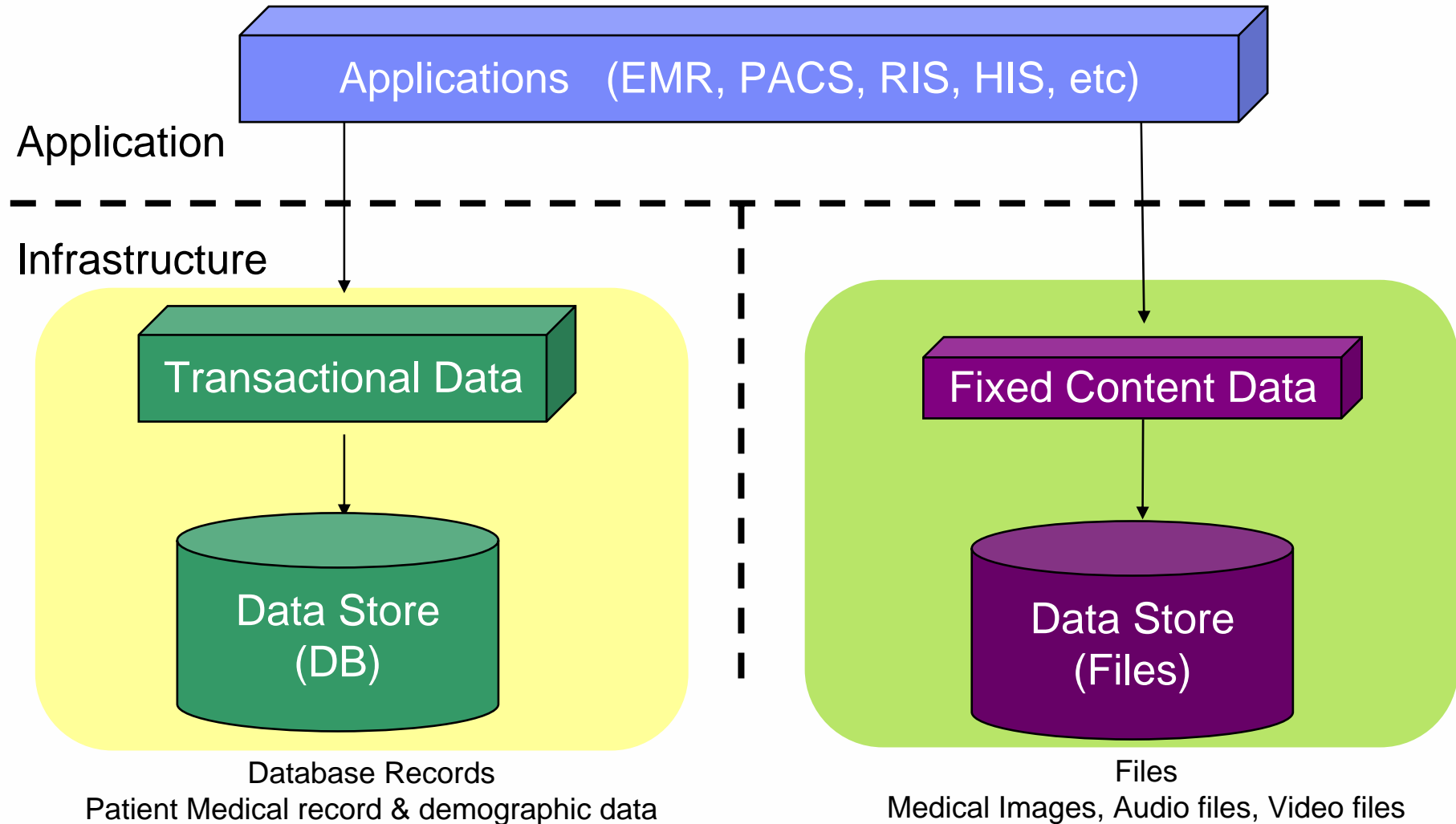# IBM Grid Medical Archive Solution

Ronald Watkins
IBM Grid & Virtualization

Agenda

- **Healthcare Market – the growing need for Medical Imaging Data**

- **GMAS Overview**

- **Customer Examples**

- **Getting Started**

Healthcare has two types of data requiring different strategies

Applications   (EMR, PACS, RIS, HIS, etc)

