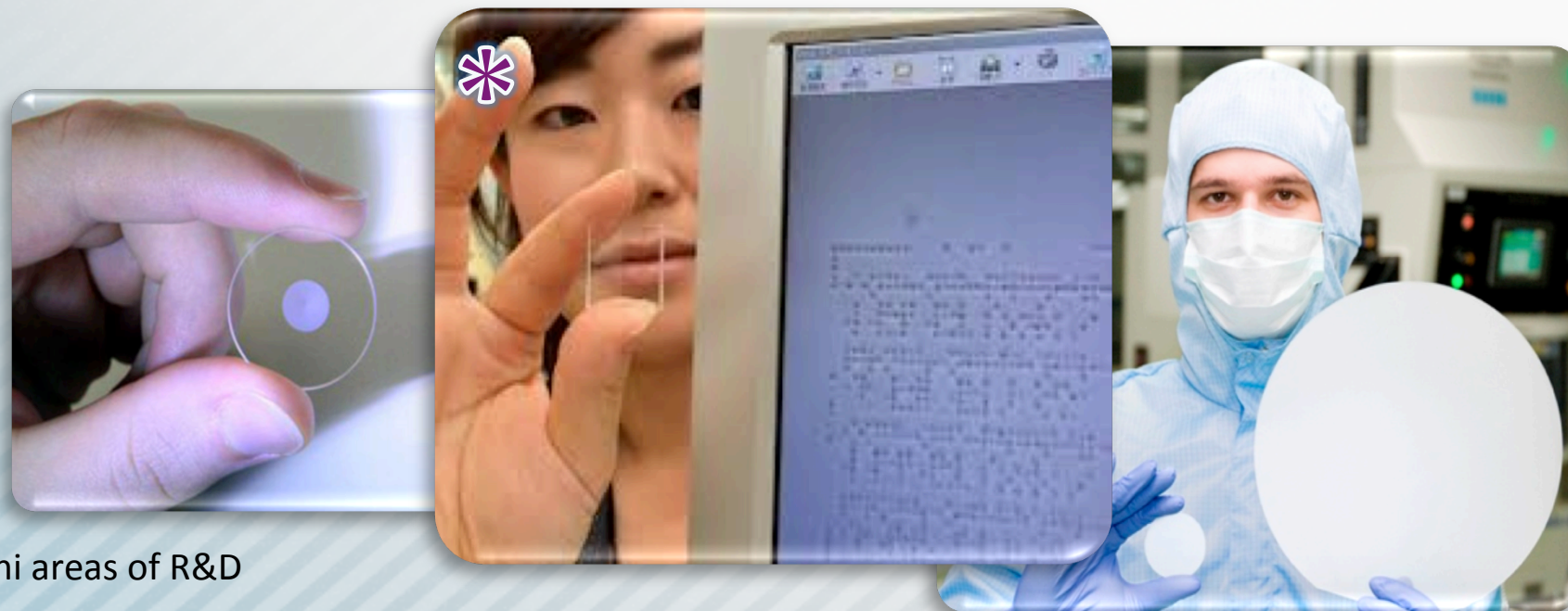
- Disk** -> Magnetic Hard Disk Drive
- Disc** -> Optical Storage Media
- ODD** -> Optical Disc Drive
- CD** -> Compact Disc
- DVD** -> Digital Versatile Disc
- BD** -> Blu-ray Disc
- BDXL** -> Blu-ray Disc eXtra Large
- DOTS** -> Digital Optical Technology System
- WORM** -> Write Once, Read Many (true WORM)
- WORMED** -> Write Once, Read Many, Eventually Delete

- ❑ The first commercially available audio CD is ***Billy Joel's "52<sup>nd</sup> Street"*** released in Japan on October 1<sup>st</sup>, 1982
  - That's almost 31 years ago
  
- ❑ 50 titles were also released on CD in those first early years including ***Pink Floyd's "Dark Side of the Moon"*** in May of 1983
  
