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The 'Blue-ray' of Hope Long-term archive of medical images



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Storage and Archival of Medical Images

Medical imaging today is at the core of modern medicine. Digital image availability at the point of care depends largely on how well the data is stored. It is important to understand the subtle differences in storage and archive first. When one talks of storage of any data, mainly two aspects are of highest concern high availability and efficient retrieval.

High availability

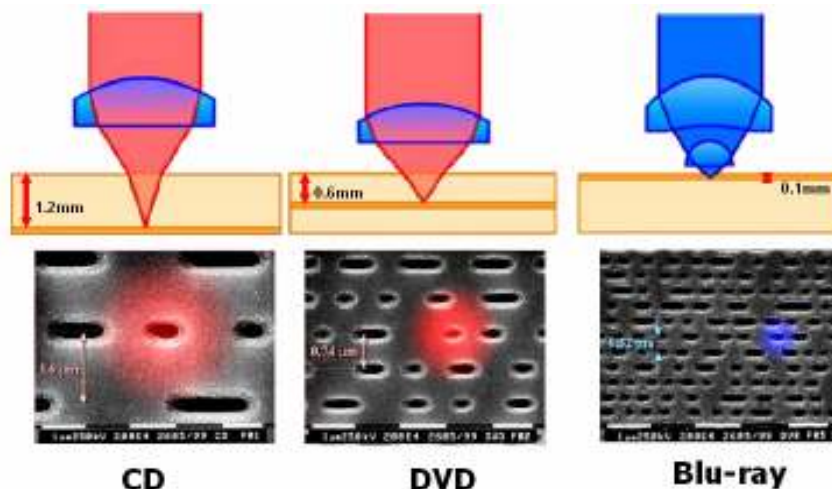
Availability is an on-going battle against 'Murphy's laws'. It is not uncommon to have a hi-tech device failing when it is needed the most. Most architects of highly available systems tackle it with redundancy! They get more hard discs to duplicate the data, use redundant network switches or cabling or even make the entire server hardware redundant too. So if one component fails, another redundant counterpart takes over. All this happens automatically, without the user actually getting to know about the failure in one of the components. Of course, software designed to achieve this plays an equally important role.

Efficient retrieval

In the healthcare environment, it is not enough to have the data available at any given time. How quickly this data reaches the Consultant, Surgeon etc. when requested, will make the difference between life and death at times.

Thus, efficient retrieval means the data has to be intelligently prioritised anticipating the need. The system should utilise the best technology available to communicate data at multiple points of care without delay. High availability and efficient retrieval together, is referred to as on-line data.

Blue-ray is an emerging technology in optical storage...
The precision of Blue Ray burning is depicted below:



When we talk of archiving of digital images, the main focus is on longevity and permanence of the record. Stringent legal guidelines in the West require all the records of the patient to be preserved. Even in case of a catastrophe and destruction of online storage, the data has to be kept intact physically at another place.

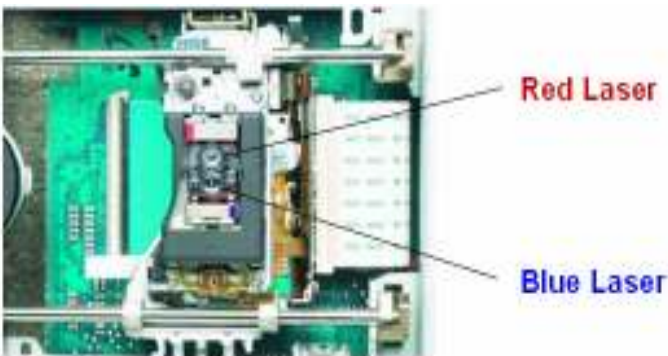
A clinician would ideally desire that all the data should be available online as well as stored as a back up permanently and separately, so that both requirements are met. Storage on Google is one such example where users have all their data on-line, always! But intelligent archive is the best bet for the healthcare industry. The online data can be restricted, balancing clinical requirement and affordability. Typically 3 to 12 TB online space, gradually upgraded over 3 to 5 years meets requirements of most of the hospitals ranging from 100 to 700 beds. But archives are faced with ever growing data, and it needs to be planned carefully.

Conventional methods of Archiving and Blu-ray technology

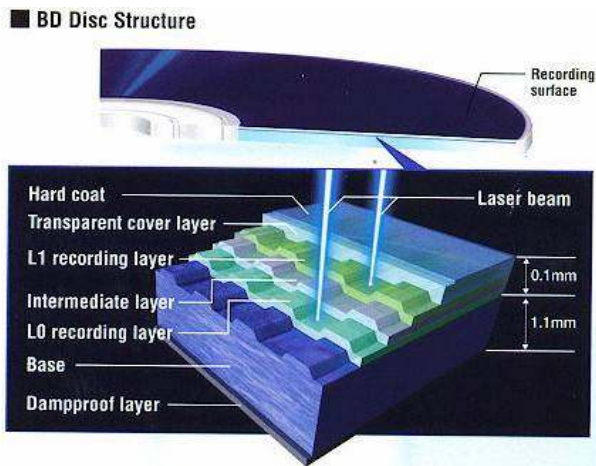
Information Technology in healthcare lags behind its counterparts in banking, manufacturing etc. Most of the other industries have long implemented and optimised archival methods to suit their own requirement. But the requirements of healthcare data archival are totally different from other industries. The sheer size of data is the key differentiator.