Application

Infrastructure

Transactional Data

Data Store (DB)

Fixed Content Data

Data Store (Files)

Database Records
Patient Medical record & demographic data

Files
Medical Images, Audio files, Video files

Medical Imaging – yesterday

- Most images were simple x-rays

- Radiology departments relied on film and paper reports

- Loss of images could be up to 25%

- Communication of images between hospitals was limited

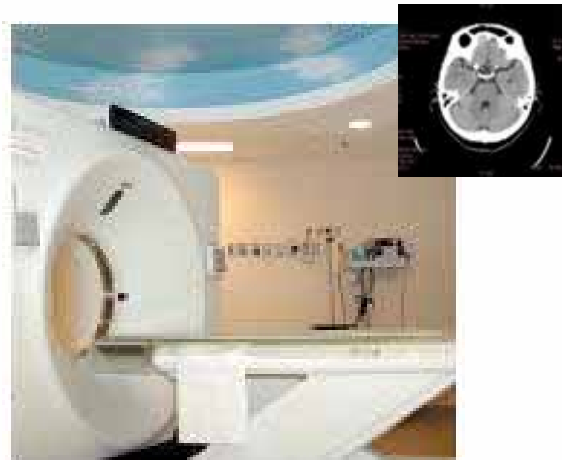Then came new modalities (imaging devices).....

Medical Imaging Modalities
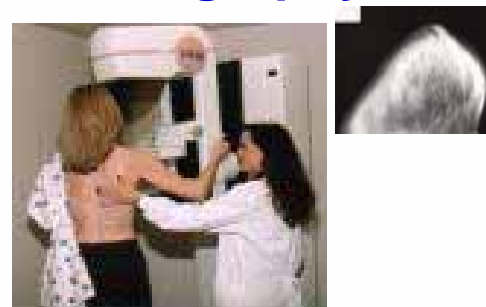
X-ray

Computed Tomography (CT)

