EMC²
where information lives

# *Patient Information Lifecycle Management:*
## Healthcare Data Storage Strategies

**Waterloo Health Informatics Think Tank**

February 4, 2004

EMC²
where information lives

# Topics of Discussion

- Canadian Healthcare Challenges
- What is Patient Information Lifecycle Management?
- The Evolution of Patient Information Storage
- Current Options
- Today's Online Information Needs
- CAS: Next Generation Storage Architecture
- What is Content Address Storage?
- Centera Success Stories

EMC²
where information lives

# Healthcare Organizational Challenges

**Cost**
Providing Quality Patient Care at Lowest Cost

**Patient Care Quality**
eHealth to Reduce Medical Errors

**Recovery**
Legislation Mandates Focus on Business Continuity

**Faster Access**
speeds treatment decisions

**Growth**
Explosion of EPR and PACS Information

**Increased Compliance**
Secure, Online Access to Information

# Patient Information Growth Projections

## *More Over the Next Year Than the Previous 40,000 Combined*

*Digital Radiology*

*Enterprise Business Applications*

*Electronic Medical Record*

*Digital Cardiology*

40,000 BCE
cave paintings
bone tools

3500
writing

0 C.E.
paper 105

1450
printing

1870
electricity, telephone

transistor 1947

computing 1950

Late 1960s
Internet

1993
The Web

1999

2003

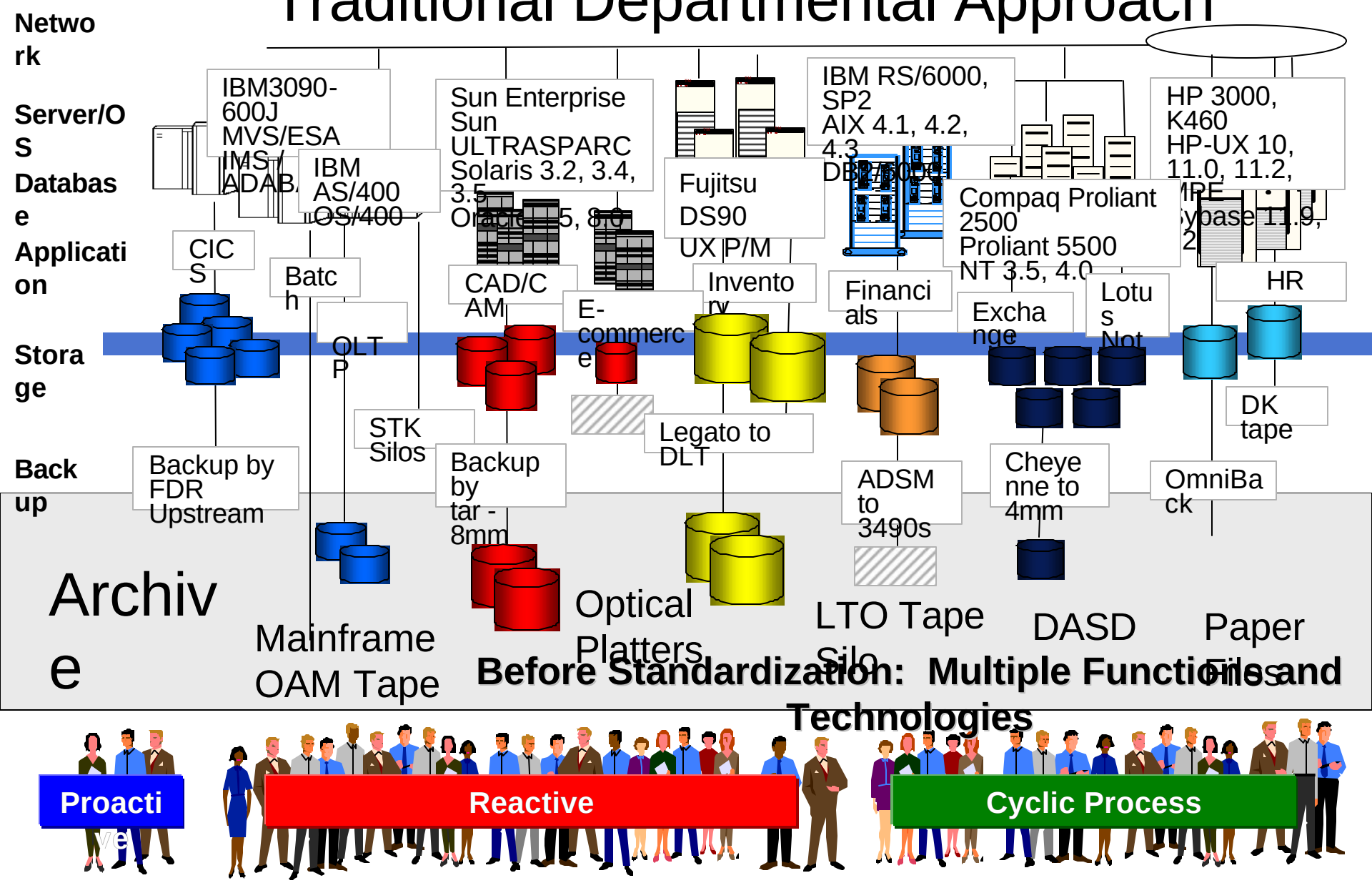
Petabytes

**Digital Radiograph**
10 MB each

Source: UC Berkeley, School of Information Management and Systems.

