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Keys to the Digital Future

# Openness, Closure, Growth and Evolution in Archival Information Systems

*Lessons from NARA's Experience*

June 6 2007

Kenneth Thibodeau, Director  
Electronic Records Archives Program  
National Archives and Records Administration

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# What is the Electronic Records Archives (ERA)?

- 🔑 ERA is the system the National Archives and Records Administration (NARA) is developing to
  - 🔧 Reengineer and automate the lifecycle management of records of the U.S. Government
  - 🔧 Preserve and provide sustained access to **electronic records** of the U.S. Government

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# What is the Plan for ERA Development?

9/05

9/06

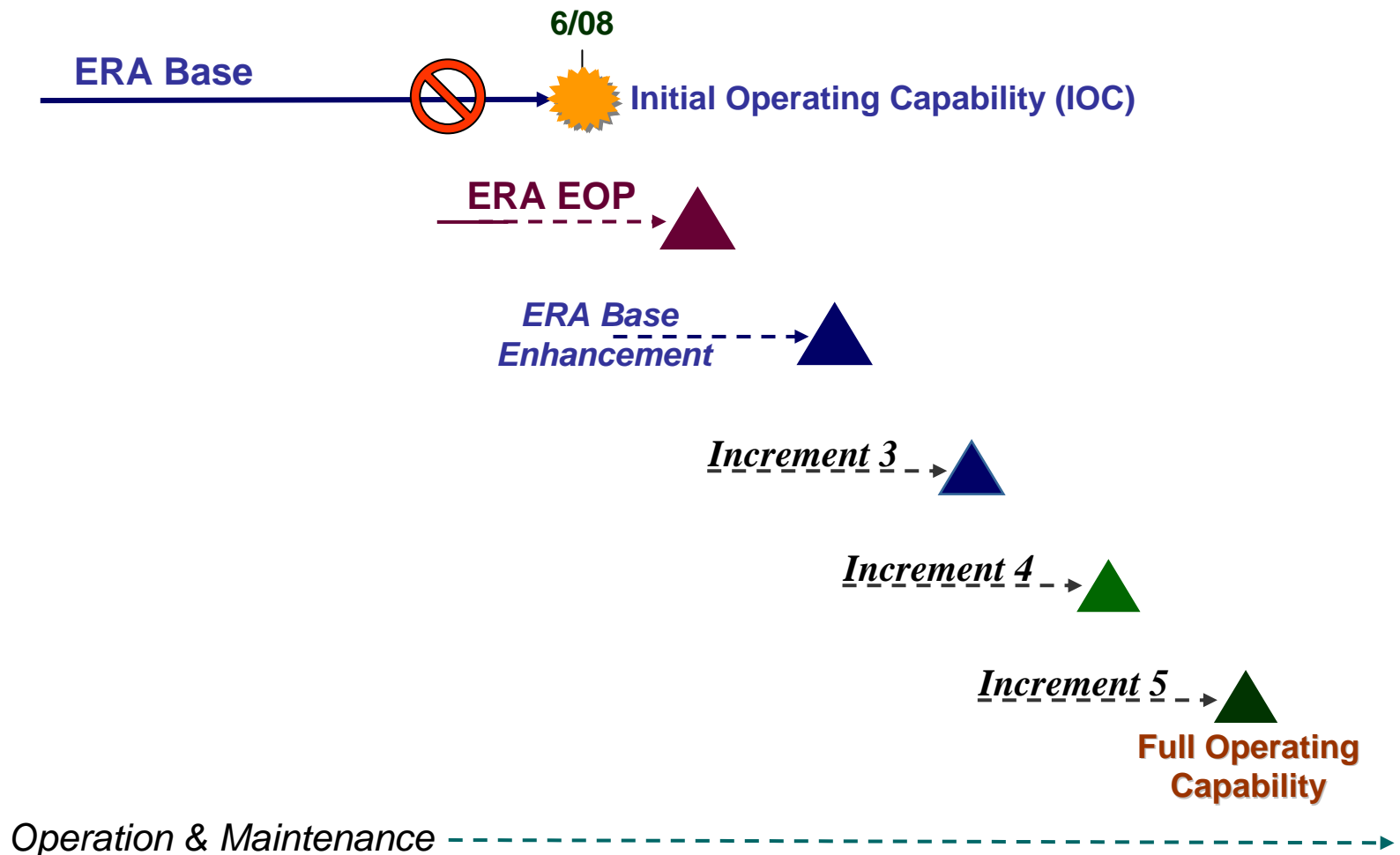
9/07

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9/10

9/11





# *Status of ERA Development:* **Requirements**

- No indecision about what is required.
- NARA's requirements were
  - Defined in an iterative process involving the entire agency, from top to bottom, and including input from the IT industry and the general public
  - Definitized in the ERA Requirements Document in December 2003
  - Stable ever since.



# *Status of ERA Development:*

## Costs

- The ERA development has suffered both cost underruns and cost overruns.
- Underrun:
  - the cost of the Initial Operating Capability, as originally defined by NARA, turned out to be twice the level of funding that became available in the two year period: \$134 M v. \$ 63 M.
    - NARA and Lockheed Martin renegotiated the contract to define a smaller, but still worthwhile IOC system within available funding.
- Overrun:
  - The delay in completion of the IOC system is expected to increase its price by an estimated \$16 M.



# *Status of ERA Development:*

## **Deliverables**

- Unlike some other major system developments in the Federal Government, NARA is getting the system it contracted for.
- The delivery of the first operational system has been delayed 9 months.
  - Since reaching agreement with NARA on a revised schedule in September, the contractor has not missed a single deadline.
- The system that will be available in July will be worthwhile. It will be used initially by NARA and four other agencies





# *Status of ERA Development:* **Management**

- The Government Accountability Office (GAO) has conducted real time audits of the ERA program every year since 2001.
- GAO has never reported mismanagement in the program.
- GAO has never reported waste in the program.
- GAO has offered recommendations for improving the program and NARA has acted on all GAO recommendations.





# GAO Observations of the Current State of the ERA Program

- “NARA Is Working to Overcome ERA Schedule Delays through Parallel Development Projects, but Uncertainties Remain”
- “ERA Base System Is Generally on Schedule to Achieve IOC, but Testing Delays Are a Risk”
- “EOP System Is Being Developed, but Completing the Development in Time for the Presidential Transition Is Uncertain”

» Testimony to U.S. Senate, Subcommittee on Federal Financial Management, Government Information, Federal Services, and International Security, May 14, 2008



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# What is the Current Status of ERA Development?

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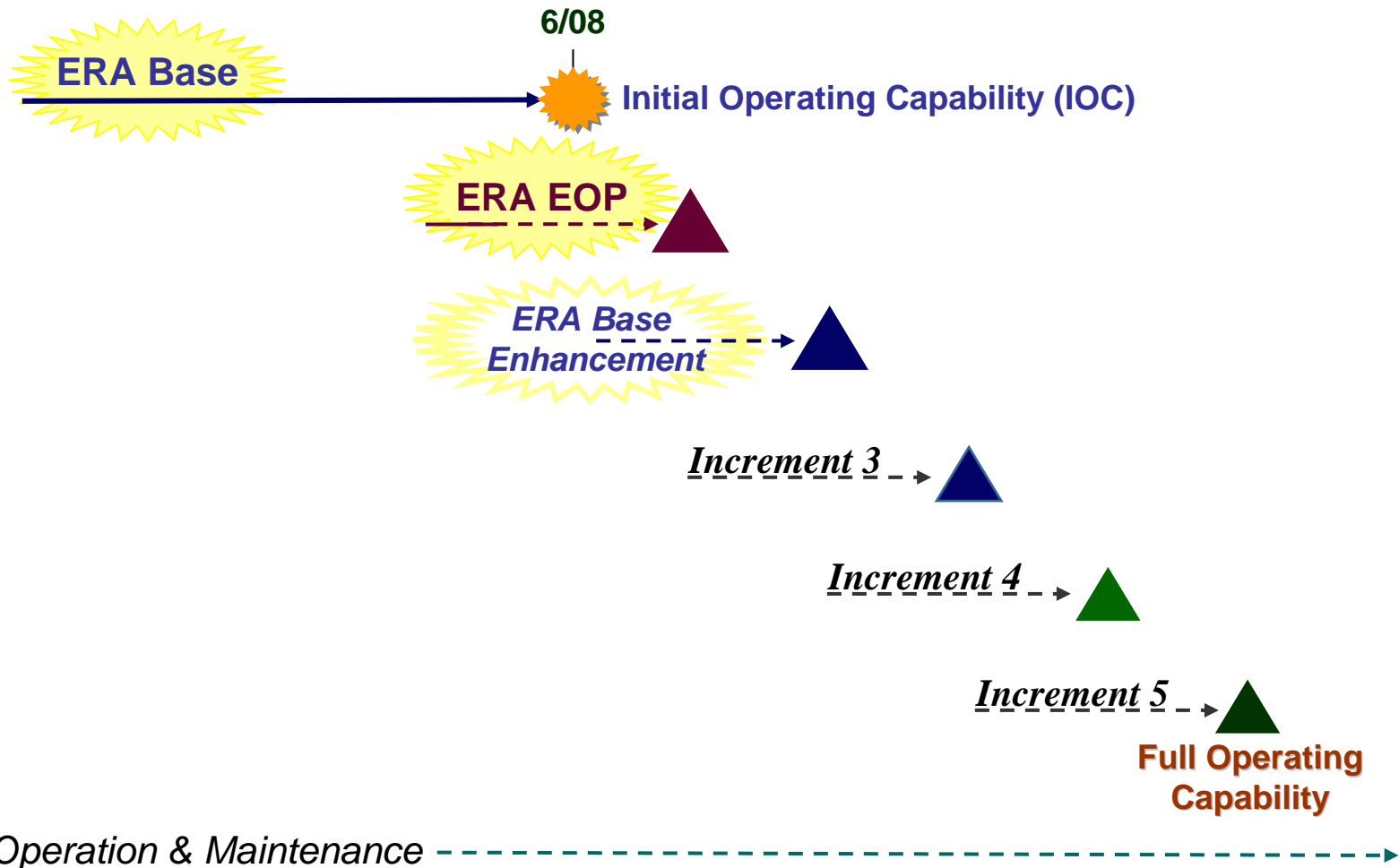
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# ERA Base System Development

## 🔑 Focus:

🔑 Federal Records

🔑 National Archives and nationwide records management

## 🔑 IOC Functions (2008):

🔑 Creation, review and approval of records schedules

🔑 Requests to transfer records, transfer of physical and legal custody

🔑 Transfer, inspection, and archival storage of electronic records

## 🔑 Enhancement Functions (2009)

- Lifecycle Management Planning

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# ERA EOP System Development

## 🔑 Focus:

- 🔒 Electronic records of the Executive Office of the President, G W. Bush
- 🔒 Presidential Libraries

## 🔑 Functions:

- 🔒 Rapid ingest & indexing
  - Transformation to more accessible form.
- 🔒 Archival storage
- 🔒 Full content search
- 🔒 Basic case management for special requests

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# ***Keys to the Digital Future***

🔑 **Openness**

🔑 **Growth**

🔑 **Evolution**

🔑 **Closure**

*Lessons from the ERA experience*

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# Openness

🔑 An Archival Information System needs to be open to

- 🔓 New types of electronic records
- 🔓 Rising and changing user expectations
- 🔓 Creative approaches to meeting the challenges of electronic records and demanding users.