- ❑ Still plays today on the latest devices supporting the newest formats



## □ All Optical-based Technologies

- \*○ 50 – 100 Yr. BDXL Media, (100 & 128 GB)
- \*○ Next Gen Blu-ray, (300 – 500 GB)
- \*○ Holographic Storage, (1 – 12 TB)
- \*○ M-Disc – 1,000 year media, (Blu-ray)
  - DOTS – Digital Optical Technology System
  - Sapphire Hard Disc – 1M yrs
  - 5D Optical Nano-glass memory – 1M yrs
- \*○ Quartz glass plate storage technology – 100M yrs



## □ Beyond Speeds & Feeds – the Intangibles



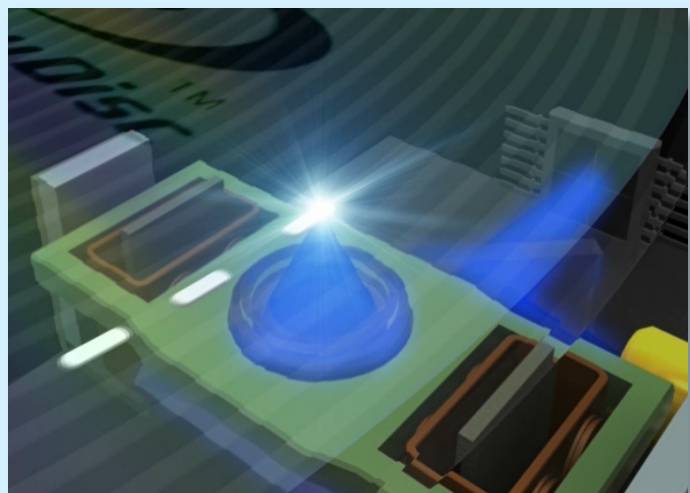
### Longevity

“Optical” recording has been used for over 10,000 years in human data recording history.



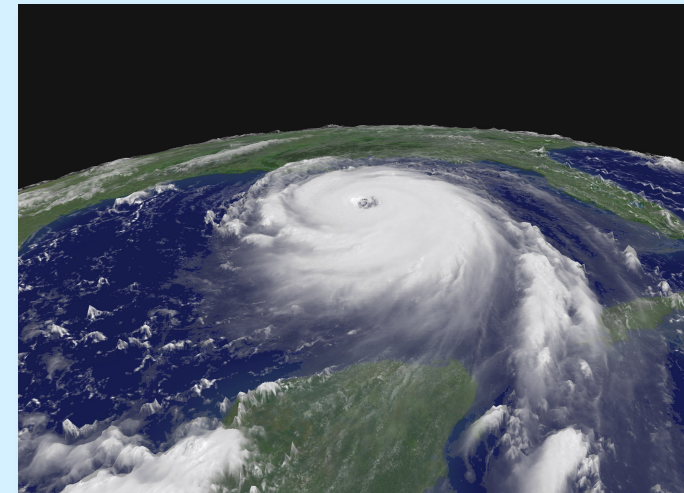
### Compatibility

Since BD can be read on general purpose PCs with consumer devices, there is less possibility that media and data will be inaccessible due to obsolete devices.



### Contactless

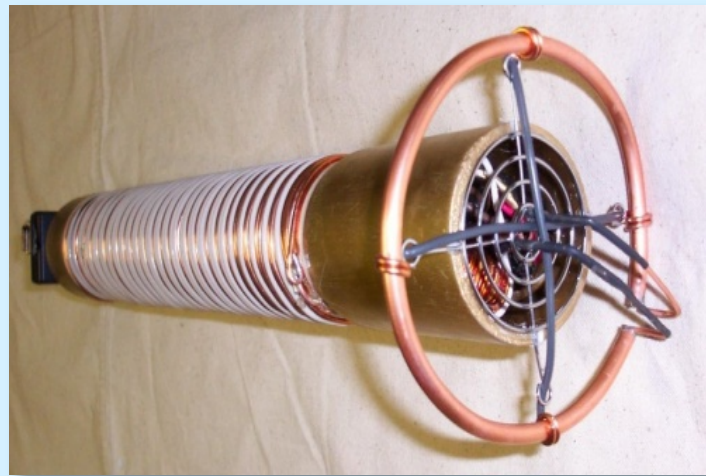
Since there is no contact with the media surface, there is less possibility of abrasion, scratch or other media wear.