Cath Lab

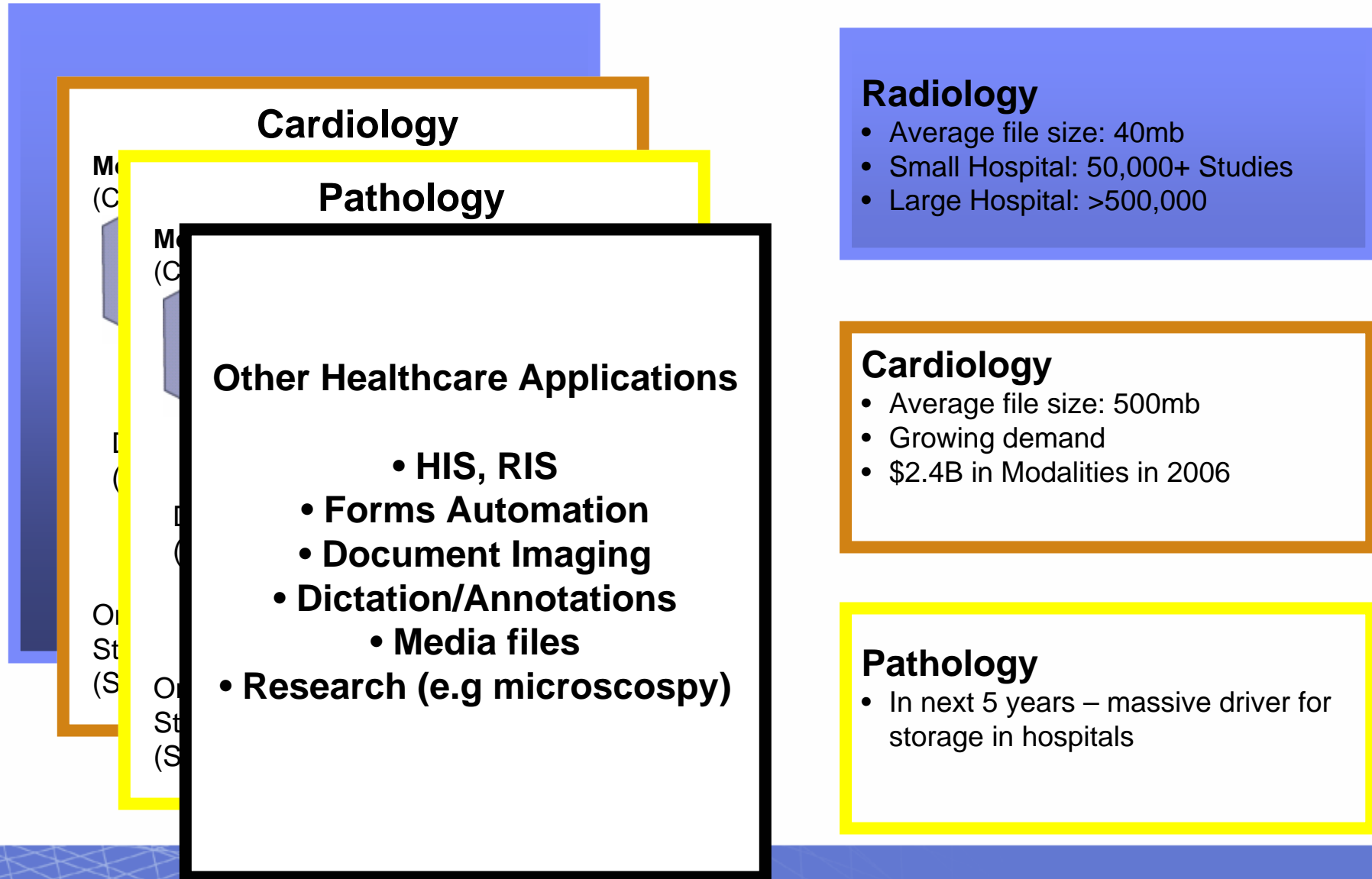**MRI**

Ultrasound

Mammography

Medical Imaging – today

- Large increase of fixed content data volumes
  30 PB in 2003 to 192 PB by 2006 (CAGR 86%)*

- Increasing number of hospitals have PACS
  (Picture Archiving and Communication Systems)

- The digitization has been driven by radiology
  departments or government health programs

- The data volume per procedure is growing:
  - 2D x-Ray (CR/DR) ~30MB/exam
  - 2D Mammogram ~120MB/exam
  - 3D MRI >150MB/Exam
  - 3D CT series of 500 slices >1 GB/ exam

- ....and it has to be stored for 30 years or more

* Reference Information 'The Next Wave' (2002). Enterprise Storage Group

CT Coronal · PET Coronal · Fused Coronal
CT · PET · PET/CT

The rapid growth of fixed content healthcare data is a strategic issue

Cardiology

Pathology

Other Healthcare Applications

- **HIS, RIS**
- **Forms Automation**
- **Document Imaging**
- **Dictation/Annotations**
- **Media files**
- **Research (e.g microscospy)**

Radiology
- Average file size: 40mb
- Small Hospital: 50,000+ Studies
- Large Hospital: >500,000

Cardiology
- Average file size: 500mb
- Growing demand
- $2.4B in Modalities in 2006

Pathology
- In next 5 years – massive driver for storage in hospitals

Healthcare Value of Medical Imaging

- **Clinical benefits of new digital imaging technology**
  - 64 slice CT scanners are becoming common – faster/better diagnosis
  - Functional MRI – show brain structure *and* brain activity
  - Molecular imaging using high powered MRI
  - PET/CT – Used in cancer diagnosis and therapy