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# Openness

- 🔓 New types of electronic records
- 🔓 Rising and changing user expectations
- 🔓 Creative approaches to meeting the challenges of electronic records and demanding users.

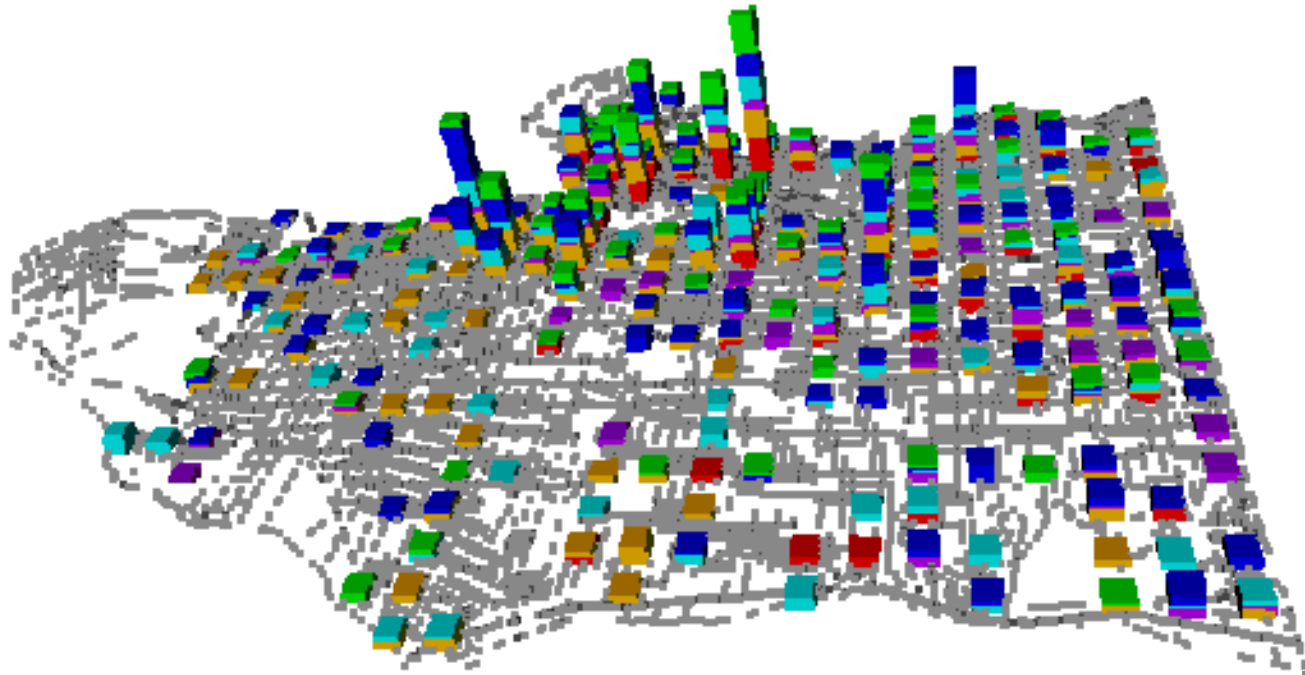


# New Types of Records: Composite Aerial Photography





# 📍 New Types of Records: Geographic Information Systems

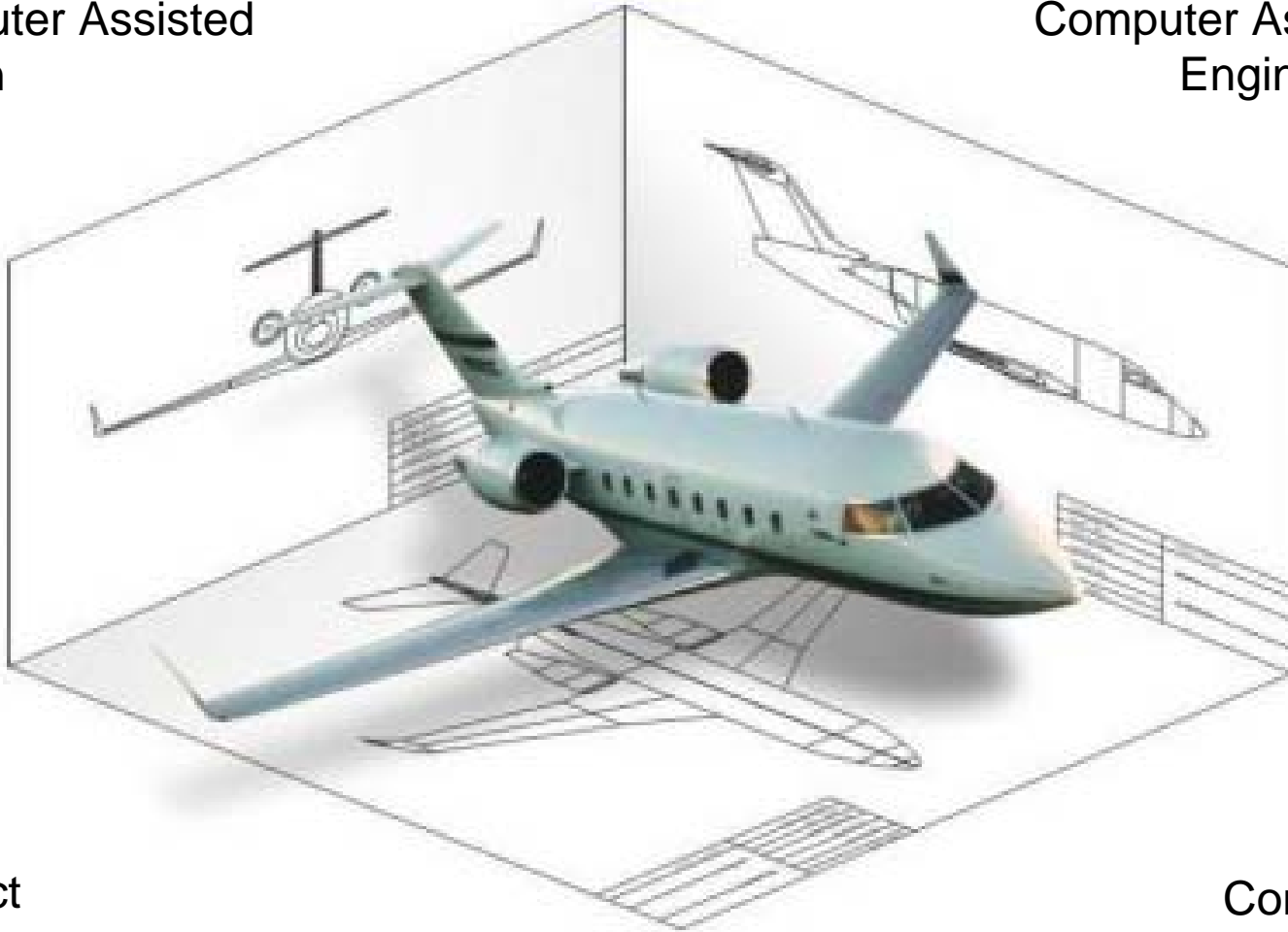




# New Types of Records: Product Data

Computer Assisted  
Design

Computer Assisted  
Engineering



Product  
Analysis and Testing

Computer  
Assisted Manufacture

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# 🔗 New Types of Records: Critical Infrastructure Data

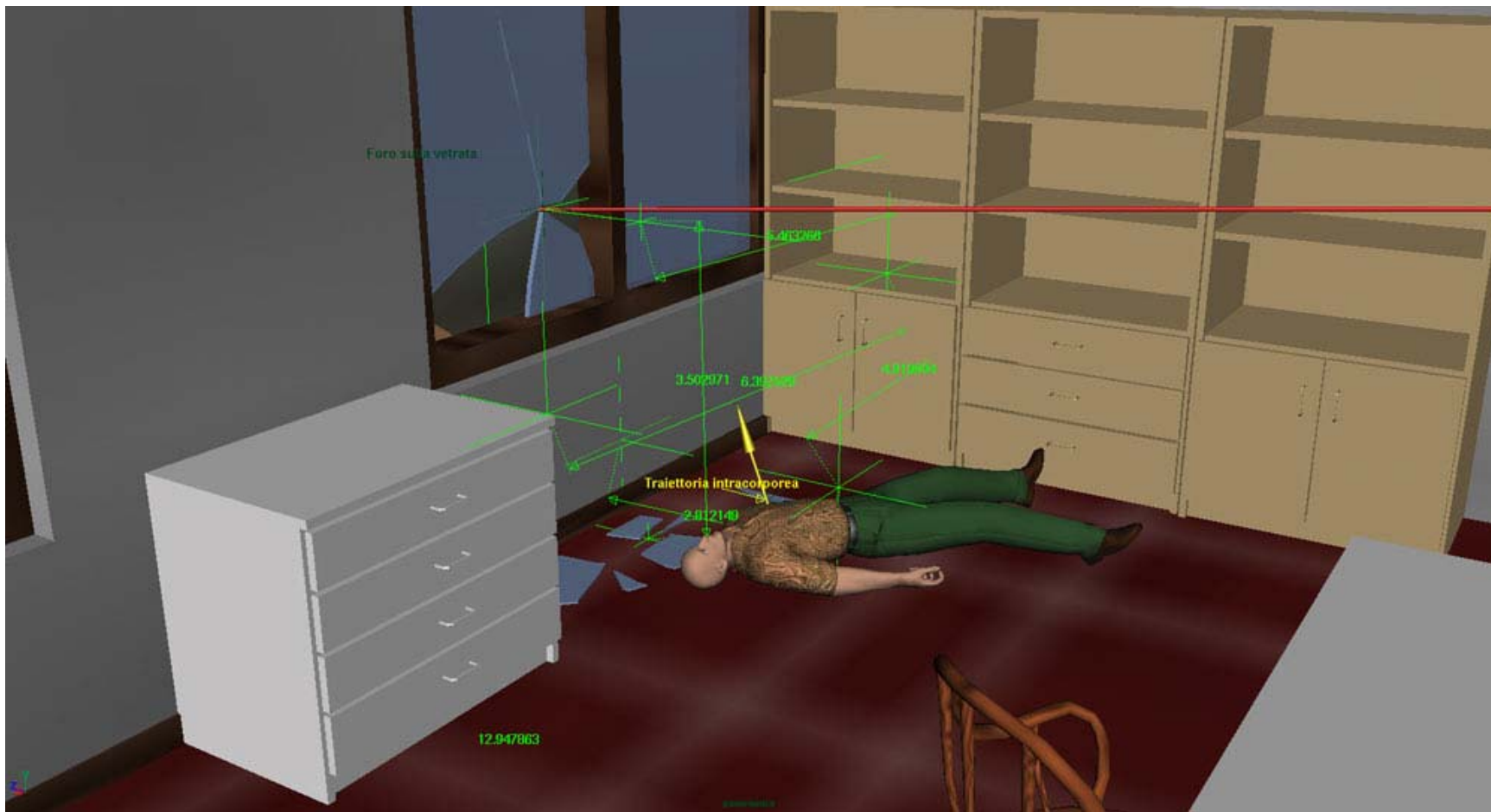


Source: CLindberg [http://commons.wikimedia.org/wiki/Image:I35\\_Bridge\\_Collapse\\_4crop.jpg](http://commons.wikimedia.org/wiki/Image:I35_Bridge_Collapse_4crop.jpg)





