



eDiaMoND – a UK eScience project

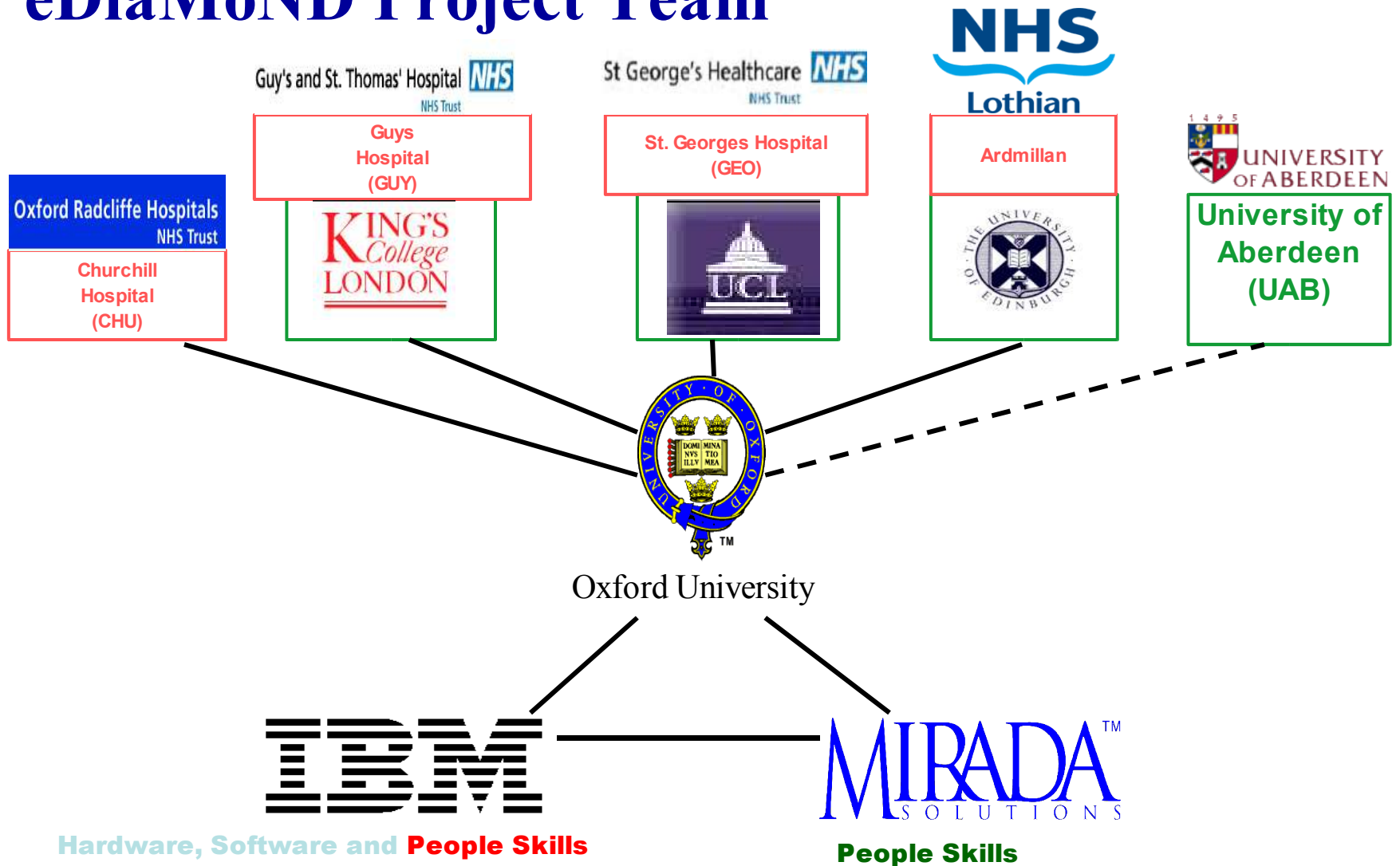
Presented by :

Sharon Lloyd, Oxford University Computing Laboratory

eDiaMoND – what is it?