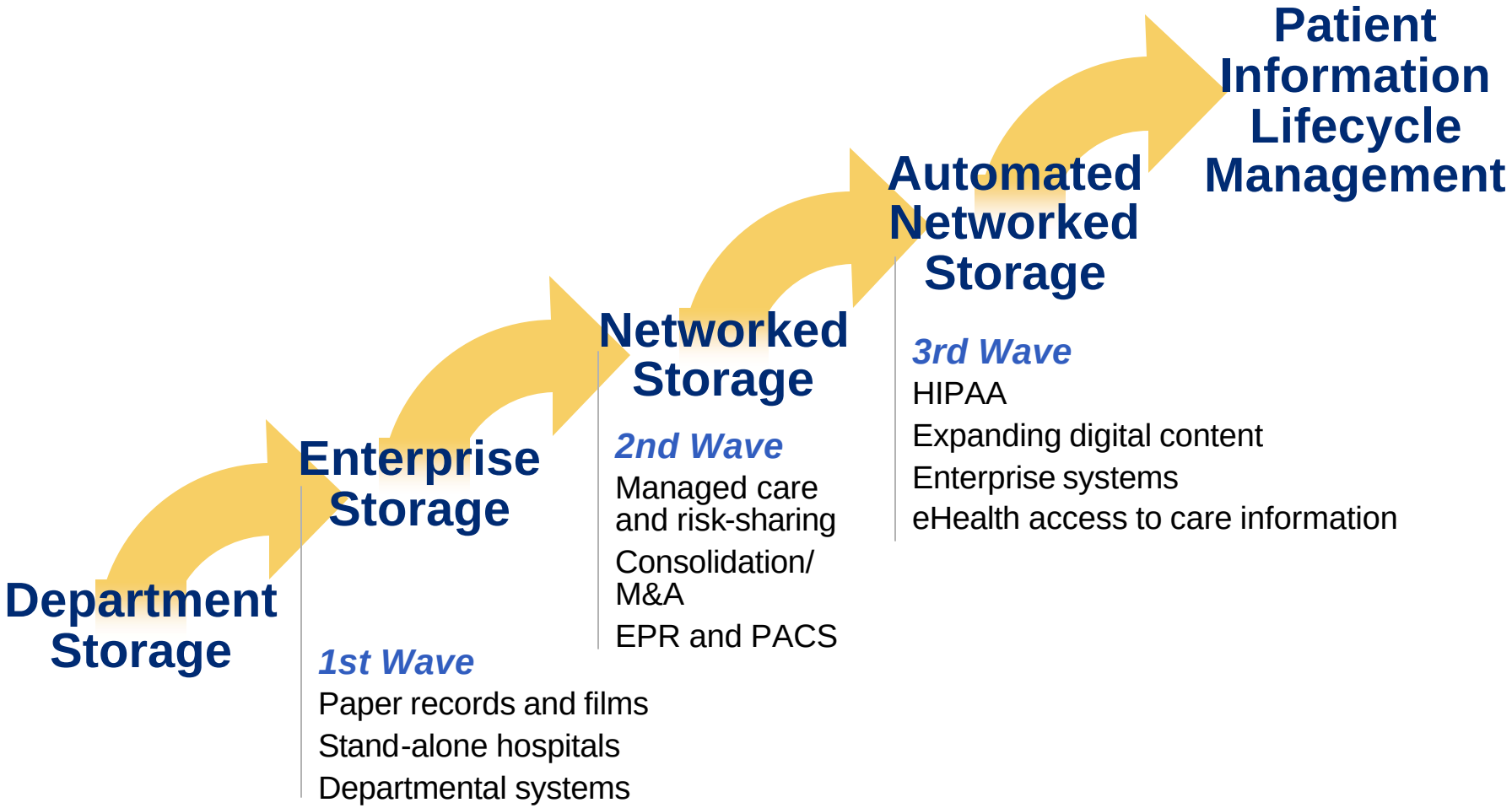
EMC²

# Traditional Departmental Approach



EMC²
where information lives

# Evolution of Patient Information Storage



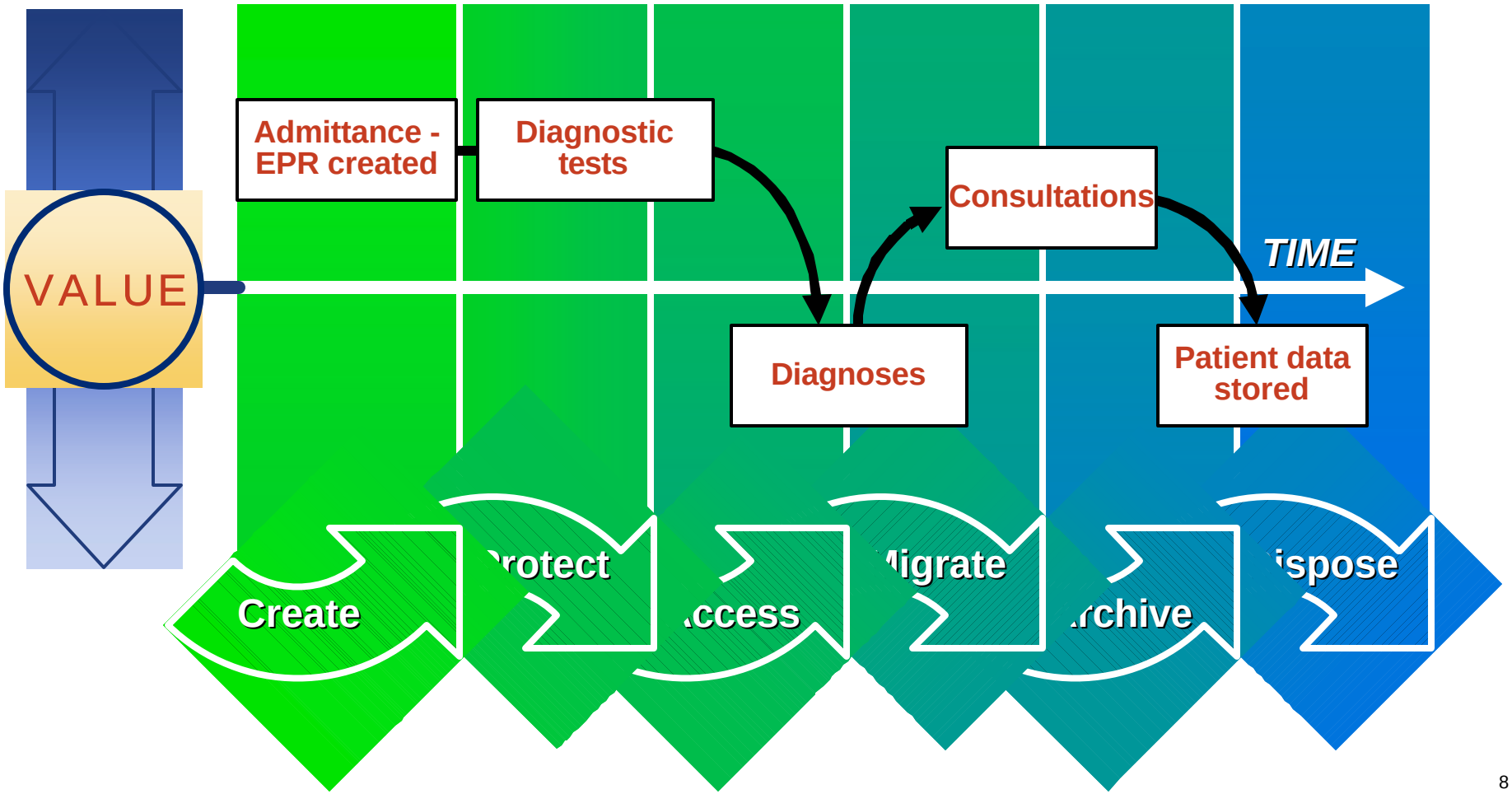
EMC²
where information lives