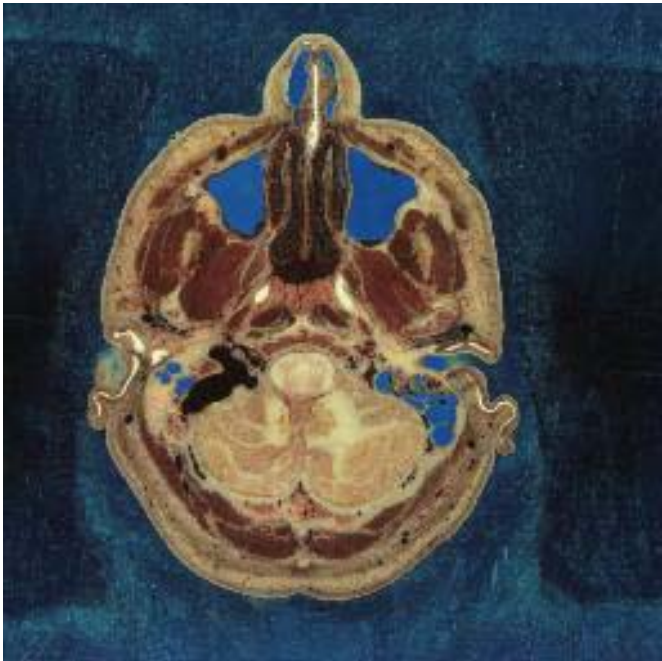
# 🔓 New Types of Records: Virtual Reality: Crime Scene Investigation







# 🔗 New Types of Records: Medical Tests and Observations



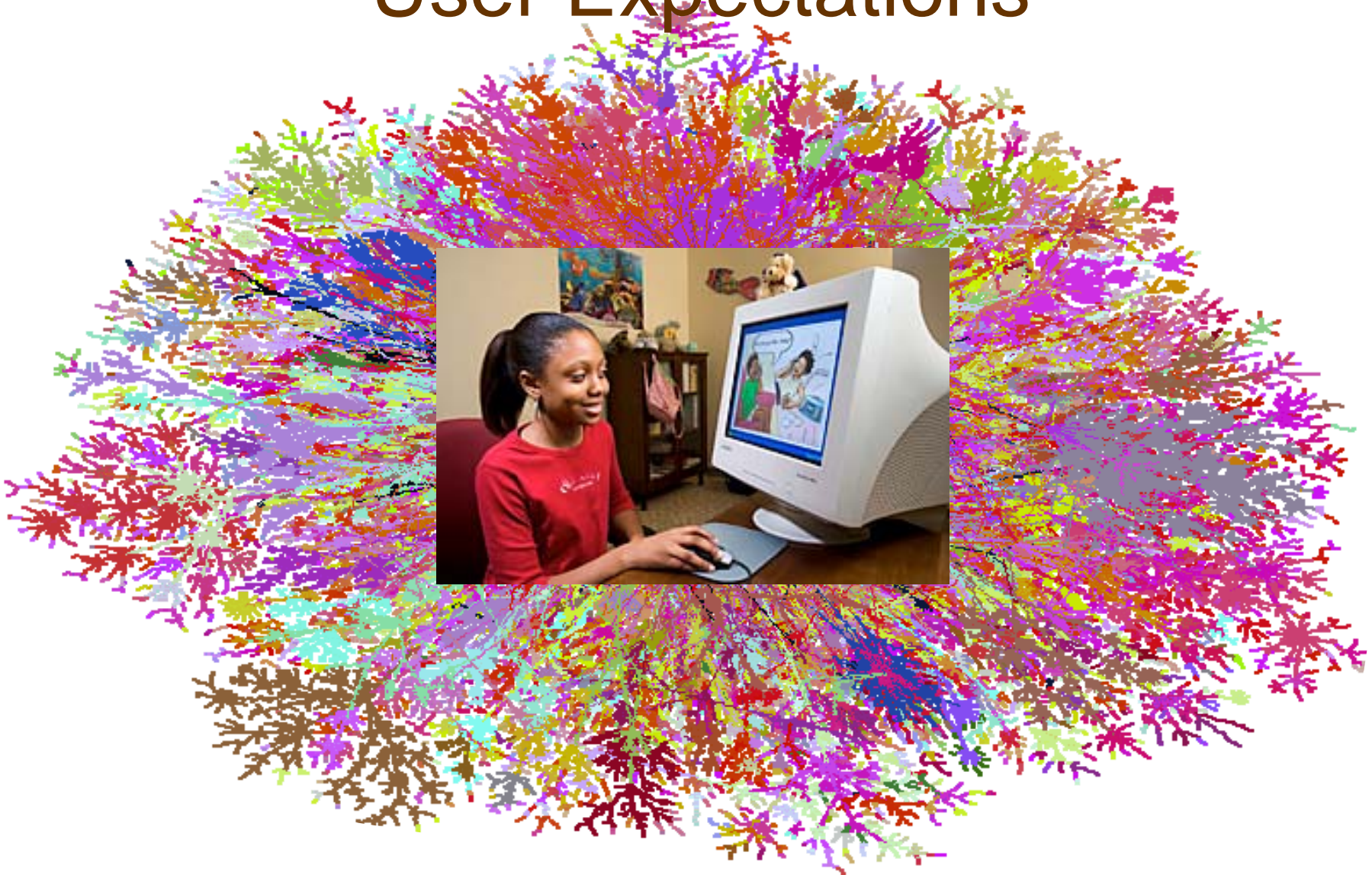


# Openness

- New types of electronic records
- Rising and changing user expectations
- Creative approaches to meeting the challenges of electronic records and demanding users.



# Rising and Changing User Expectations





# Openness

- New types of electronic records
- Rising and changing user expectations
- Creative approaches to meeting the challenges of electronic records and demanding users.



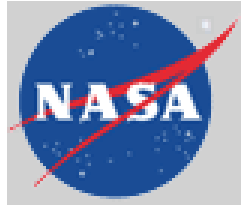
# Creative Approaches

- ← The conceptual apparatus we bring to bear on
  - The nature of records
  - Requirements for preserving records
  - Requirements for serving users





# Creative approaches: Partnerships



National  
Science  
Foundation



National Computational  
Science Alliance



Global  
Grid  
Forum



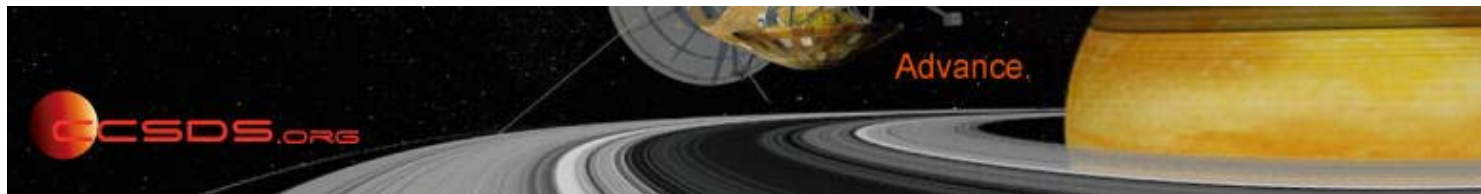
The Library of Congress



Army Research  
Laboratory



DIGITAL LIBRARY  
FEDERATION





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# ***Keys to the Digital Future***

🔑 Openness

🔑 **Growth**

🔑 Evolution

🔑 Closure

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# Growth

➔ An Archival Information System needs to be able to grow to

- 🔑 Process, store and provide access to increasing volumes of electronic records
- 🔑 Accommodate increasing numbers and frequency of use