- £4.1m budget funded through EPSRC/DTI and IBM SUR grant
- 2 year project commencing December 2002
- Multi Academic and Commercial collaborators over 12 sites
- Aimed at delivering a prototype which could support breast screening in the UK for Screening, Computer Based Training, Epidemiology and Computer Aided Detection
- Ambitious Project, short timescales with lots of publicity!

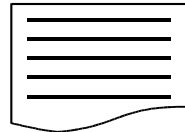
eDiaMoND Project Team



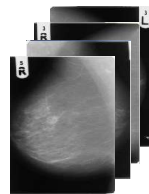
Fact..

- 1 in 4 of all cancers in women are in the breast. Men are also susceptible.
- Breast cancer is diagnosed in a total of 348,000 cases every year in the USA and EU, and kills almost 115,000 women annually
- It is estimated that one in eight women will develop breast cancer during the course of their lives; it is also estimated that one in 28 women will die of the disease.
- It has been reported that there is a 35% reduction in mortality from breast cancer amongst those groups of women aged 50-64 who are screened, a clear indication of the benefits of a Breast Screening Programme

UK Breast Screening – Today



Paper



Film

Began in 1988

**Women 50-64
Screened
Every 3 Years
1 View/Breast**

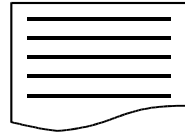
1,300,000 - Screened in 2001-02
65,000 - Recalled for Assessment
8,545 – Cancers detected
300 - Lives per year Saved



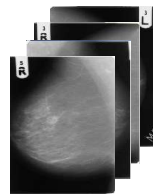
**~100 Breast
Screening
Programmes**
- Scotland
- Wales
- Northern Ireland
- England

230 - Radiologists (Double Reading)

UK Breast Screening – Challenges



Digital



Digital

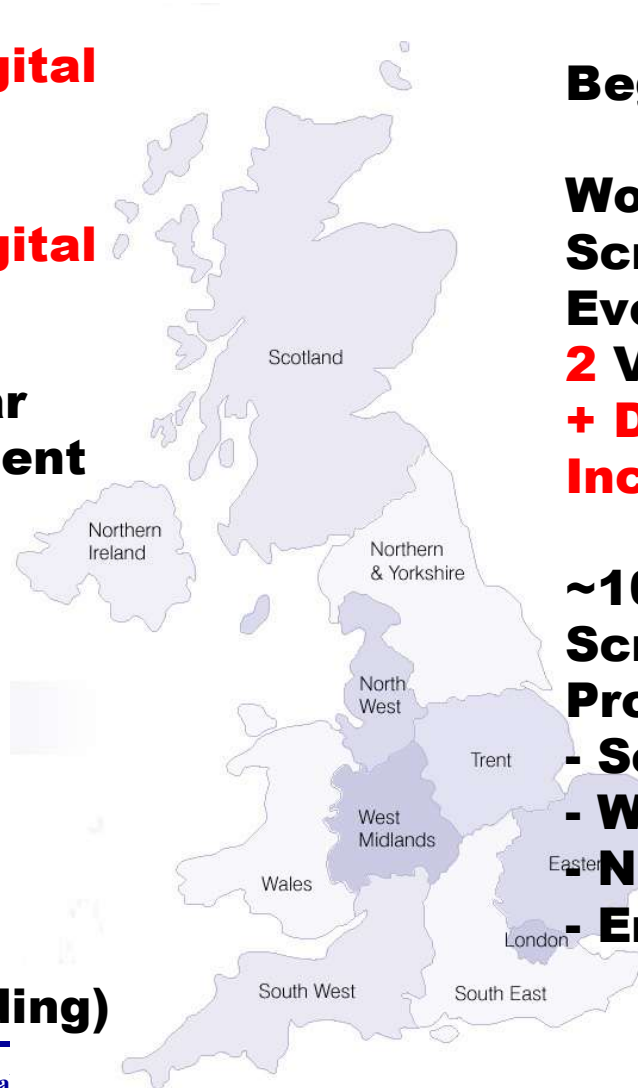
Began in 1988

**Women 50-70
Screened
Every 3 Years
2 Views/Breast
+ Demographic
Increase**

2,000,000 - Screened every Year
120,000 - Recalled for Assessment
10,000 - Cancers
1,250 - Lives Saved

