

Archiving Redundancy and Back-up Strategies

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Introduction

- Archive is the “heart” of the PACS: Critical component
- What is the archive anyway:
 - Database for querying
 - Image Archive for reliable, fast storage
- Interface is proprietary/standard (DICOM); often both
- “Image Manager” takes care of DICOM MPPS and STC for exam status, image count and responsibility
- Workflow manager is also often considered part of the “archive”, providing work lists to multiple users simultaneously
- System administration tools are critical: find “lost images”, update, merge, split, query statistics

Architectural Requirements

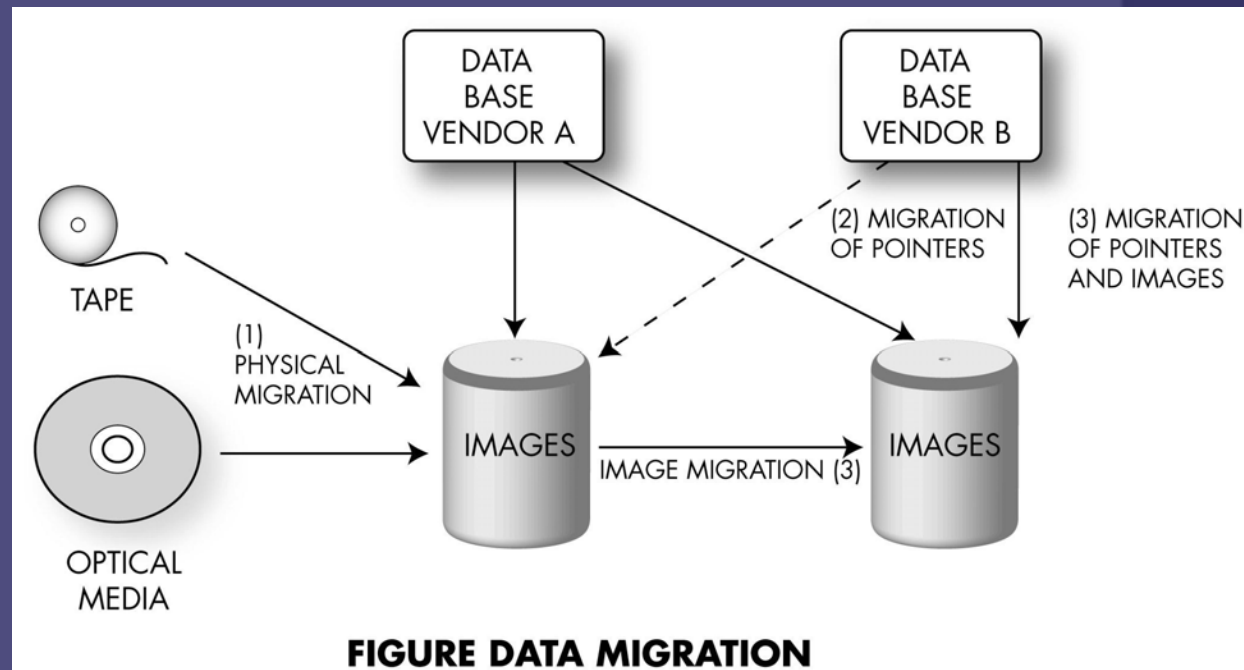
- Need to know number of retrievals (depends on in-out-patient) for bandwidth requirements (7 days-7 retrievals)
- Performance requirements, depending on study size (1000 slice CT, including previous study – mammo cardiology cineloops); intelligent pre-fetching or caching is often required
- Number of years available on line? (7 is most common)
- Traditional tier organization (raid-MOD-tape) still applies: (raid-raid-raid);
 - 50% of all institutions all spinning disk;
 - 20% combined with MOD
 - 30% still have tape
- Is non-volatile media required (MOD?) depends on institution

Trends

- Technology changes (disk capacity, speed): don't buy too much!
- Architecture changes (SAN, NAS, grid storage)
- Increase in images (mammo, multislice CT and path!!!)
- Increase in image sizes (512-1024)
- Enterprise storage (“ologies”) incl cardiology (only 15%): much more cost effective both from hardware and operational perspective
- Outsourcing (ASP, SSP)

Trends (cont)

- Deal with “Old data”: migration of both database and/or images – issues related to reconciling mis-identified studies, proprietary attributes and/or database info for key images, annotations, overlays, etc.
 - 10-20% users are “looking”; also migration from mini-PACS or even from same vendor!



Trends (cont)

- HIPAA requirements for risk analysis, back-ups, contingency plans and data integrity
- Impact of recent natural disasters (Katrina) and hardware failures (Oregon; 5000 studies from 900 patients were lost)
- Poll data:
 - 36% mirrored archive
 - 21% load balancing
 - 24% SSP
 - 18% NO redundancy

Disaster Recovery (DR), Business Continuity (BC) and High Availability (HA)

- Disasters:
 - Outside factors (floods, weather, fire)
 - Recovery: require up-to-date back-up
- Business continuity:
 - Major hardware failure, localized fire, cut in network, etc.
 - Hot/cold spare, off site
- High availability:
 - Smaller scale problems, localized hardware issues, network
 - Mirrored systems and/or load balancing
 - “test” server for max. couple of days (also for upgrades, tests) – either from PACS vendor or other vendor (in-house, SSP)

Disaster Recovery (DR), Business Continuity (BC) and High Availability (HA)

Configuration	BC	HA	DR
1. RAID only	-	-	-
2. RAID w. test server	+		
3. RAID w. test server and back-up	+		+
4. RAID w. test server, back-up and local mirror	+	+	+
5. RAID w. test server, back-up and remote mirror	+	++	+
6. RAID w. test server, back-up, and multiple copies	+	+++	+

SSP Considerations

- In many cases preferred business model (pay-per-click): operations vs capital budget
- Good solution in case there is a physical and/or skill-set (IT) limitation
- NO issues with data migration
- Consistent with regional/centralized storage architectures (RHIO)
- Balance on-site storage (3 months-1 year) with off-site
- Perfect solution for disaster recovery (total restore) or localized hardware/software failures (go back to latest checkpoint-incremental)
- When there is economy of scale, institutions could provide their “own” SSP

Conclusion

- The archive is the most critical component of the PACS and also the most expensive
- Obsolescence, cost, performance and high availability are key parameters
- Failure is not an option due to the patient care impact, short term (ER!), mid-term (in-patients) and long term (follow-up)
- SSP can be a viable solution to meet many of these requirements, either in-house or outsourced