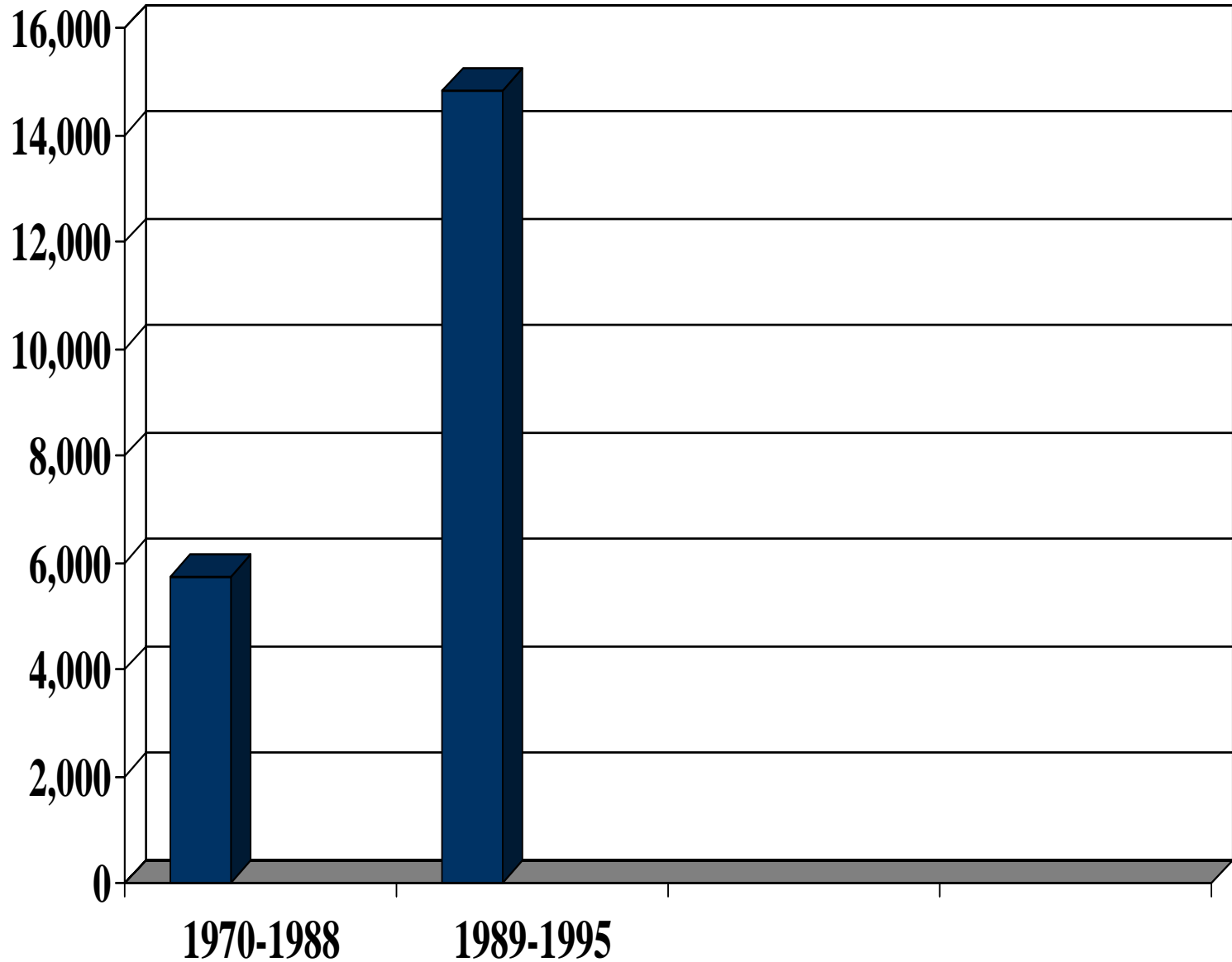


# Increasing Volumes of Digital Information

- In 2006, the amount of digital information created, captured, and replicated was ...281 exabytes or 281 billion gigabytes. This is about 3 million times the information in all the books ever written.
- By 2011, the digital universe will be 10 times the size it was in 2006.
- Not all information created and transmitted gets stored, but by 2011, almost half of the digital universe will not have a permanent home.
- The number of electronic information “containers” — files, images, packets, tag contents — is growing 50% faster than the number of gigabytes. The information created in 2011 will be contained in more than 20 quadrillion — 20 million billion — of such containers
  - IDC. The Diverse and Exploding Digital Universe. An Updated Forecast of Worldwide Information Growth Through 2011. March 2008