# Patient Information Lifecycle Management Vision


***Managing critical information throughout a patient's life at the lowest total cost***

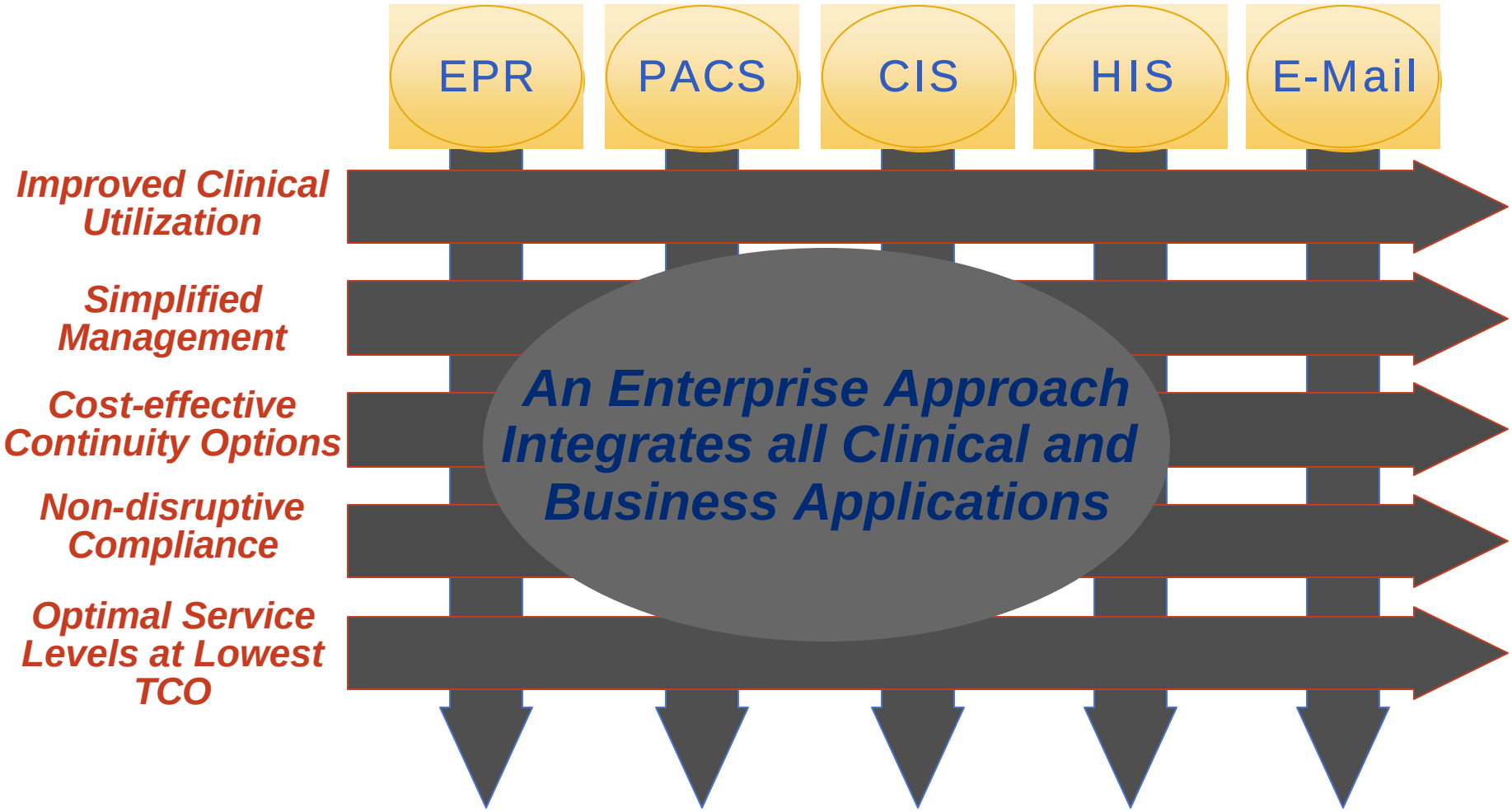
# Value of Patient Information Changes throughout Its Lifecycle