- **Research & Development benefits of digital imaging technology**
  - PET/CT and SPECT can assist the drug development process
  - Combining phenotypic, genotypic and imaging information into one comprehensive patient view
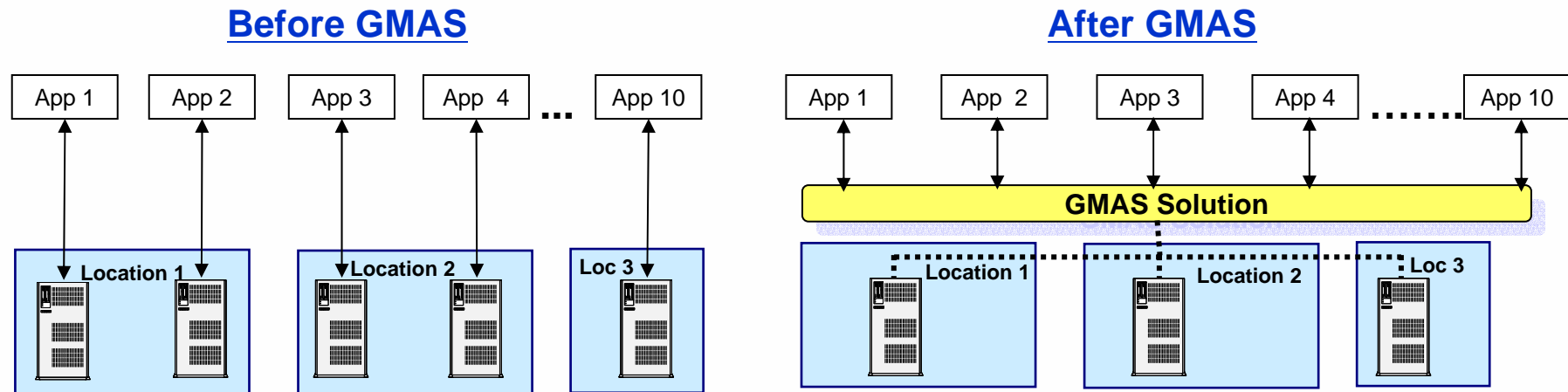
GMAS Overview

IBM's Grid Medical Archive Solution (GMAS)
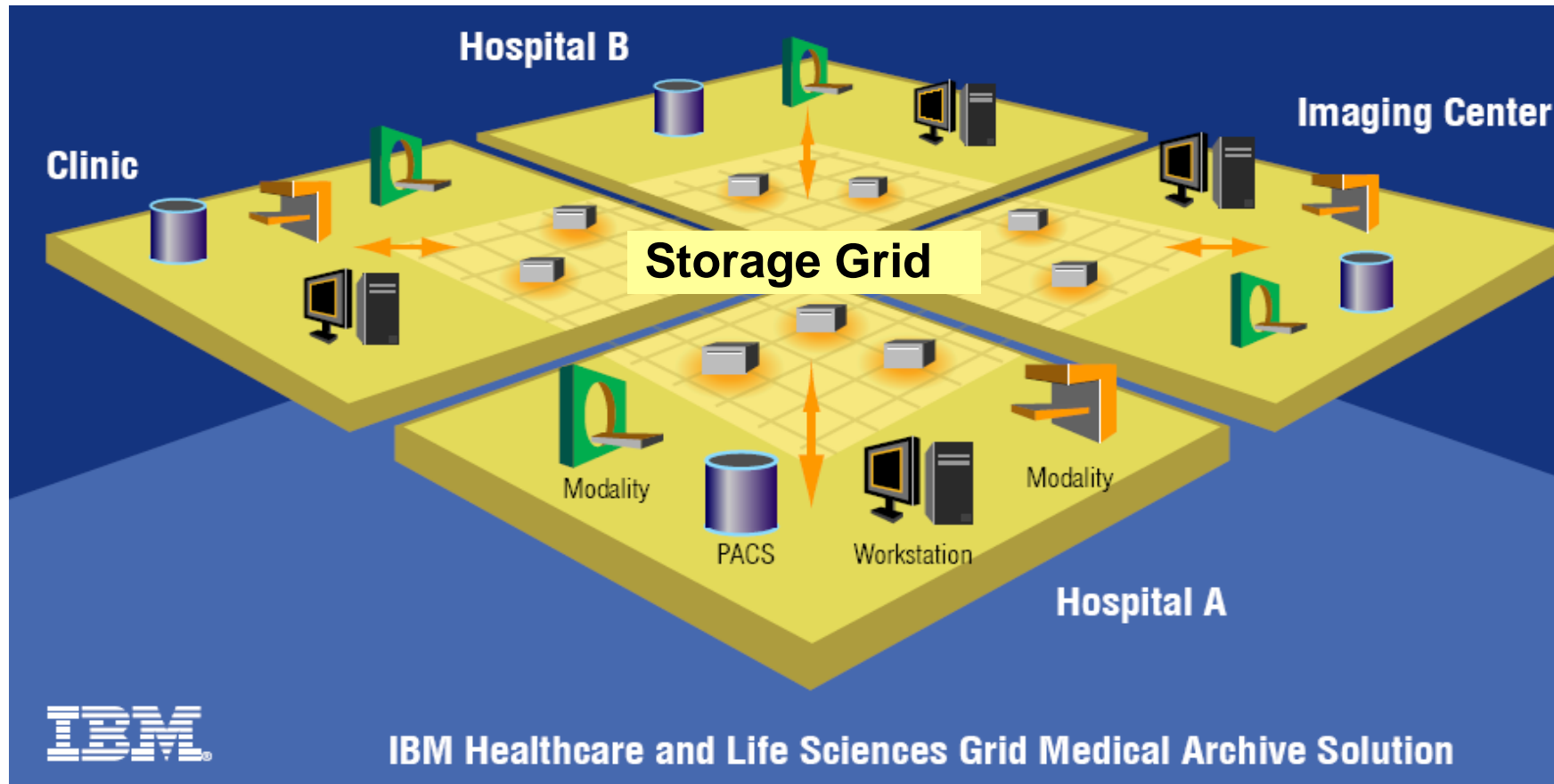
IBM's GMAS is a multi-site, multi-tier, multi-application
fixed content *enterprise storage virtualization platform*