### Survivability

Only data stored on optical discs survived hurricane Katrina.

## □ Beyond Speeds & Feeds – the Intangibles



### Non-Magnetic

2 recording technologies are needed for a sound data preservation strategy, with magnetic recording being considered as one.



### Ubiquitous

Several industries use optical devices which supports a mass volume industry and maintains compatibility. UHD?



### Reliable

Since device and media are separated, reliability and replacement of devices doesn't affect the reliability of media.

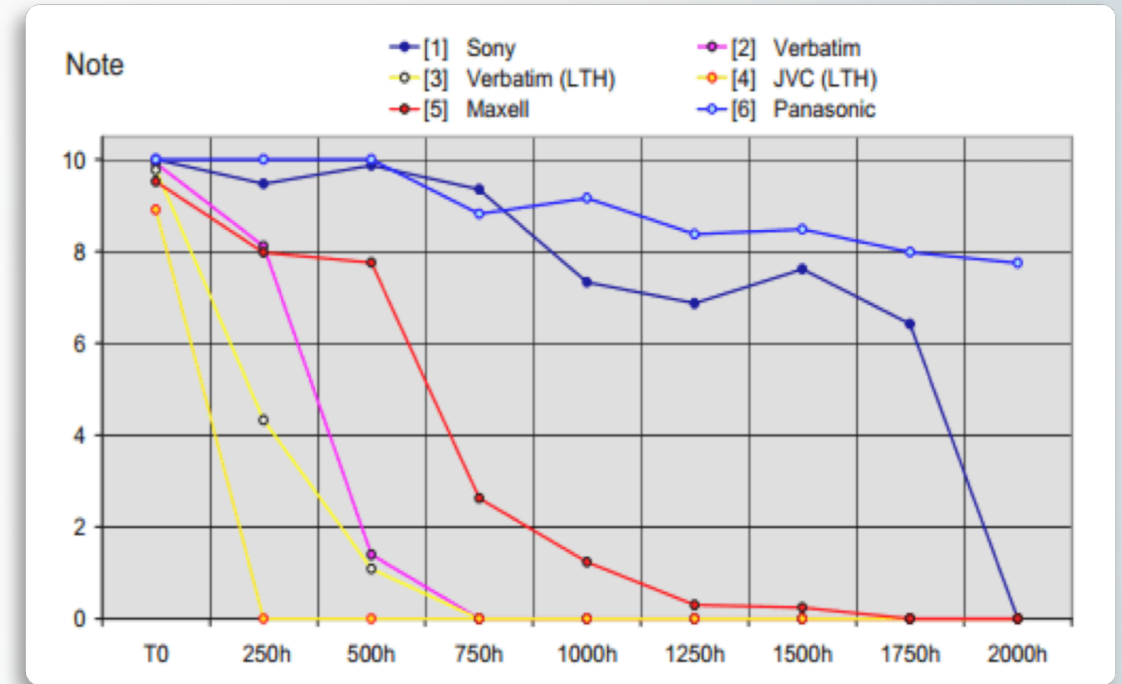


### Green

Almost no electricity nor special environmental condition is needed to store media for a long time.