**One Patient Episode: Data Stored for 7- 21 Years According to Healthcare Regulations**



EMC²
where information lives

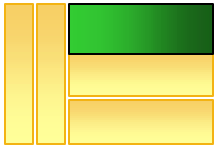
# Patient Information Lifecycle Management
## Implementation



EMC²
where information lives

# Information Management

**Deployment of the Right Solution at the Right Time for the Right Information Based on Policies**



**Business Process** — Time

Create → Protect → Access → Migrate → Archive → Dispose

**Business Requirements** — Value

| | | |
|---|---|---|
| Data value | High | Low |
| Data type | Transactional | Archive |
| Availability | 24x7 | Infrequent |
| Recovery | Immediate | Days + |
| Security | Distribution profile | Access rights |
| Cost | High | Low |
| Compliance | Retention | Retrieval |
| Flexibility | High | Low |

EMC²
where information lives

# *Healthcare Organization's Options*

**Enabling the Right Service Level at the Right Cost**

## Automated Management

**High End SAN/NAS**

**Mid-Tier SAN/NAS**

**"ATA" SAN**

**Silos**

**Vaults**

Approximate industry average acquisition cost per megabyte

EMC²
where information lives

# EMC's Networked Storage Platforms

## Scalable, Best-of-Breed Platforms


*"Consolidation with DMX has helped us reduce storage costs by almost 80%."*

— EarthLink

*"Centera and CLARiiON are the foundation for our business continuity strategy."*

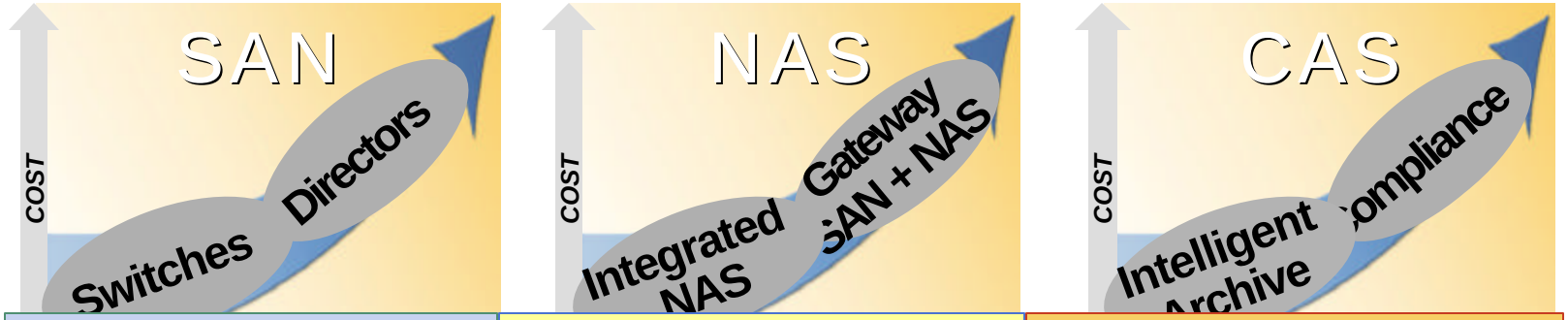
— Rogers Medical

EMC²
where information lives

# SAN, NAS, CAS

**Application Data Usage**

| High Update Rates | Moderate Update Rates | Low Update Rates |
|---|---|---|
| ex. TRANSACTIONAL | ex. COLLABORATIVE | ex. ARCHIVAL |