GMAS Storage Virtualization

Before GMAS

| App 1 | App 2 | App 3 | App 4 | ... | App 10 |

Location 1   Location 2   Loc 3

After GMAS

| App 1 | App 2 | App 3 | App 4 | .... | App 10 |

GMAS Solution

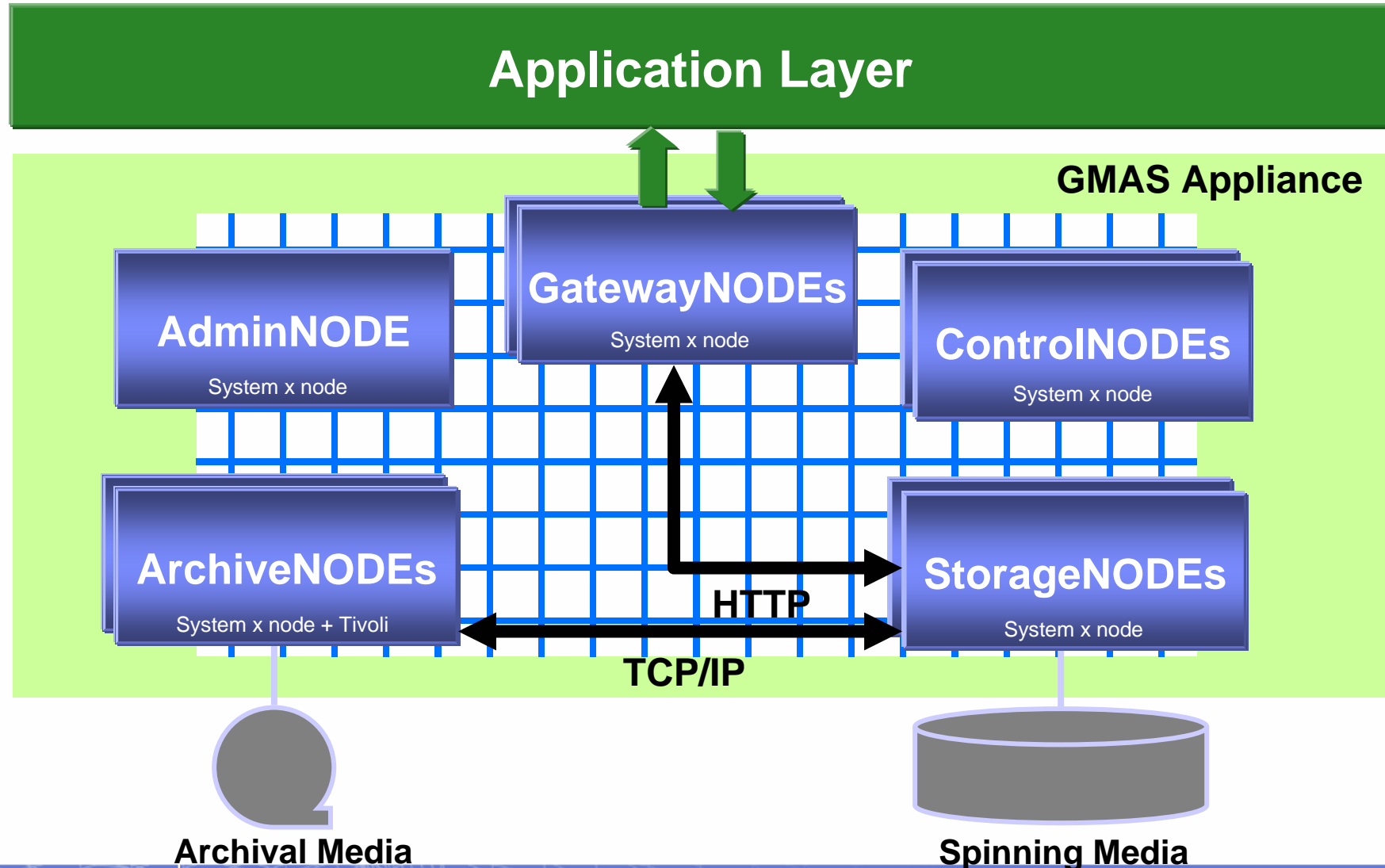Location 1   Location 2   Loc 3

"Siloed" architecture:
- Unable to share resources across applications
- Requires application downtime for maintenance
- Manual administration, upgrades & conversions
- Inherently vulnerable to storage failures

"Virtualized" infrastructure:
- Collapses silos into a single shareable storage pool across applications
- Enables maintenance, support & data conversion without application downtime
- Enables automated upgrades & data conversions
- No single point of failure

GMAS Architecture

Application Layer

GMAS Appliance

GatewayNODEs
System x node

AdminNODE
System x node

ControlNODEs
System x node

ArchiveNODEs
System x node + Tivoli

StorageNODEs
System x node

HTTP

TCP/IP

Archival Media

Spinning Media

GMAS Intuitive Interface

Overall GMAS Business Benefits

- **Enhanced Application Performance**
  - Timely access to data across sites & storage tiers

- **Real Time Business Continuity and Lifetime Data Protection**
  - Protection from data loss & application downtime

- **Easy Extensibility and Scalability**

  - Across all medical disciplines, applications and locations

- **No Vendor Lock-in**
  - Supports all storage manufacturers

- **Decreased Total Cost of Ownership:**
  - Improved storage utilization
  - Consolidated storage infrastructure
  - Optimized price performance beyond acquisition
  - Lights out administration

Customer Examples

UHCS Augusta

Challenge:

- Address the exponential growth of Cardiology imaging and other fixed content data

- Establish an enterprise-wide storage layer to increase flexibility and eliminate vendor lock-in

- Leverage rather than eliminate existing investments and technologies in storage infrastructure

- Cost effectively establish baseline technologies for image sharing across the enterprise & the region as a whole

Solution:

- IBM's Grid Medical Archive Solution (GMAS):
    - Single bundled offering including Software, Hardware, Services and Support
    - Built on IBM DS4100 Storage, System x Intel Servers and Bycast software
    - Leverages existing EMC storage investment
    - Easily expandable to 2nd location for off-site replication

UNIVERSITY HEALTH CARE SYSTEM

Business Benefits

- *Elimination of hardware vendor 'lock-in'*
- *Inherent real time business continuity / disaster recovery*

- *Improved application resiliency*
- *Leveraging of existing storage investments*