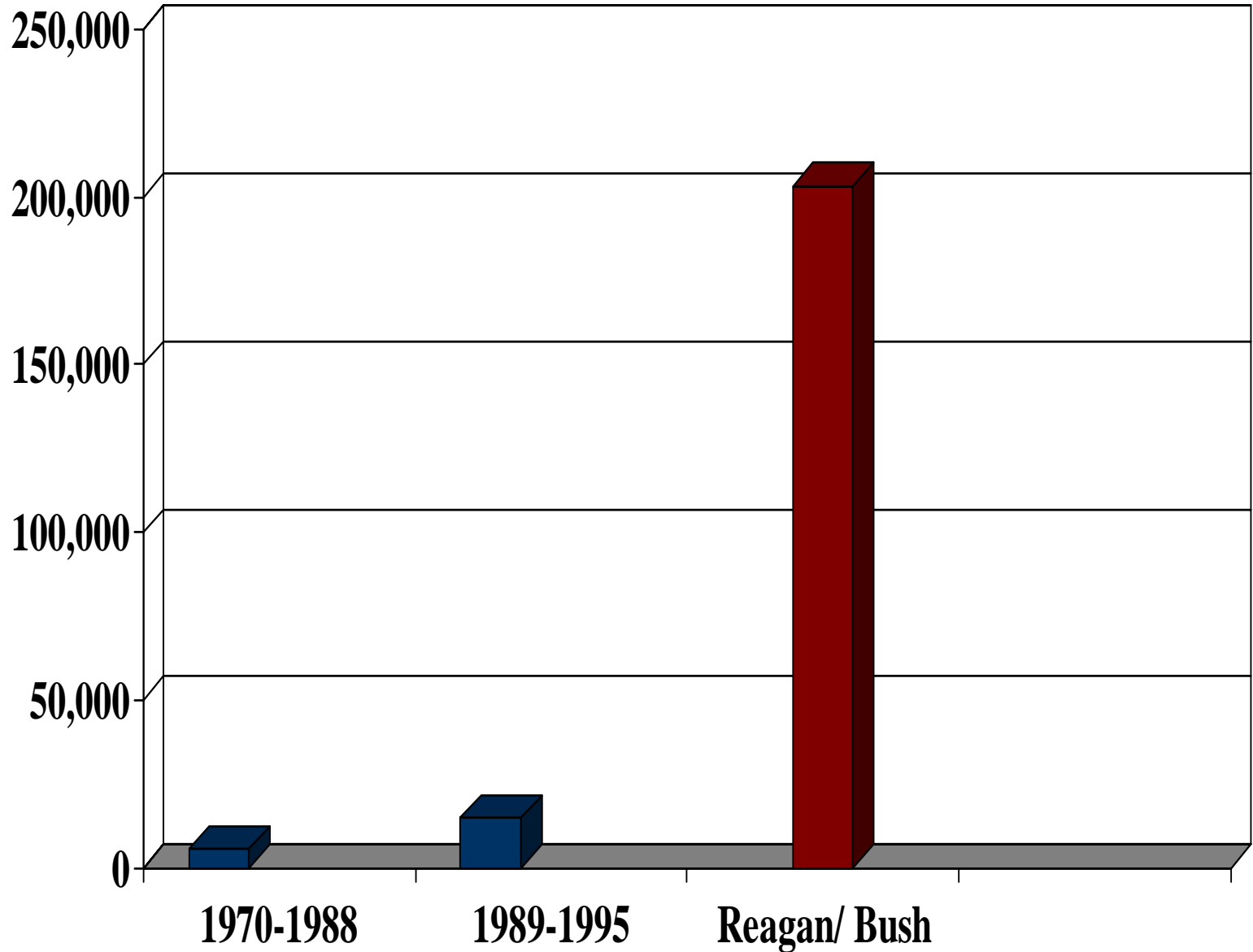


# Transfers of Digital Files to NARA



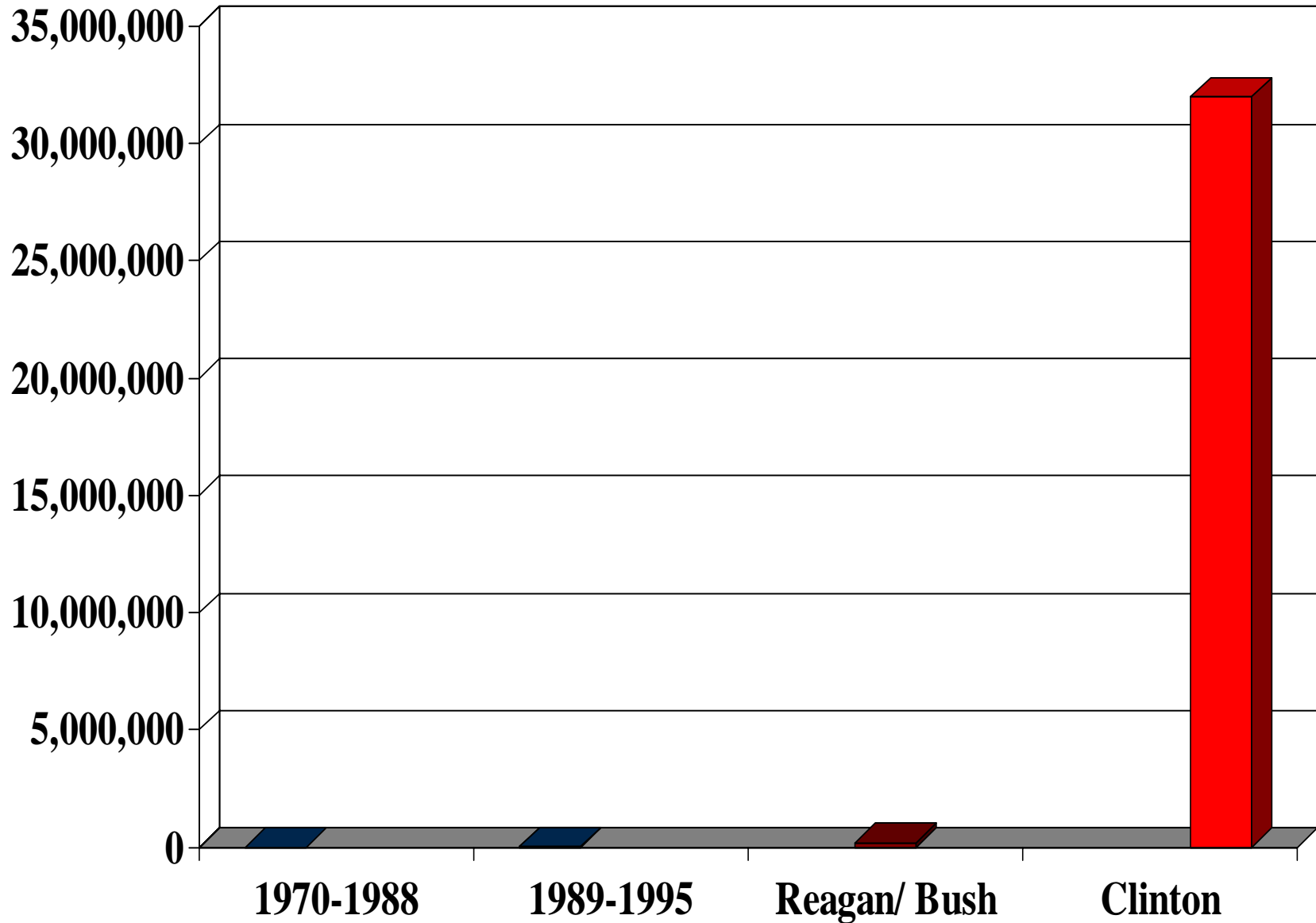


# Transfers of Digital Files to NARA





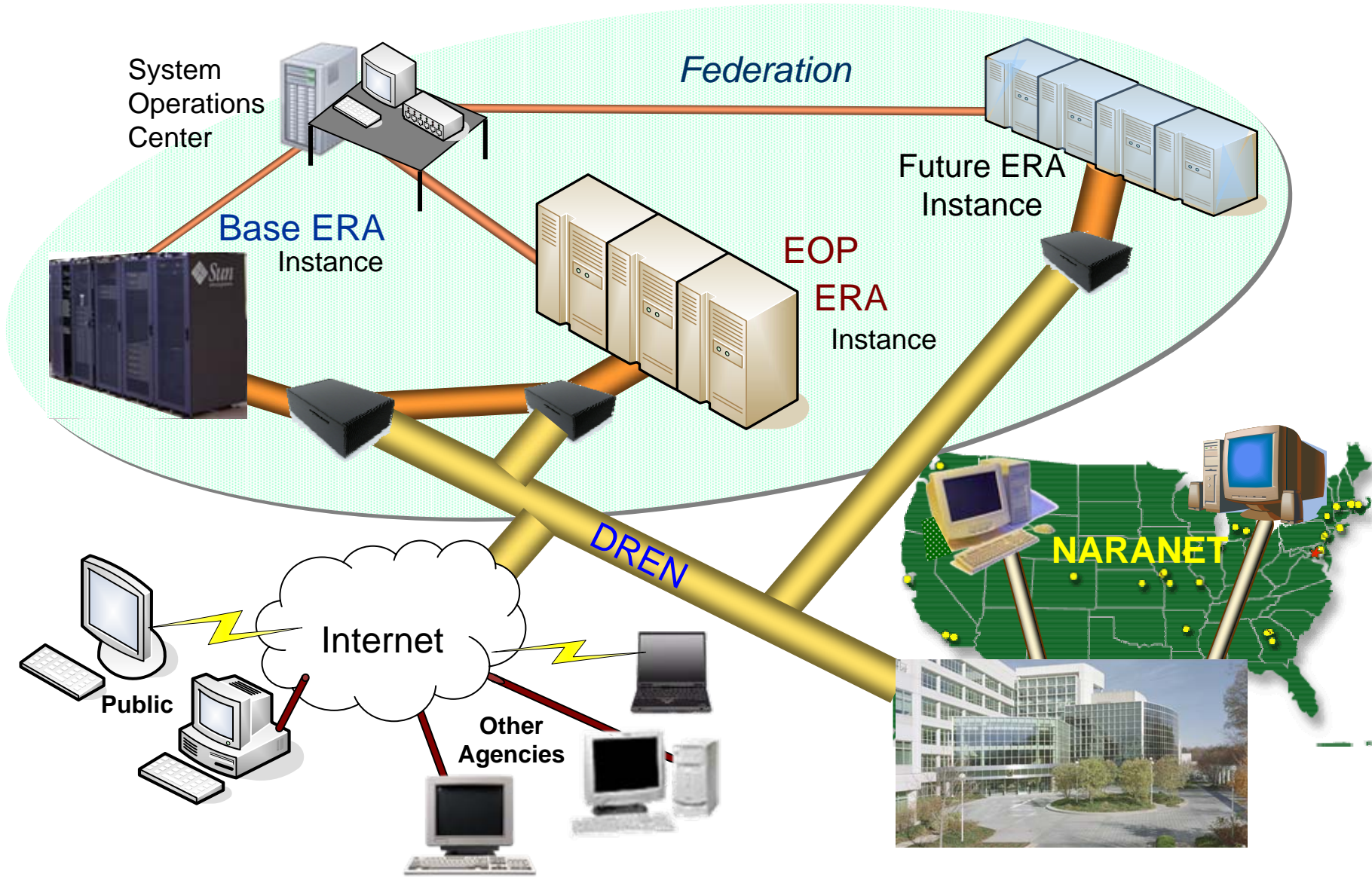
# Transfers of Digital Files to NARA







# Planning for Open-ended Growth



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# ***Keys to the Digital Future***

🔑 Openness

🔑 Growth

🔑 **Evolution**

🔑 Closure

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# Evolution

➔ An Archival Information System needs to be able to evolve in response to

🔗 Changing Information Technology

- Obsolescence
- Opportunities

🔗 Changing business requirements

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# Evolution

## Changing Information Technology

- Obsolescence
- Opportunities

## Changing business requirements

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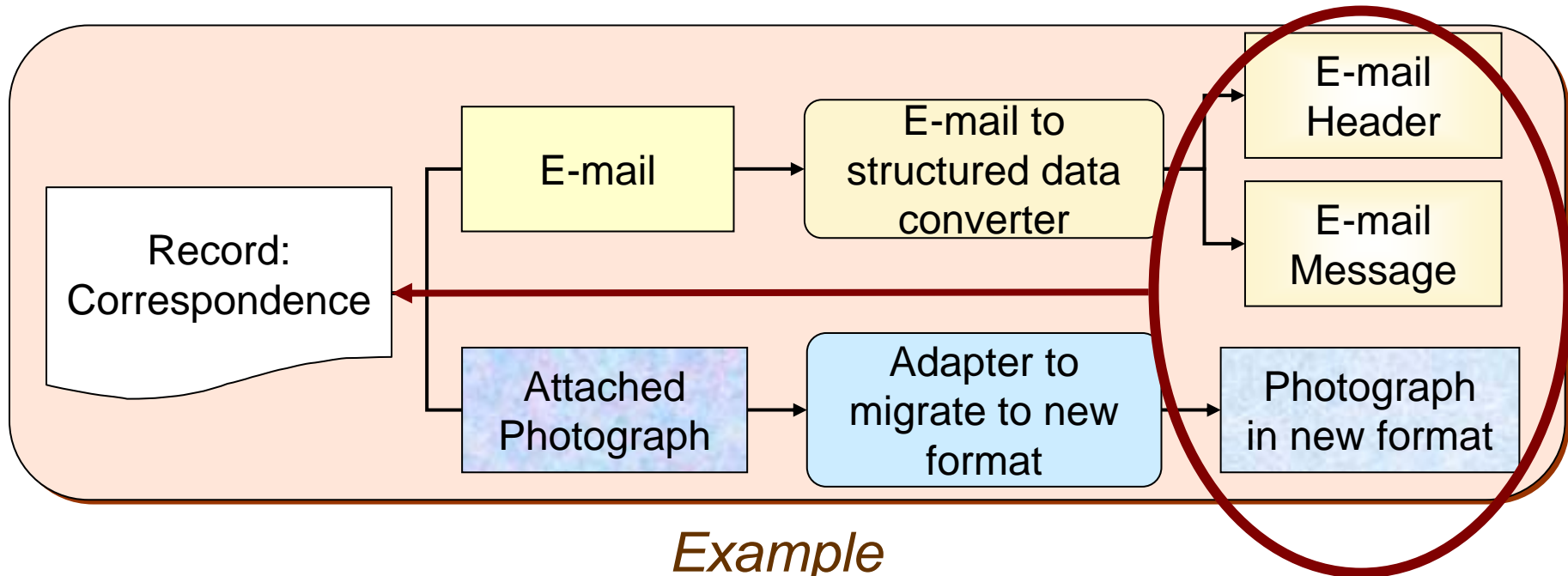
# Obsolescence of Formats of Electronic Records

- Strategy: Preservation and Access Levels
  - Common:
    - Retain records in original formats
  - Basic Level:
    - Use concurrent software for access
  - Enhanced Level
    - Create new version in current format
    - Use current software for access to new version
  - Ideal Level
    - Create version in persistent format, or
    - Create persistent software for access



# Obsolescence of Formats of Electronic Records

- System Architecture: Preservation Framework
  - Does not prescribe specific preservation solutions
  - Allows a variety of different software tools to be introduced and used for different formats.





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# Evolution

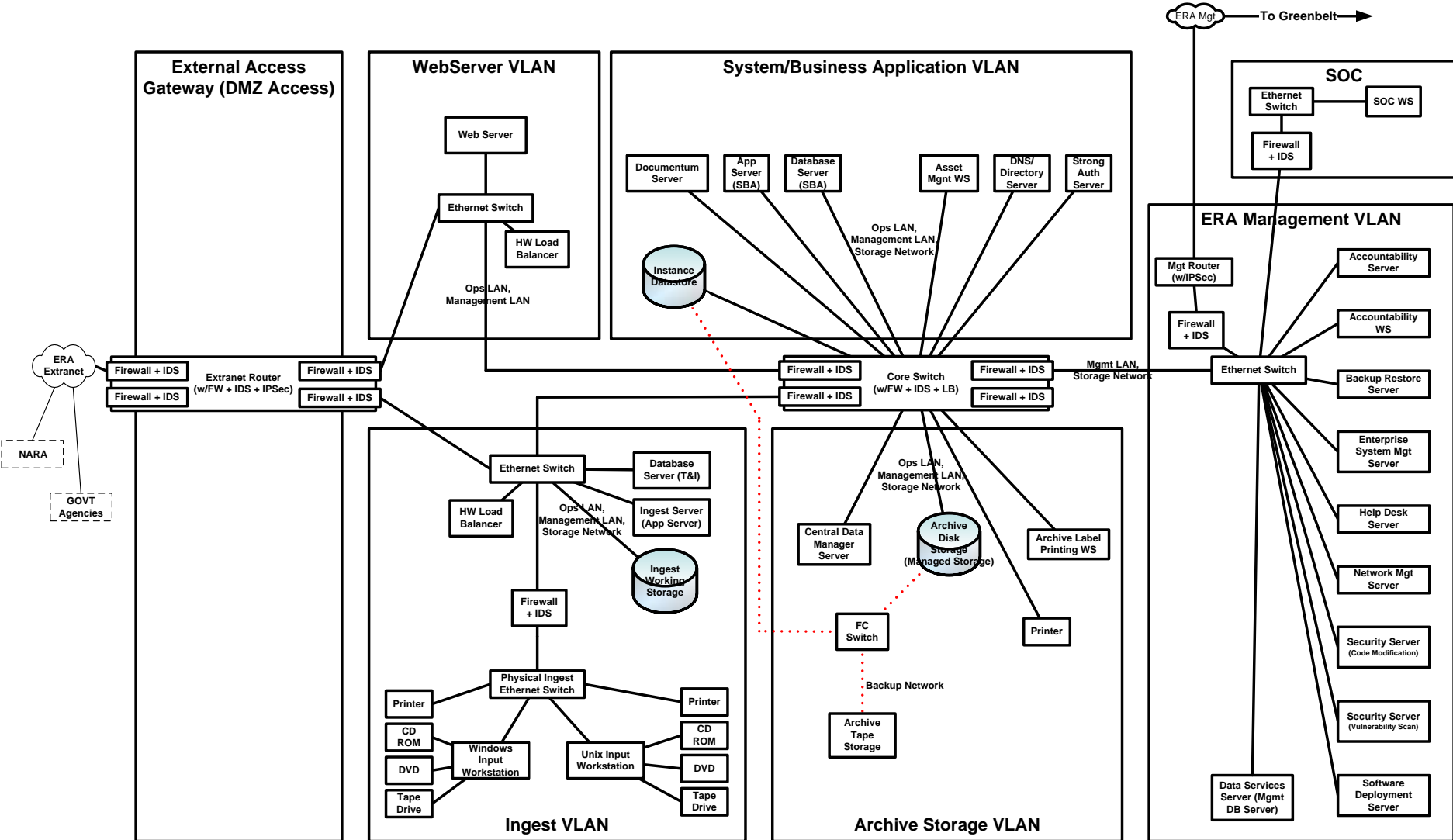
## Changing Information Technology

- Obsolescence
- Opportunities

## Changing business requirements

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# Changing Information Technology: Service Oriented Architecture