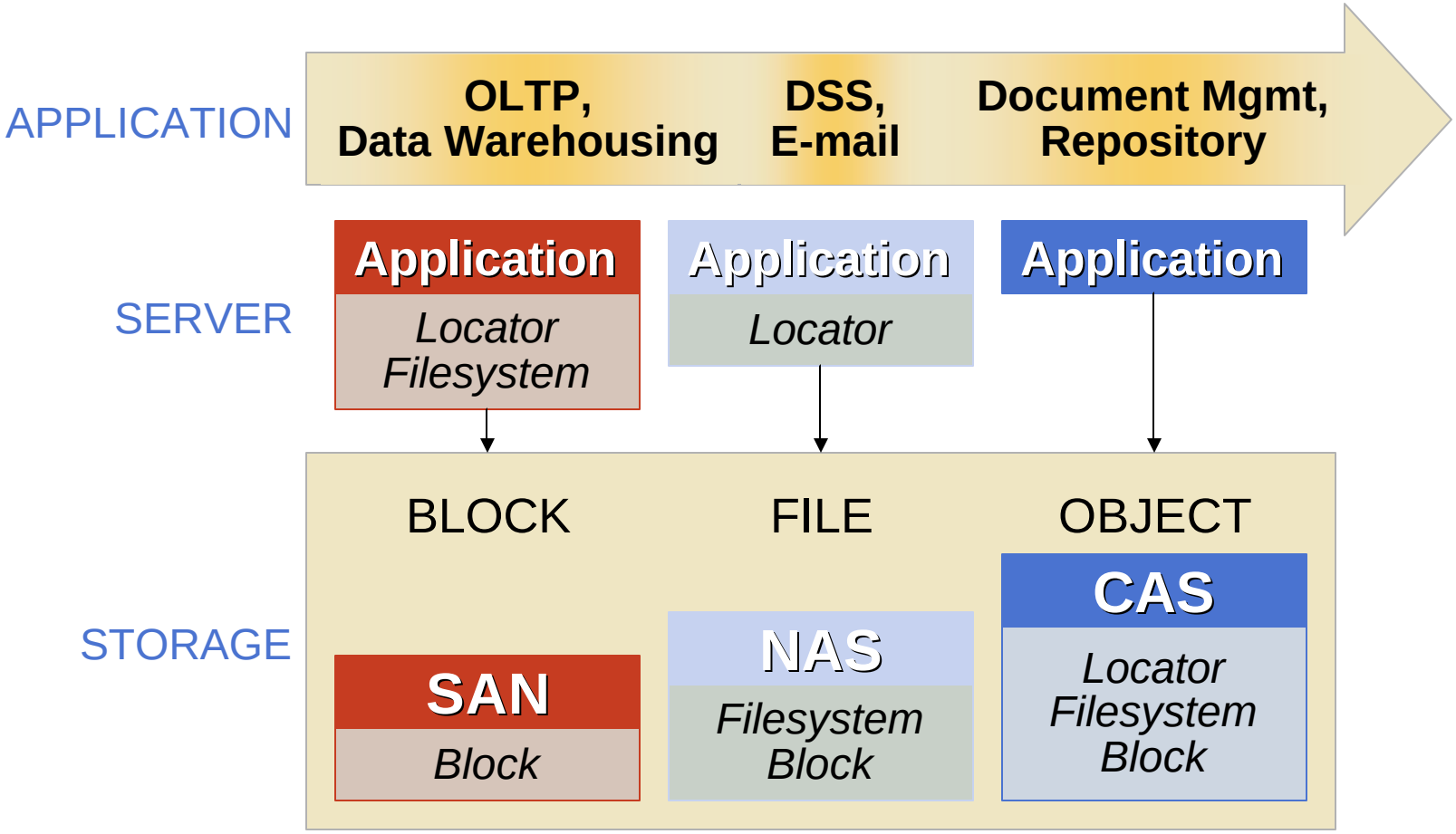



| Networked Access | Fibre Channel Based | IP Based | Fixed Content |
|---|---|---|---|
| **Purpose** | For transferring data between servers and storage devices | For file sharing and economical data base connectivity | For fast access and assured authenticity of fixed content |
| **Economic Advantage** | Leverage management cost of a storage infrastructure | Lowest cost to connect and share files | Best TCO/ROI |
| **Typical applications** | OLTP, data warehousing, ERP, large databases | Software development, product design and development, small databases, workgroup applications | E-mail archiving, Content Management, Database Archiving, Medical Imaging |