# Not All Optical Media are Created Equal

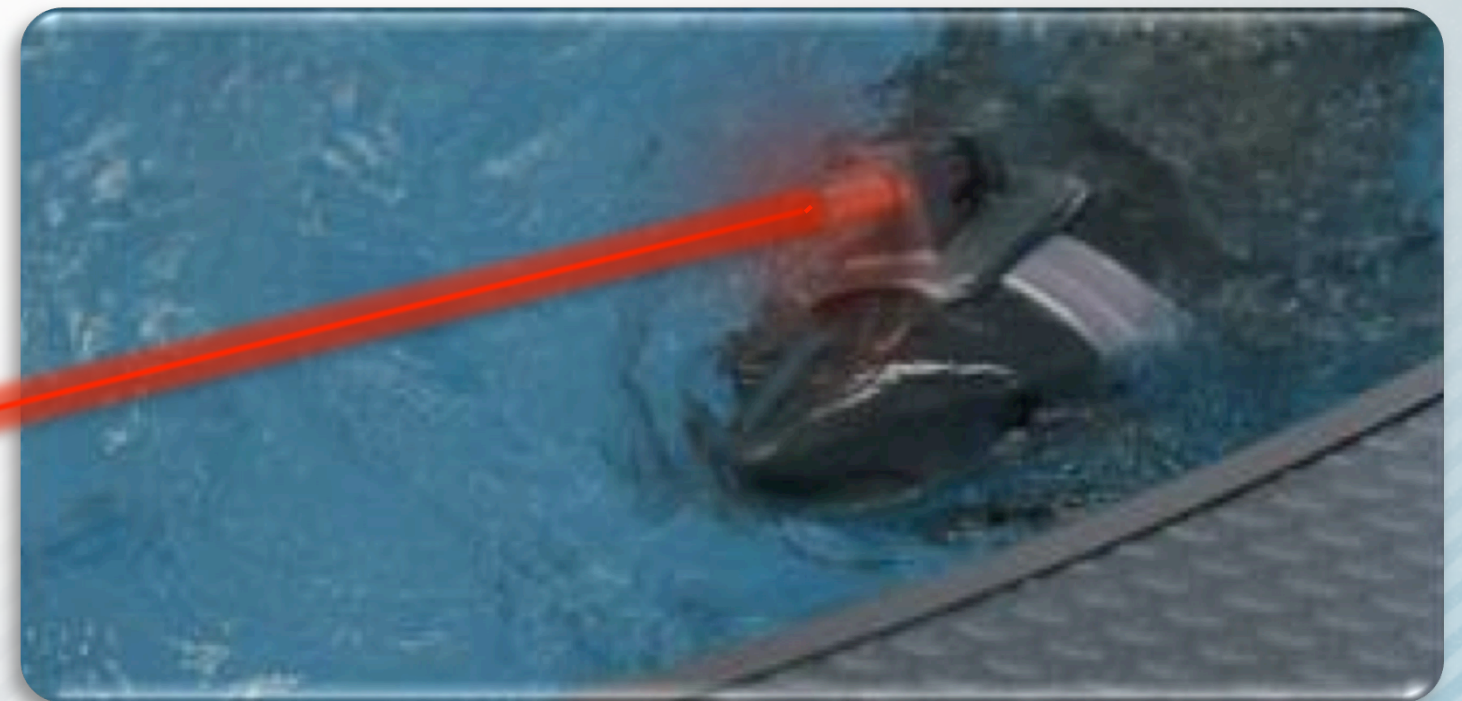
- Low-to-High – LTH low cost, organic dye based
  - Dye Change Recording  
**NOT FOR LONG TERM ARCHIVING!**
  - Gives Optical technology a bad name
- High-to-Low – Normal Blu-ray characteristic
  - Phase Change Recording using an in-organometallic compound
  - Basis for long-term optical archiving
- True WORM Media not WORMED
  - Hard concept to grasp
  - Other flaws
- Zero-space race



Source: <http://www.myce.com/news/french-research-avoid-blu-ray-lth-discs-for-data-archival-64265/>