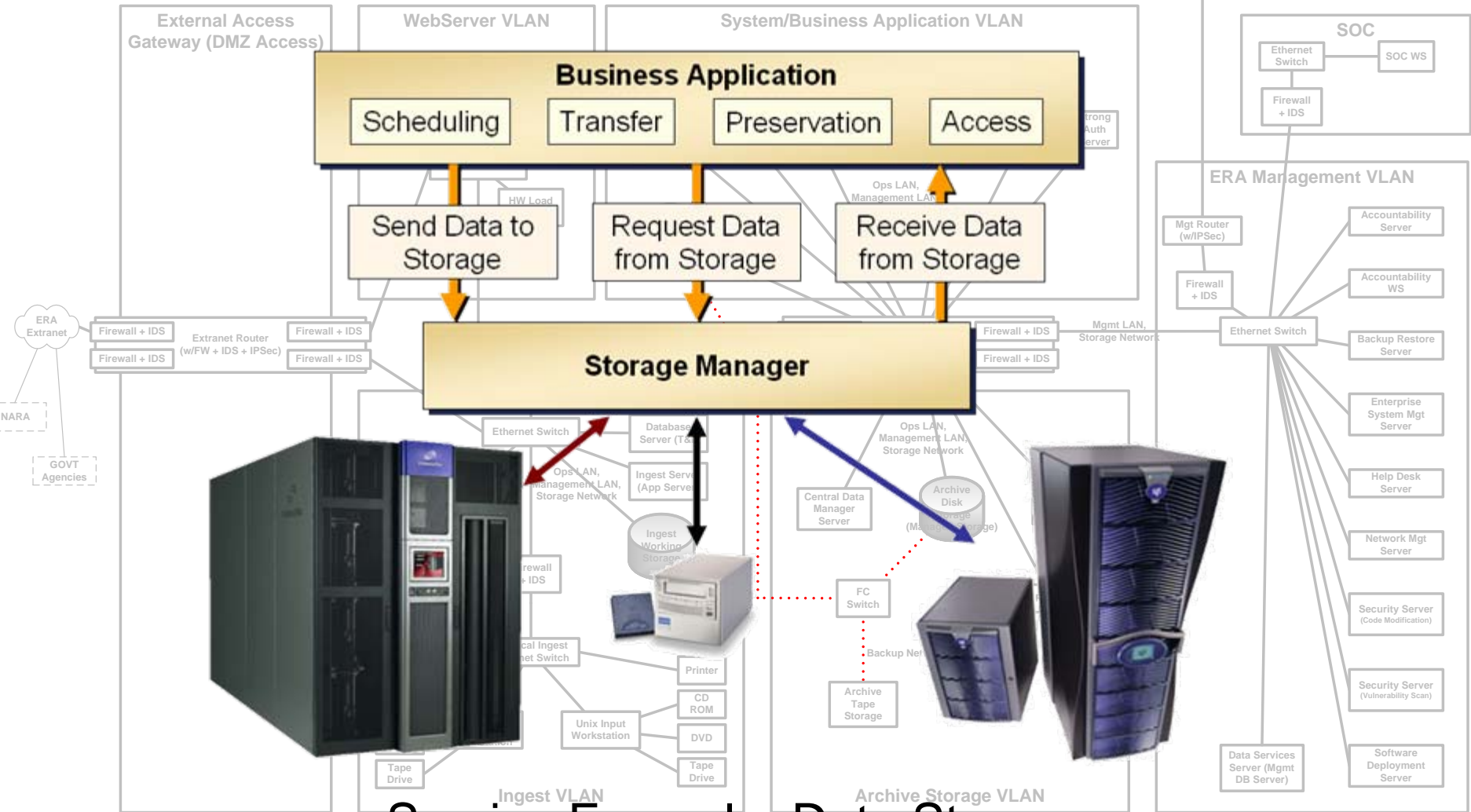


Derived from:  
ERA Hardware Block Diagram -2007 0823  
(Tab: I1R2 U/USBU Detailed Block)  
Updated 24 Aug 2007

1Gb Ethernet ———  
2/4Gb Fibre Channel ·····

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# Changing Information Technology: Service Oriented Architecture



Service Example: Data Storage

From: A Hardware Block Diagram -2007 0823 (Tab: 11R2 U/USBU Detailed Block) Updated 24 Aug 2007

1Gb Ethernet  
2/4Gb Fibre Channel

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# Evolution

 Changing Information Technology

- Obsolescence
- Opportunities

 Changing business requirements



# 🔓 Evolution of Business Requirements



# Records Schedule: Current

Request for Records Disposition Authority <small>(See instructions on reverse)</small>		Leave Blank (NARA Use Only)	
To: National Archives and Records Administration (NIR) Washington, DC 20408		Job Number	
1. From: (Agency or establishment)		Date Received	
2. Major Subdivision		<b>Notification to Agency</b> In accordance with the provisions of 44 U.S.C. 3303a, the disposition request, including amendments, is approved except for items that may be marked "disposition not approved" or "withdrawn" in column 10.	
3. Minor Subdivision			
4. Name of Person with whom to confer	5. Telephone (include area code)	Date	Archival of the United States
<b>6. Agency Certification</b> I hereby certify that I am authorized to act for this agency in matters pertaining to the disposition of its records and that the records proposed for disposal on the attached _____ page(s) are not now needed for the business of this agency or will not be needed after the retention periods specified; and that written concurrence from the General Accounting Office, under the provisions of Title 8 of the GAO Manual for Guidance of Federal Agencies: <input type="checkbox"/> is not required <input type="checkbox"/> is attached <input type="checkbox"/> has been requested			
Signature of Agency Representative		Title	Date (mm/dd/yyyy)
7. Item Number	8. Description of Item and Proposed Disposition	9. GRS or Superseded Job Citation	10. Action taken (NARA Use Only)



# Create Records Schedule

## Records Schedule

\* Required fields

General Info

General

\*Records Schedule ID: [ ]

Schedule Subject: [ ]

\*Agency or Establishment: State - Department Of

\*Legacy Data: [ ]

Default Schedule:

Status: [ ]

\*Internal agency concurrences will be provided: [ ]

\*Record Group: 59

Records Schedule applies to:

Major Subdivision  Agency-wide  General Records

\*Major Subdivision: Major Agency Division

Minor Subdivision: Minor Agency Division

Background

Background Information: [ ]

GAO Concurrence

Not Required  Requested  Received

Items: [ ]

Records Scheduler

\*First Name: Jane

\*Last Name: Doe

\*Title: Records Manag

Fields prepopulated based on user profile



# Create Schedule Item

## Temporary Records

## Permanent Records

General	7. Item Number	8. Description of Item and Proposed Disposition	9. GRS or Superseded Job Citation	10. Action Taken (NARA Use Only)
<p>Item ID: <input type="text"/></p> <p>*Description: <input type="text"/></p> <p>Does agency have an associated manual? <input type="checkbox"/></p> <p>*Manual ID: <input type="text"/></p> <p>*Manual Version: <input type="text"/></p> <p>*Manual Item ID: <input type="text"/></p> <p>Is this a change to an approved schedule? <input type="checkbox"/></p> <p>Is this item media neutral? <input type="radio"/> Yes <input type="radio"/> No</p> <p>Final Disposition</p> <p>*Final Disposition: <input checked="" type="radio"/> Permanent</p> <p>Temporary Disposition Instructions</p> <p>Cutoff Instructions: <input type="text"/></p>				
<p>Transfer Instructions</p> <p>Transfer to: <input type="text"/></p> <p>Time after cutoff when transfer occurs: <input type="text"/></p> <p>*Retention Period</p> <p><input checked="" type="radio"/> Destroy immediately on cut-off</p> <p><input type="radio"/> Destroy <input type="text"/> after cut-off</p> <p><input type="radio"/> Destroy between <input type="text"/> years and <input type="text"/> years after cut-off</p> <p><input type="radio"/> Retain at least <input type="text"/> years after cut-off, but longer is authorized</p> <p><input type="radio"/> Retain no more than <input type="text"/> years after cut-off</p> <p><input type="radio"/> Destroy when no longer needed</p> <p><input type="radio"/> Destroy <input type="text"/> years after cut-off or when <input type="text"/> occurs, whichever is sooner</p> <p><input type="radio"/> Destroy <input type="text"/> years after cut-off or when <input type="text"/> occurs, whichever is later</p> <p><input type="radio"/> Destroy <input type="text"/> years after cut-off or <input type="text"/> years after <input type="text"/> occurs, whichever is sooner</p> <p><input type="radio"/> Destroy <input type="text"/> years after cut-off or <input type="text"/> years after <input type="text"/> occurs, whichever is later</p> <p><input type="radio"/> Other</p> <p><input type="text"/></p>				
<p>Date Span</p> <p>*First year of records accumulation: <input type="text"/></p>				



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# ***Keys to the Digital Future***

🔑 Openness

🔑 Growth

🔑 Evolution

🔑 **Closure**

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# Closure

➔ An Archival Information System needs to be able to provide closure to ensure

- 🔒 Preservation and presentation of authentic records
- 🔒 Comprehensive lifecycle management of electronic records
- 🔒 Consistency with well-established archival science

Close

# ERA: A Set of Nested Systems

## Outer system:

- lifecycle management of records of all types

## Inner Electronic Records System:

- Ingest, preservation, disposition, and access to electronic records

## Search & Preservation Frameworks

- Support a variety of different approaches to different needs.