## Choosing the Right Solution

EMC²
where information lives

# Evolution of Application and Storage Platforms



EMC²
where information lives

# Introducing EMC Centera™

## The world's first Content Addressable Storage platform

**Simple**

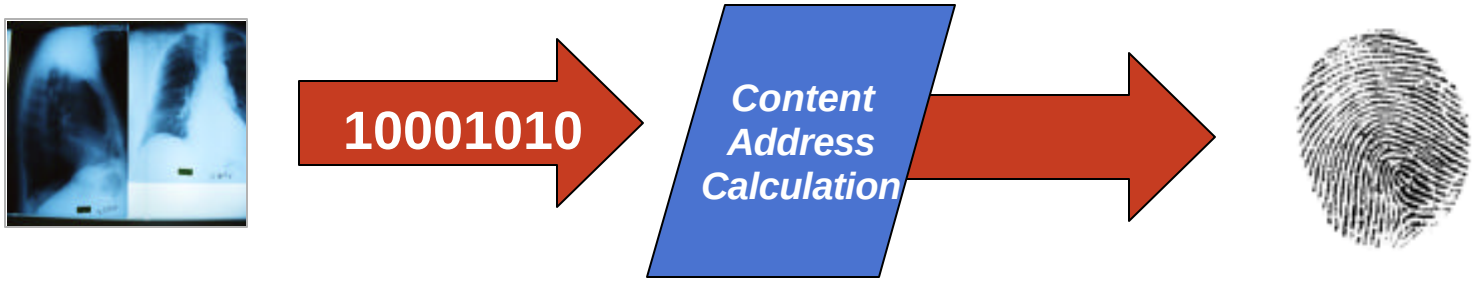
**Scalable**

**Secure**

***Disk Based Content Archiving and Retrieval Solution***

EMC²
where information lives

# Content Addressing - The Centera Building Block

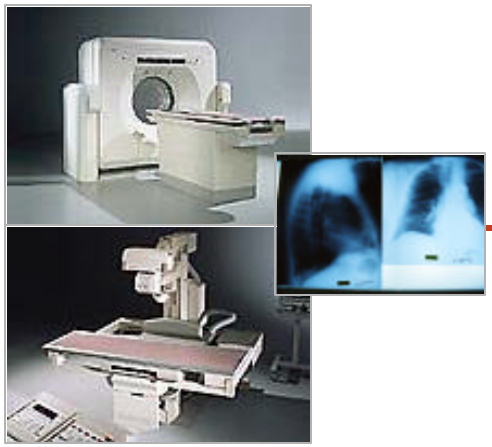



Content addresses are 128-bit digital fingerprints. - 4PJGVL39UEK7ReDN9JM0A2HR3U6

- Assured Content Integrity
  - Unique “fingerprint” is generated from the content itself
  - Constantly validates integrity of data objects and structure
- Location independence
  - Address is globally unique
    - Not a place in a hierarchy (file system)
    - Not a place in a disk array (logical volume)
- Duplicate elimination
  - Identical addresses means identical objects
    - Stored only once (plus mirrors and replicas)

EMC²
where information lives

# How Centera Works



1

Object is created or used by an application

*Application Server*

2

Object is sent to Centera via Centera API over IP

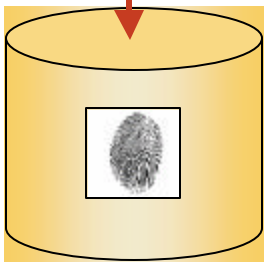
*Centera*

3

Centera generates unique Content Address

4

Content Address returned to application



5

Content Address is retained for future reference

EMC²
where information lives

# *EMC Centera*

## Purpose-Built Magnetic Disk Records Storage to Overcome Current Media Limitations and Facilitate Records Retention Compliance

- ✓ Non-Rewriteable, Non-Erasable
- ✓ Record-level Retention, Protection and Disposition
- ✓ Assured Content Integrity and Availability
- ✓ Seamless Content Migration
- ✓ Record-level Auditability
- ✓ Faster Record Retrieval
- ✓ Superior TCO

EMC²
where information lives

# Centera: for Long-term Archiving

- Stores any kind of content: content cannot be updated once stored—non-repudiation
- Rich metadata is stored: content can be “annotated”
- Easy to deploy: just add repository IP addresses
- No filesystem or LUNs: easy to manage
- Continuous object availability: objects are mirrored—no single point of failure
- Low maintenance: non-disruptive self-healing
- Off-the-shelf: best-of-breed standard architecture
- Scalable: easy to add capacity non-disruptively
- Performance: internet response time

EMC²
where information lives

# *Centera Advantages*

- **Simple management** (With Centera, your applications no longer have to understand and manage the physical location of stored information. Instead, Centera creates a unique identifier that applications can use for retrieval)
- **Fast, location-independent access** (Centera gives you fast, shared, networked access to fixed content at Internet speed. And, access is location-independent, greatly simplifying application development and deployment)
- **Assured authenticity, efficient replication** (Because Centera gives each stored object a unique address, integrity and authenticity are assured. Only one copy and one replica of each object is stored, no matter how many times the object is used)
- **Scalability without reconfiguration** (Centera's architecture is based on redundant arrays of independent nodes (RAIN), making it highly scalable to hold petabytes of content. To add capacity, just plug in another node. Centera auto-discovers and configures the new capacity as it is installed)

EMC² where information lives

# More Centera Advantages

- **Self-healing** (Centera continuously monitors to detect and repair soft errors. It also automatically reconfigures itself and replicates objects as necessary, in the event of hardware failures such as disks or nodes. These incidents are automatically reported through EMC's remote monitoring system)
- **Business continuity protection** (All information objects are synchronously mirrored within a local Centera cluster to support automatic recovery from component failures. Centera can also be configured to maintain duplicate copies of fixed content at a remote site to guard against site disaster)
- **Easy installation and non-disruptive upgrades** (Centera systems can be installed or upgraded in less than an hour, without disrupting content access. Centera's software operating environment, CentraStar, can also be upgraded non-disruptively as new versions are released)
- **Future-proof architecture** (Long-term data often outlives the technology on which it is stored. Because Centera is designed to accommodate new technology without costly and disruptive conversion or migration, it eliminates this problem)