Conventional methods used are hard discs (other than online archival tools), tapes, tape libraries, CD / DVD, juke, Magneto Optical Discs (MOD).

- Blu-ray media discs referred to as BD have a life expectancy of 50 years and are expected to go beyond 100 years as technology matures.
- It is environment friendly with the least consumption of power for archive libraries /robotics owing to large data size per media. Currently 50GB discs are commercially available. The size is expected to reach 100 GB per media soon.



Blue -ray Disc (BD) Structure



Backward compatibility of Blue-ray

AIIMS, New Delhi becomes the first site in India for implementing Blue Ray technology based archive for **Philips BIG BORE CT** scanner installed in Dr Bhimrao Ambedkar Institute Rotary Cancer Hospital. This scanner is aimed at routine radiology studies as well as radiation therapy simulation.

21st Century Health Management Solutions provided Advanced Imaging System for Blue Ray archival and DICOM communication. The archive is scalable and can address larger archival requirements.

Aniruddha Nene, Principal Consultant and Director – Imaging, 21st Century Health Management Solutions remarks that Blue-ray technology is the optimal choice for permanent archive with life of the media exceeding 50 years and size exceeding 50GB per media.

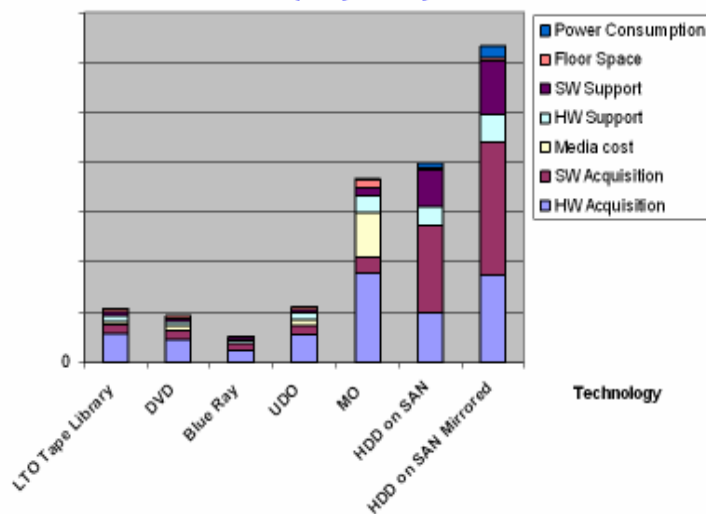
Right choice of the Solution

Blue-ray based archive has the least cost of ownership of all other types.

Please refer to the chart of technology comparison.

Technology comparison		DVD Library	Blue-ray Library	LTO-3 Library	SATA II RAID Enclosure	FC RAID Enclosure
Type of media		BareMedia	BareMedia	Tape Cartridge	RAID Enclosure	RAID Enclosure
Security against data change		True WORM*	True WORM	simultated WORM	simultated WORM	simultated WORM
Life Expectancy	Years	>30	>50	5 in controlled environment	~2	~3
Mandatory Data Migration	Years	~30	~50	~3	~2	~3
Media Cost	Rs/GB	10-12	20-24	12-16	25-34	80- 120
Write	Cycles	>10,000	>10,000	500	>100,000	>100,000
Read	Cycles	no limits	no limits	500	>100,000	>100,000
Load	Cycles	no limits	no limits	5,000	-	-
Average File Access	Seconds	<1	<1	58	<1	<1
Mandatory Head Cleaning	Hours	-	-	every 50 - 100	-	-
Storage Temperature	Celsius	5 - 45	5 - 55	15 - 25	15 - 30	10 - 40
Storage Humidity	% r.h.	10 - 80	10 - 80	20 - 50	20 - 50	10 - 80
Exposure to Magretic Fields	-	No impact	No impact	Catastrophic	Catastrophic	Catastrophic
Exposure to Radiation/X-Rays	-	No impact	No impact	Catastrophic	Catastrophic	Catastrophic
UV Light	-	Not advisable	Not advisable	Not advisable	-	-

Total Cost of Ownership - Archival Storage Systems
12 TB Capacity over 3 years



Conclusion

Indian healthcare industry has been witnessing Information Technology transformation in recent times. We do not have large legacy systems to be migrated to the latest technology. Indian healthcare industry can leapfrog to adopt the latest archival technology easily and quickly.

Blu-ray technology appears to be a clear winner among the other technologies. Until the next avatar of technology, the holographic storage becomes practical Blu - ray will dominate the archive market.