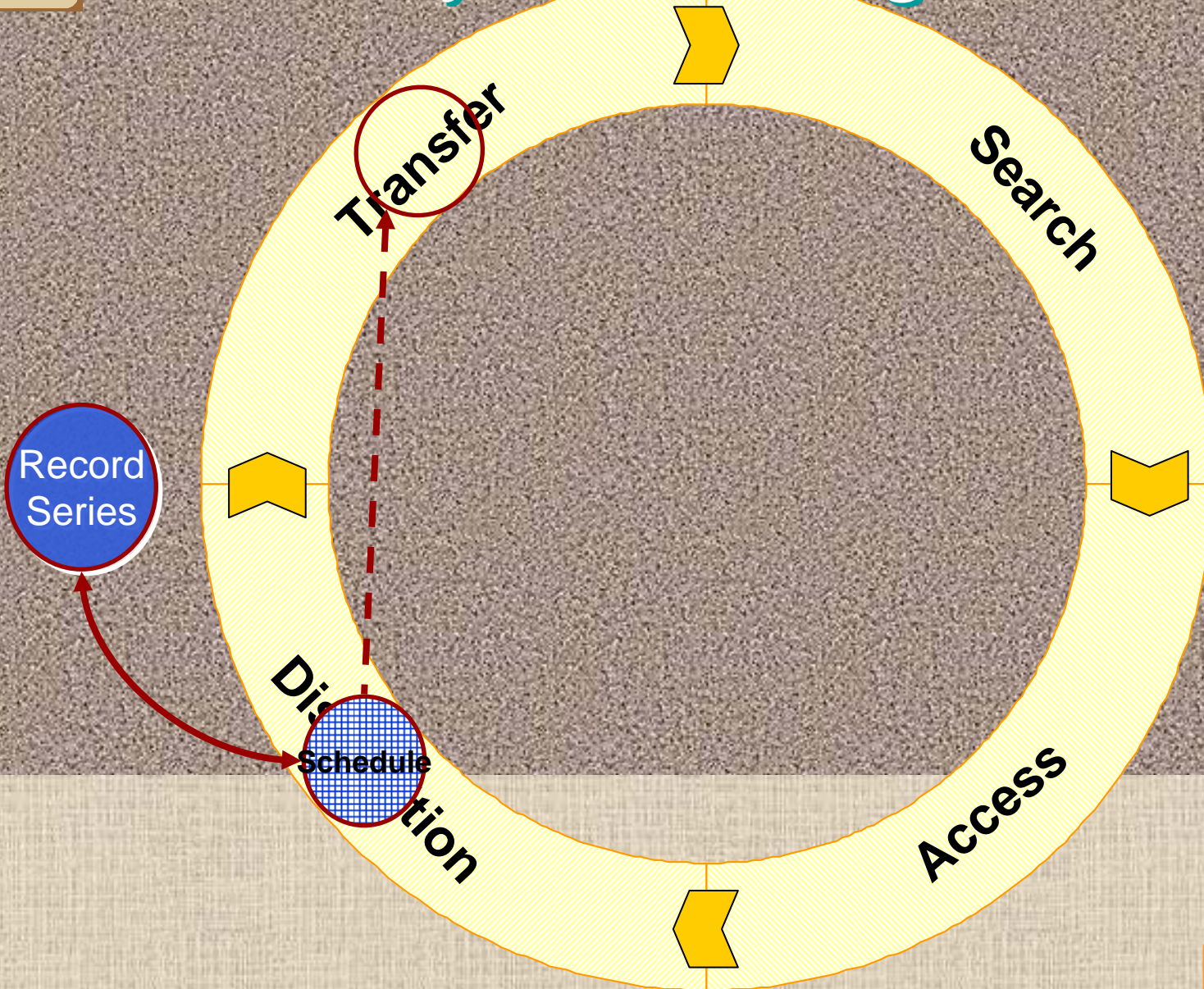
## Archival “mini-systems”

- Specific, systematic management for each series or aggregate of electronic records.