EMC²
where information lives

# Key Centera Innovations

- Content addressing
  - Content authenticity
- RAIN implementation
  - Scalability and manageability
- Distributed content
  - Business continuity
- Compliance Edition module
  - Enables regulatory compliance

EMC²
where information lives

# EMC PACS Solution

## Improving Physician Workflow: After EMC

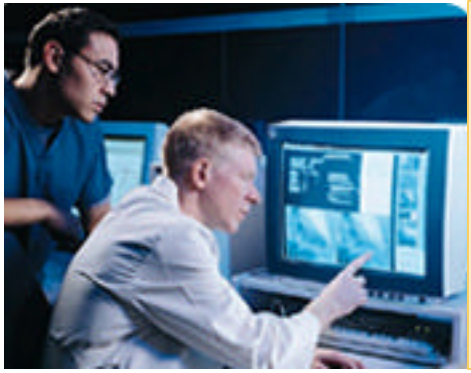
### Acquisition Station

- Procedure Room

*Images acquired and moved*

### Short-Term Online Image Cache

- Most recent studies accessible in milliseconds



### Image Review and Analysis on Multiple Workstations

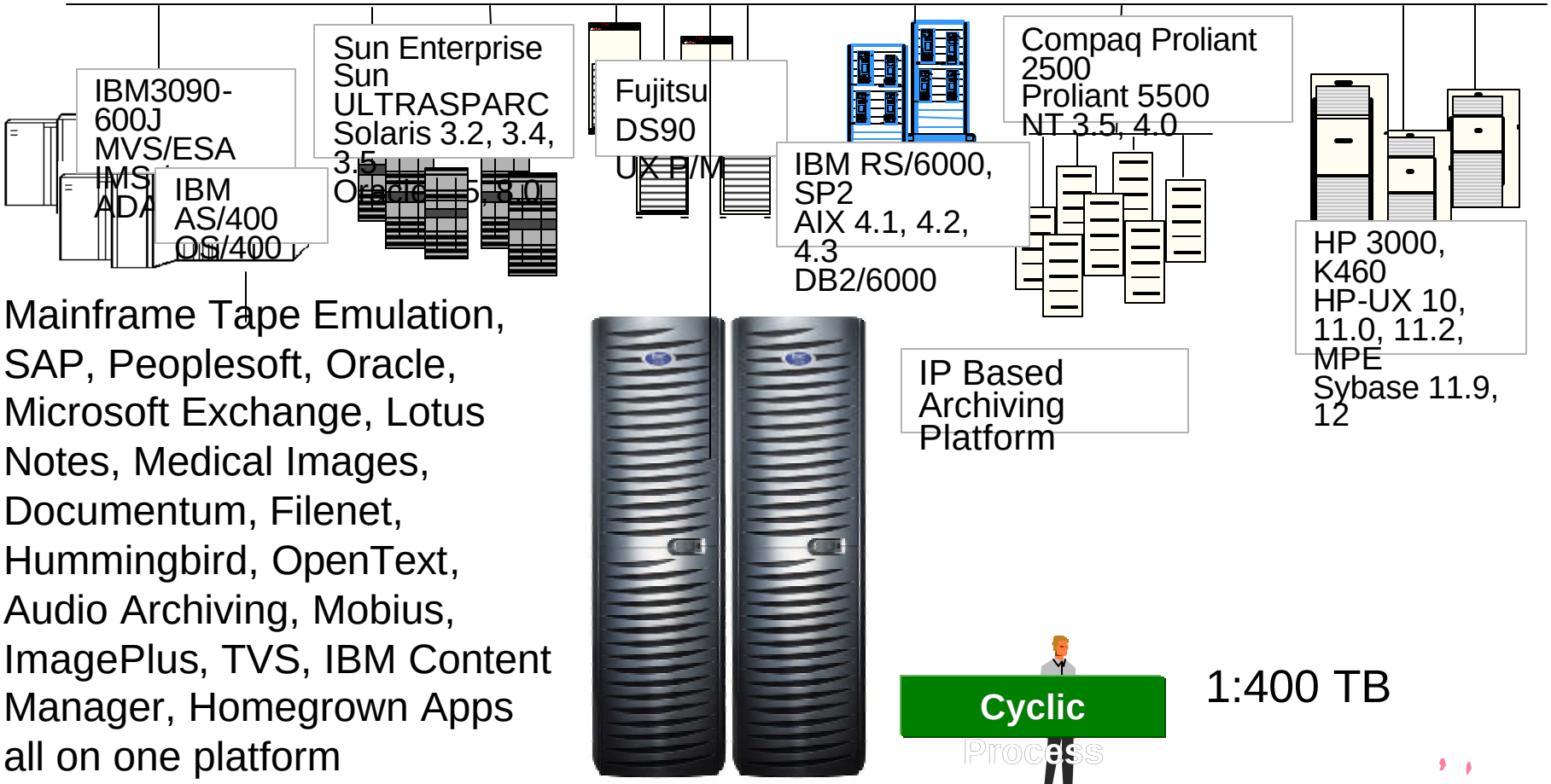
- Viewing room
- Onsite office
- Surgical suite
- Offsite