- *Improved ease of expansion to new clinical sites*

- *Cost effective entry point & improved TCO*

"We were looking for a storage platform that would improve organizational flexibility, reduce administration and optimize our storage utilization. IBM's GMAS solution provided us the best combination at a competitive price.
William Colbert, Vice President/CIO, University Hospital

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Generations+

Challenge:

- Enable secure sharing of images across 3 distributed major NYC hospitals

- Improve enterprise wide storage utilization and Philips Medical's PACS system resiliency and uptime

- Establish a real time disaster recovery strategy for medical images

Solution:

- Deploy IBM's Grid Medical Archive Solution to link together Philips PACS across all 3 hospital sites and deliver storage virtualization and increased utilization across a wide area network.   The project includes the following technologies:
  - IBM's Grid Medical Archive Solution
  - Philips EasyAccess PACS
  - IBM System x Intel servers, IBM Storage and Bycast software

HHC NEW YORK CITY HEALTH AND HOSPITALS CORPORATION

How NYC takes care of its own.

Business Benefits

- **Real time disaster recovery with automatic fail over**
- **Improved PACS application resiliency, uptime and scalability**
- **Decreased hardware obsolescence**
- **Improved storage utilization across all sites**
- **Easier storage upgrades**

60 TB Multi Facility Solution deployed in less than 30 days

Provincial Health Services Authority

Challenge:

- Delivering Cancer and Pediatric care for Province of British Columbia (Pop. 4M)

- Seamless access to images across Province

- Integrate with existing multi-vendor PACS

- Geographically dispersed facilities

Solution:

- Provincial grid in production since 2002
- Links 40+ hospitals with 1,500+ users
- 60TB at 5 Data Centers, distributed DR
- Less than 1 FTE to operate and maintain
- Stentor, Agfa, GE, McKesson, Siemens, …

PHSA
Provincial Health Services Authority

Solution Business Benefits

- ***Timely access to patient data***
- ***Reduction of avoidable medical procedures***
- ***Increased resiliency and uptime***
- ***Images accessible via EHR***
- ***Enhanced clinical collaboration***

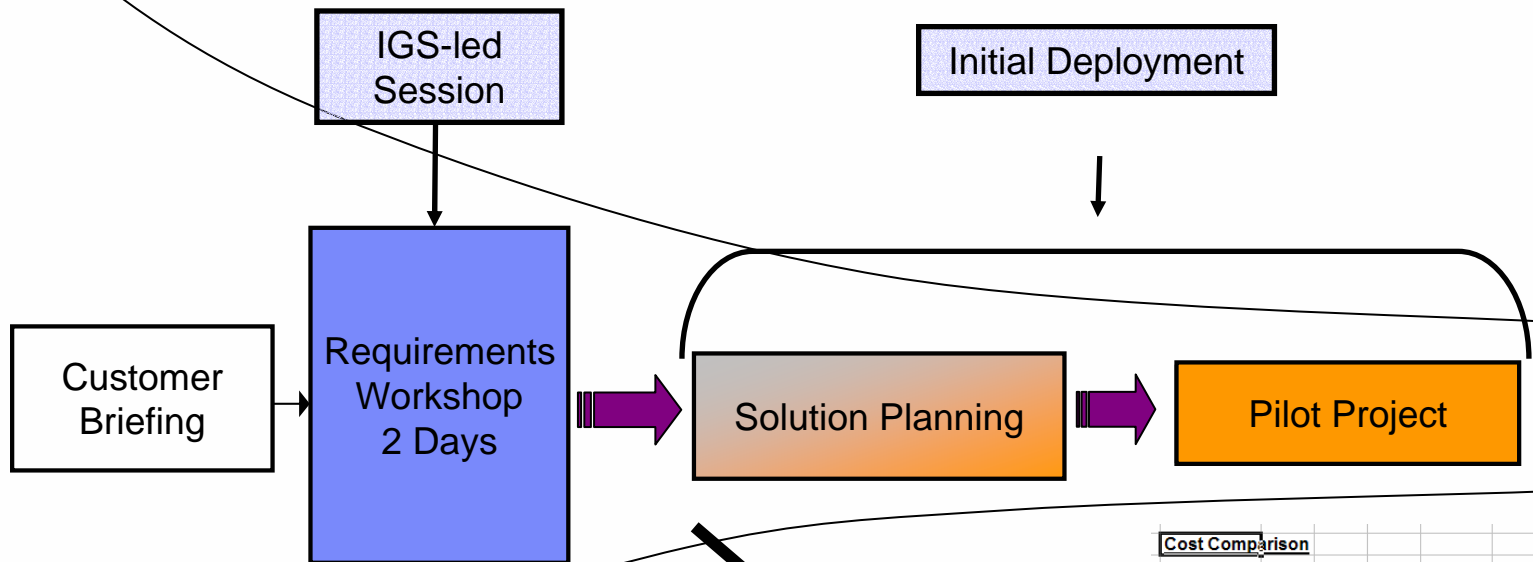*In full production for over three years with no downtime*