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# Lifecycle Management

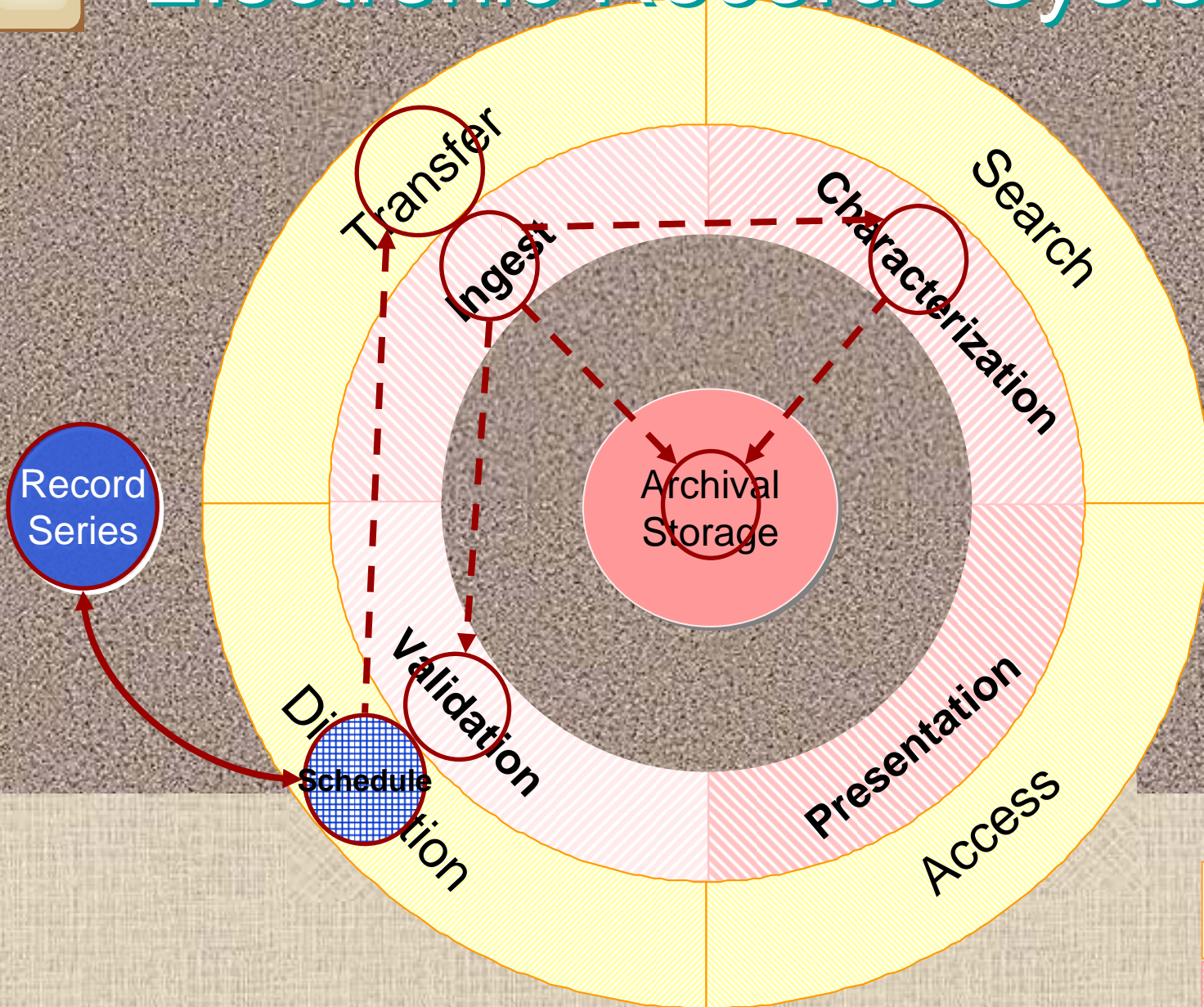


Lifecycle  
Management



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# Electronic Records System



**Lifecycle Management**

**Electronic Records**

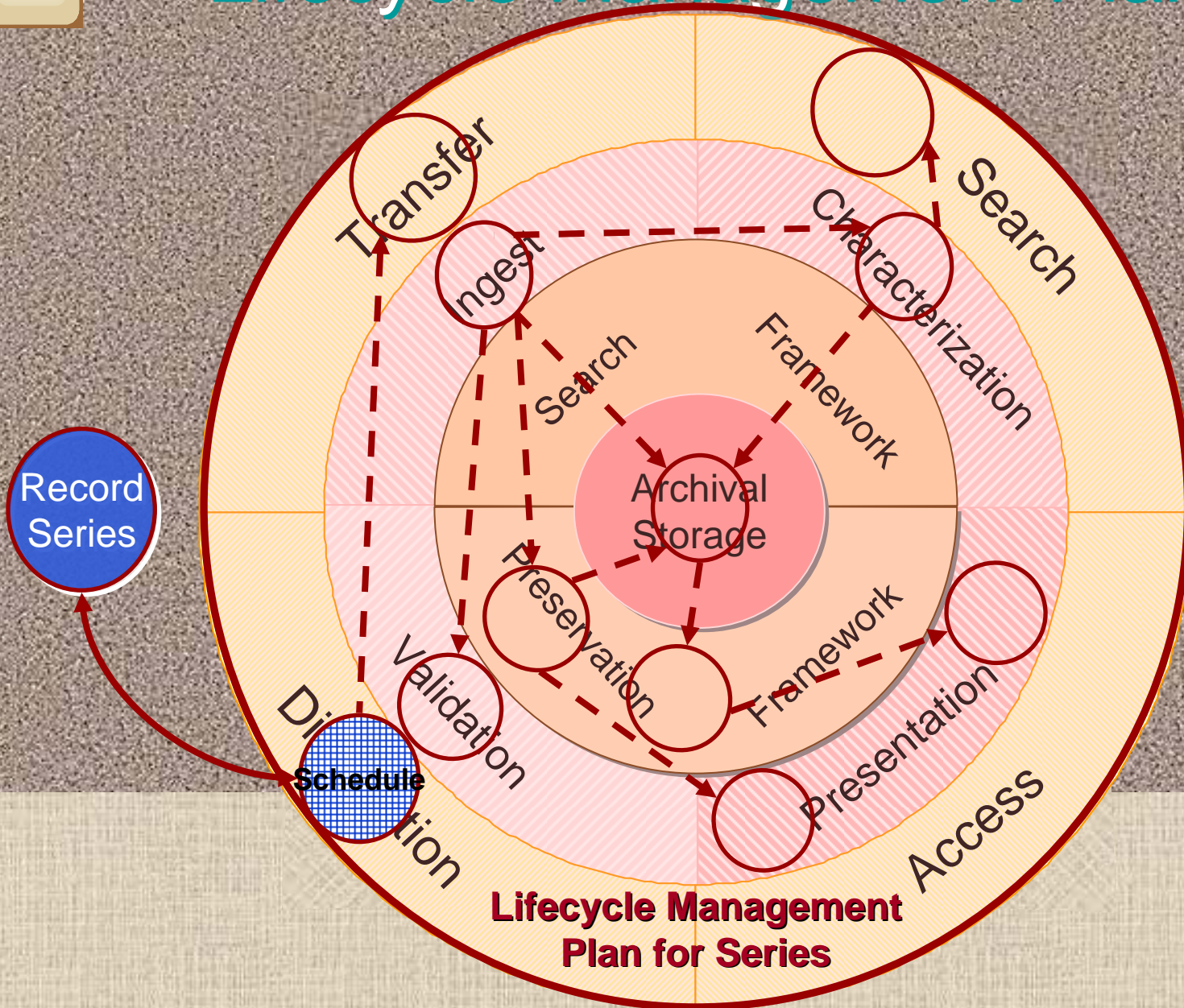






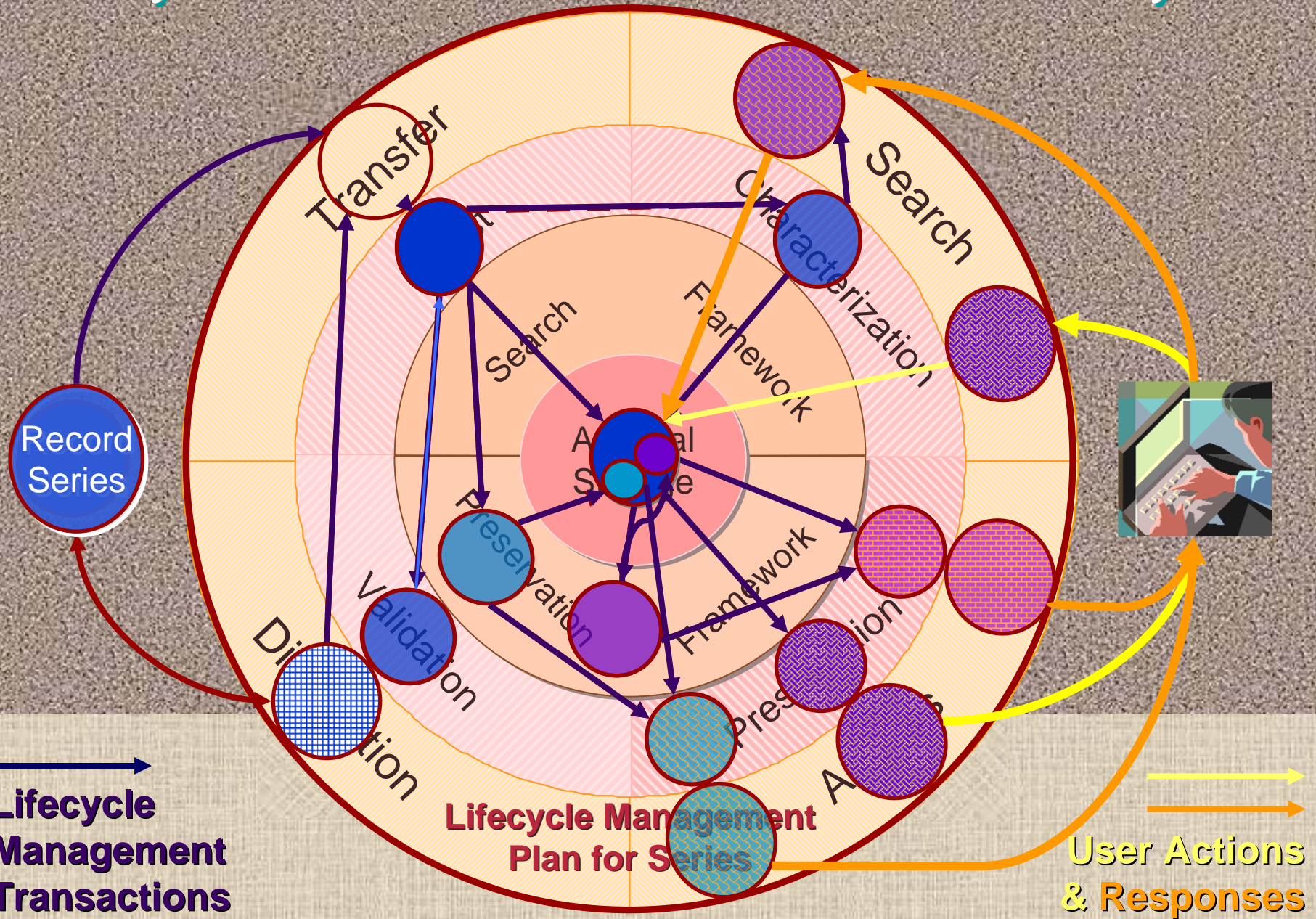
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# Lifecycle Management Plan





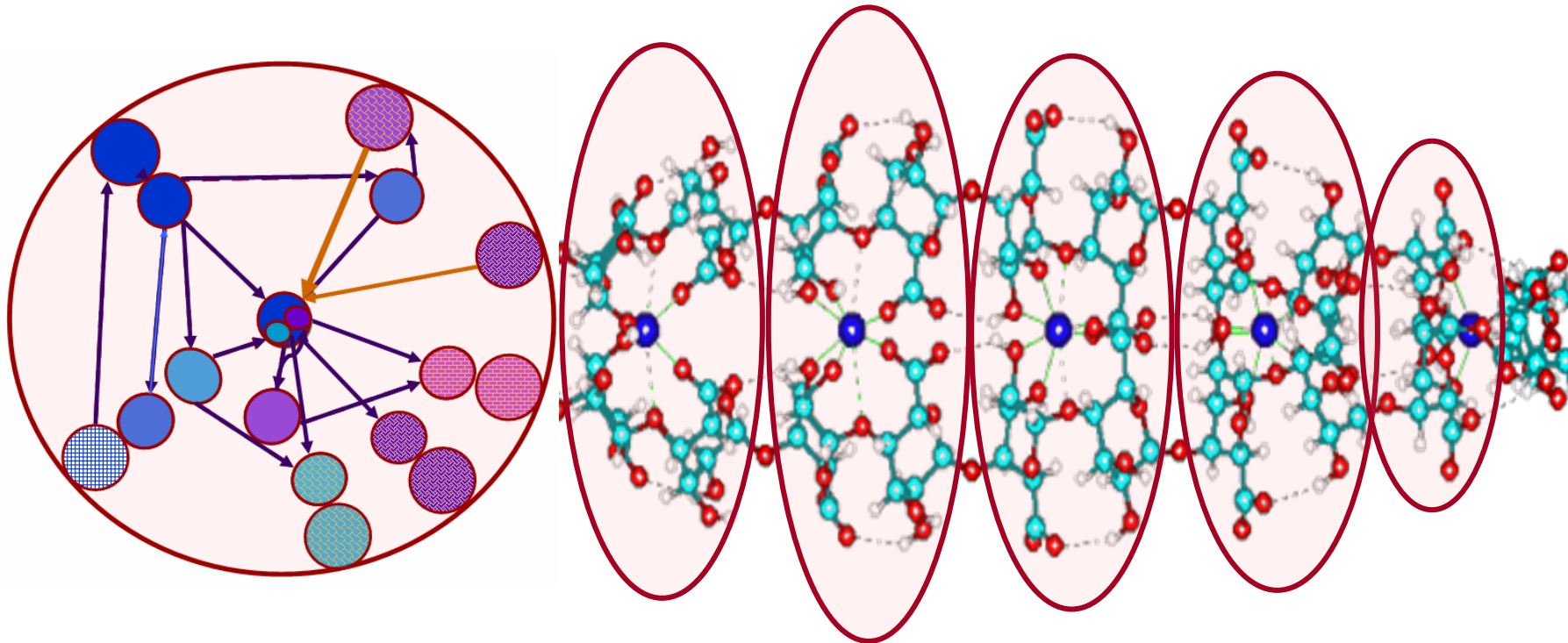
# 'Mini-System' Within the Electronic Records System







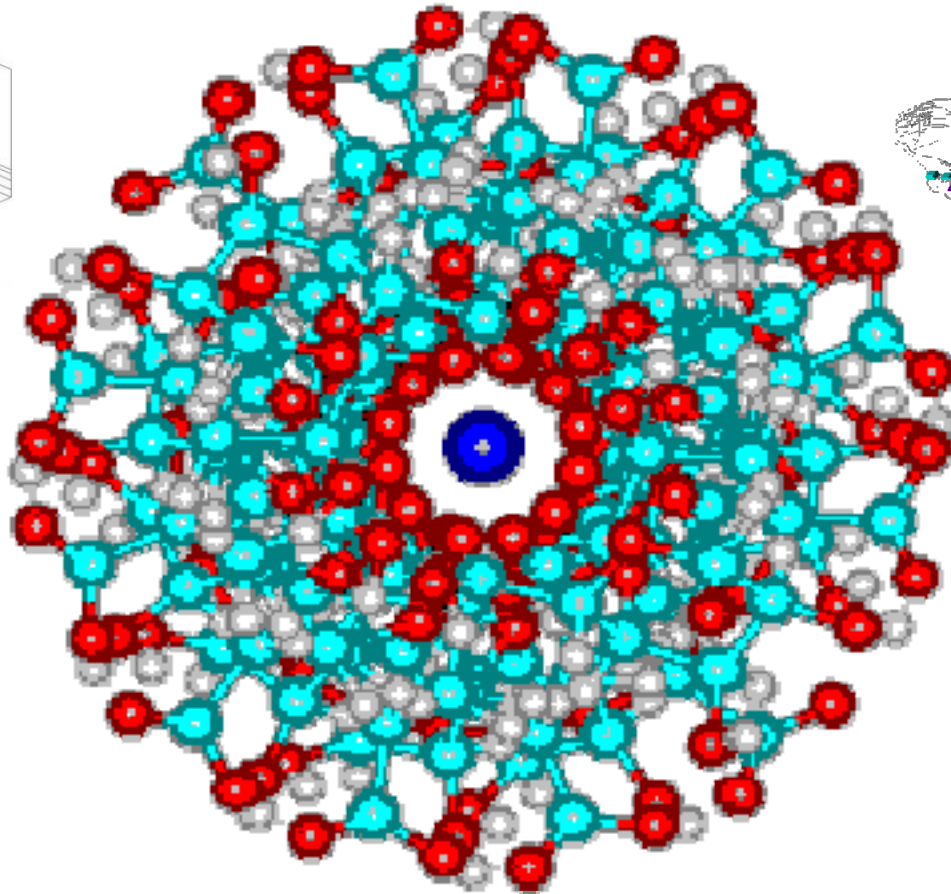
# ERA as a Set of Mini-Systems



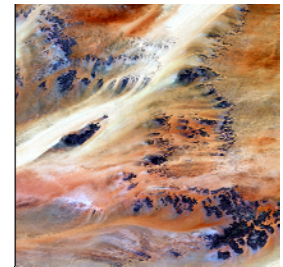
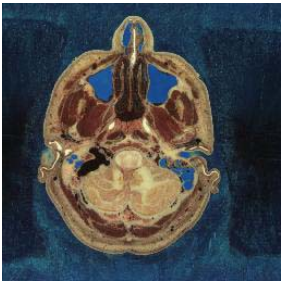
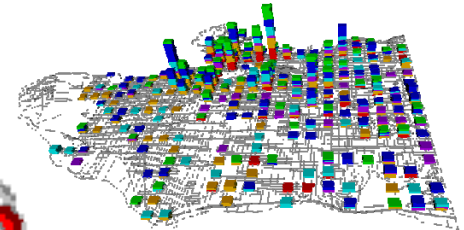
 Lifecycle Management Plan

Each “Mini-system” is defined by the Lifecycle Management Plan for a Records Aggregate, such as a series or fonds

# Archival Science



Start ASLI EAMTRB IFAUTO  
BNE MSCHE IREFT



*What's an electronic record?*

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# Anticipating the Future

- 🔑 Reasonable assumptions about the future
  - 🔓 Uncertainty and Innovation in Technology
  - 🔓 Increasing power, speed, capacity and usefulness of information technology
  - 🔓 Increasing connectivity
  - 🔓 Increasing volumes, numbers, varieties and complexities of digital formats
  - 🔓 Increasing reliance on computers in the activities of institutions, the lives of individuals, and the interactions of groups of people.

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# Facing the Future

- Recognize those things that will not or should not change
  - 🔑 Archival science: stable principles, concepts, requirements and understanding.
  - 🔑 Organization's mission and the functions needed to accomplish it.
- Embrace necessary and beneficial change
  - 🔑 Capitalize on improvements in technology
  - 🔑 Improve archival and information science
    - Create archival engineering
  - 🔑 Leverage partnerships
- Accept and act on responsibility to obtain resources

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# Thank you.



For more information:

[www.archives.gov/era](http://www.archives.gov/era)