### Long-Term Online Image Archive

- Entire patient history accessible in seconds

EMC²
where information lives

# The Next Generation:
## Centera Enterprise Archive Platform




Mainframe Tape Emulation, SAP, Peoplesoft, Oracle, Microsoft Exchange, Lotus Notes, Medical Images, Documentum, Filenet, Hummingbird, OpenText, Audio Archiving, Mobius, ImagePlus, TVS, IBM Content Manager, Homegrown Apps all on one platform

**After: Enterprise Archive Standardization**

# Partnering with Top Tier PACS Application Providers

## PACS Partners

- Agfa
- Algotec Systems
- Amicas
- DR Systems
- Eastman Kodak Health Systems
- Emageon
- Fujifilm Medical
- GE Medical Systems
- Merge Technologies
- McKesson Imaging Group
- Philips Medical Systems
- Siemens

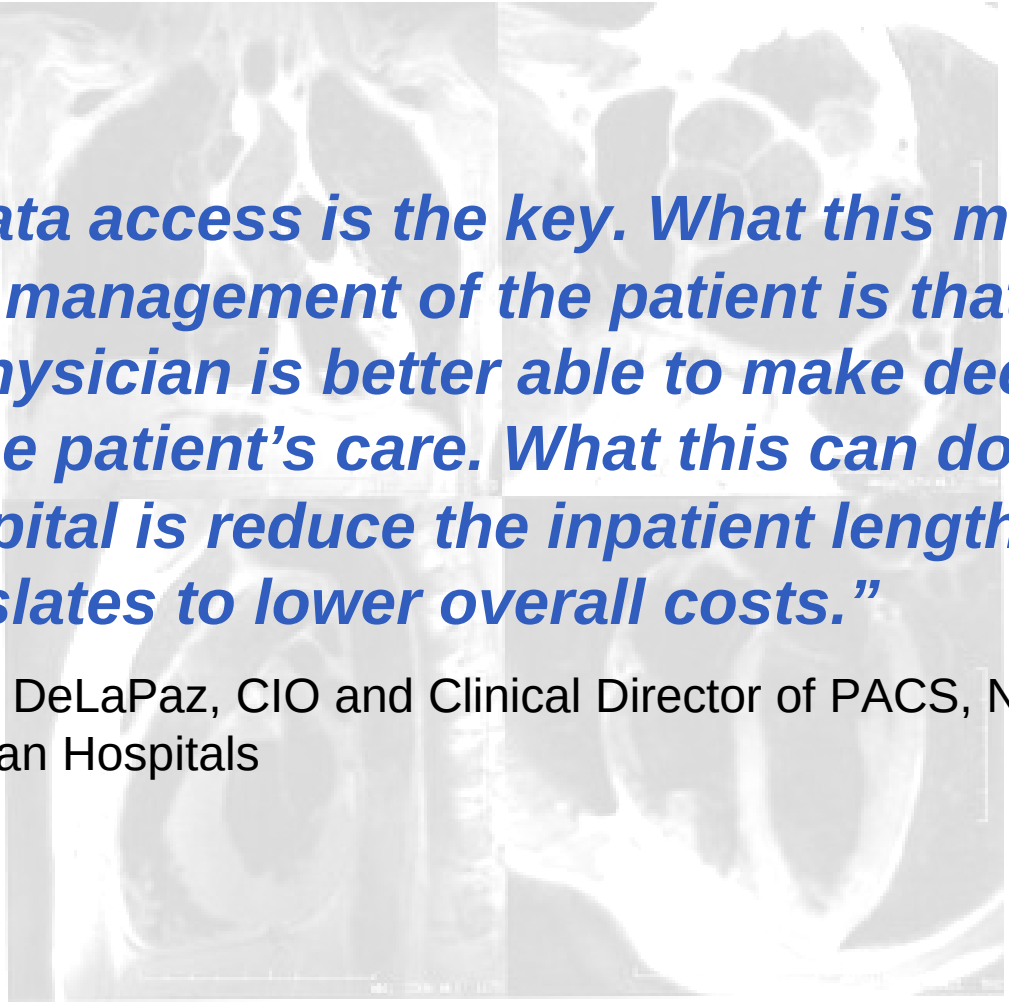
EMC² where information lives

# *More than 90% of the World's Largest Healthcare Organizations Deploy EMC Infrastructure*

## EMC Customers Include:

- Partners Healthcare
- Yale-New Haven Hospital
- Columbia Presbyterian-Cornell Medical Center
- UCLA Medical Center
- Cleveland Clinic
- Children's Hospital Boston
- University of Chicago Hospitals
- Stanford Medical Center
- Johns Hopkins Medical Center
- Memorial Sloan Kettering Cancer Center

# Customer Quote on the Benefits of EMC Solutions



*"Speed of data access is the key. What this means for the clinical management of the patient is that the referring physician is better able to make decisions earlier in the patient's care. What this can do financially for the hospital is reduce the inpatient length of stay which translates to lower overall costs."*

— Dr. Robert DeLaPaz, CIO and Clinical Director of PACS, New York Presbyterian Hospitals

EMC²

where information lives