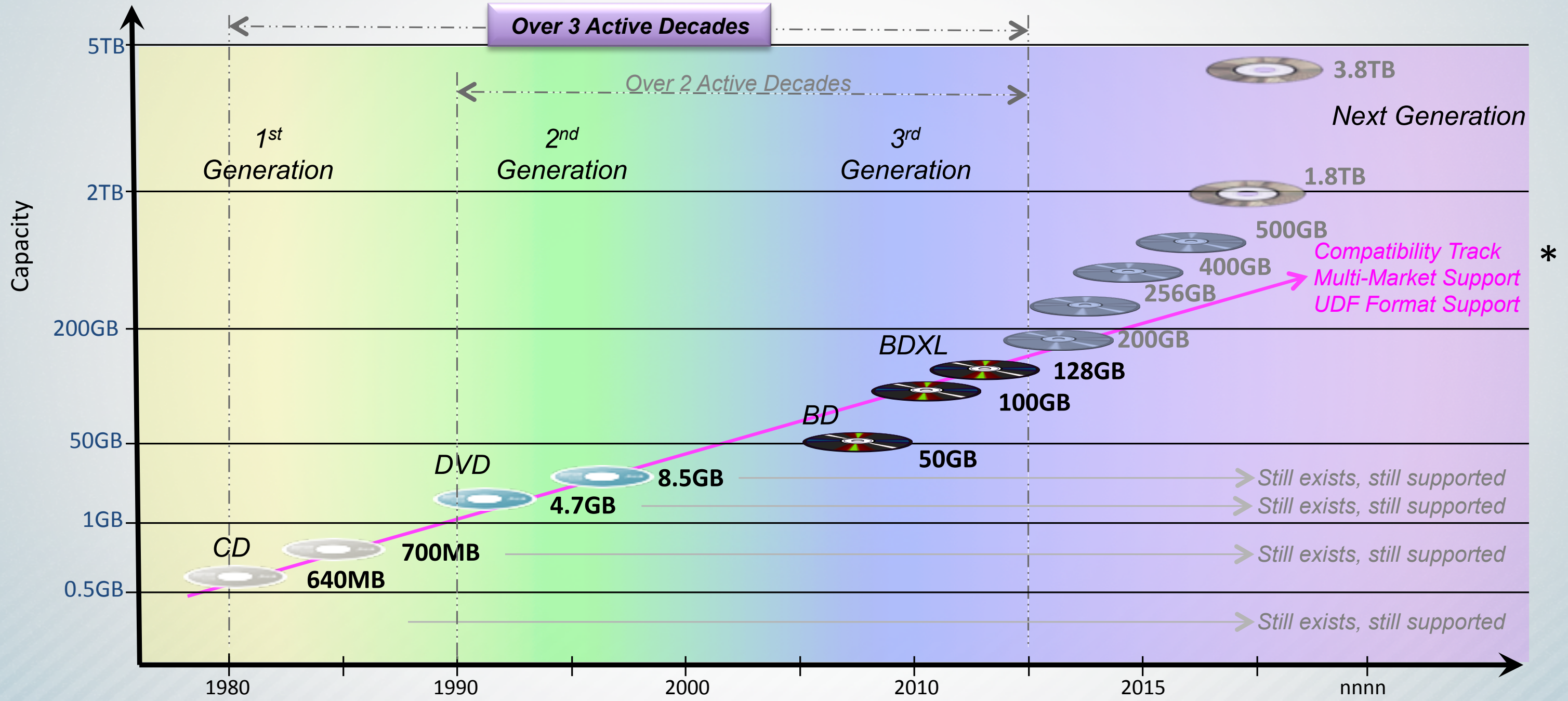
- 321 == 3 copies, 2 sites and 1 other technology, *or visa versa*
- 322 == 3 copies, 2 sites and 2 technologies
  
- Several long-term data preservation strategists are coming to consensus that the 2 recoding technologies used today, hard disks and tape, are considered the same technology – magnetic
  - Similar vulnerabilities
  
- Long-term TCO is still a key goal
  - Life of the company
  - Life of the republic
  - Life that spans republics





# Technology & Format Longevity – Mass Markets

Not to Scale



Historical Casualties



\* Today, you can buy new standard drives that are compatible with media written over 30 years ago. This trend will continue due to markets for consumer and distribution driven volume

- Commercial optical storage is over 30 years old and still compatible today in modern mass produced equipment.
- Attempting to break or elongate the migration cycle.
- More R&D and investment is happening with optical storage technologies
- Enterprise archive media life in the 50, 100 to 1,000 year timeframe
- Different value proposition
- Careful, all media are not created equally
- Who here subscribes to the notion that magnetic recording with tape and disk, is the same technology?