Getting Started

GMAS Entry Edition

- **What it is:**
  - ✓ Grid Medical Archive Solution made easy
  - ✓ Pre-built, Pre-priced solution. Includes all hardware, software, services.

- **Provides NFS/CIFS interface**
  - ✓ Industry Standard Open Access – NAS-like interface
  - ✓ Utilize NFS or CIFS to store and retrieve Medical data

- **Provides "protected" storage**
  - ✓ All data is on RAIDed disk and replicated between Nodes
  - ✓ Digital Signature & Non-erasable, Non-rewriteable
  - ✓ Self-healing capabilities

- **Provides redundant "control" function**
  - ✓ Redundant control, replicated between GMAS Nodes
  - ✓ Complete redundancy, no single point of failure
  - ✓ Redundant components at LAN/WAN connected sites

What is the first step? Document data & storage requirements, estimate 3-5 year TCO and deliver a pilot project …

IGS-led Session

Initial Deployment

Customer Briefing

Requirements Workshop 2 Days

Solution Planning

Pilot Project

GMAS TCO Tool

Working production pilots average 3 to 5 weeks to deploy

Cost Comparison

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Hub-and-Spoke Solution Costs (< 10km apart)						
Costs -- One-off	1,587,798	0	0	209,435	0	1,797,233
Costs -- Ongoing	104,028	104,028	104,028	302,627	302,627	917,337
Total Costs	1,691,826	104,028	104,028	512,062	302,627	2,714,570
Hub-and-Spoke Solution Costs (> 10km apart)						
Costs -- One-off	2,487,798	0	0	209,435	0	2,697,233
Costs -- Ongoing	176,028	176,028	176,028	374,627	374,627	1,277,337
Total Costs	2,663,826	176,028	176,028	584,062	374,627	3,974,570
Grid Solution Costs						
Costs -- One-off	1,203,615	0	0	497,435	0	1,701,050
Costs -- Ongoing	145,628	145,628	145,628	357,850	357,850	436,884
Total Costs	1,349,243	145,628	145,628	855,285	357,850	2,853,634
Cost Differential Summaries						
Hub-and-Spoke Costs (< 10km apart)	1,691,826	104,028	104,028	512,062	302,627	1,899,882
Grid Costs (< 10km apart)	1,349,243	145,628	145,628	855,285	357,850	1,640,499
Net Cost Differential (< 10km apart)	342,583	(41,600)	(41,600)	(343,223)	(55,223)	259,383
Hub-and-Spoke Costs (> 10km apart)	2,663,826	176,028	176,028	584,062	374,627	3,015,882
Grid Costs (> 10km apart)	1,349,243	145,628	145,628	855,285	357,850	1,640,499
Net Cost Differential (> 10km apart)	1,314,583	30,400	30,400	(271,223)	16,777	1,375,383

GMAS Summary

- GMAS is an IBM strategic storage grid solution for multi-site hospitals. GMAS <u>Entry Edition</u> is a storage solution for <u>single-site</u> hospitals.

- GMAS can also be used as a storage grid solution for ALL Fixed Content Data such as lab results, doctor notes, audio files, video files, email, etc.

- IBM has a complete Virtualization strategy that includes server virtualization, storage virtualization and virtualization management software.