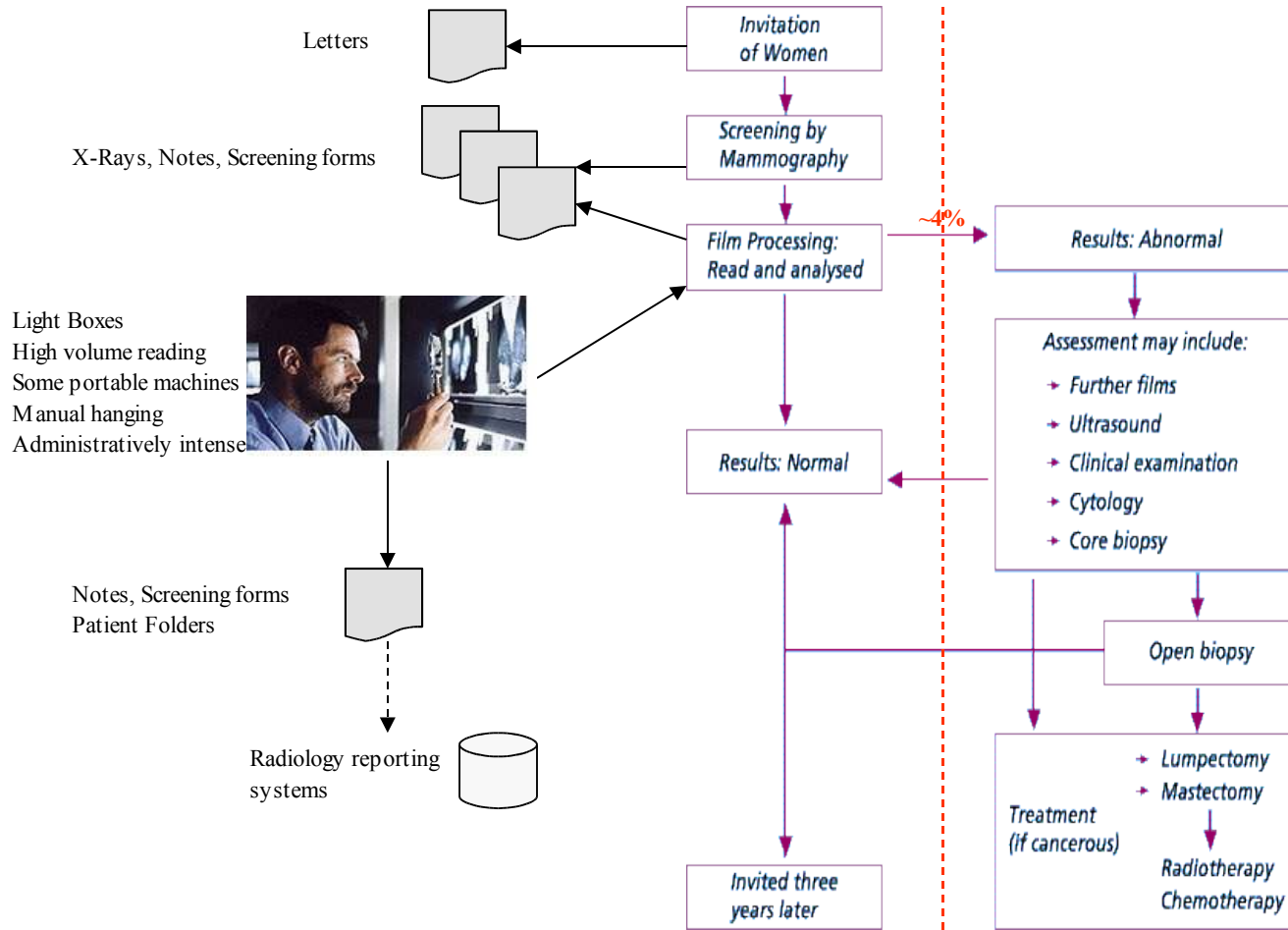


**~100 Breast
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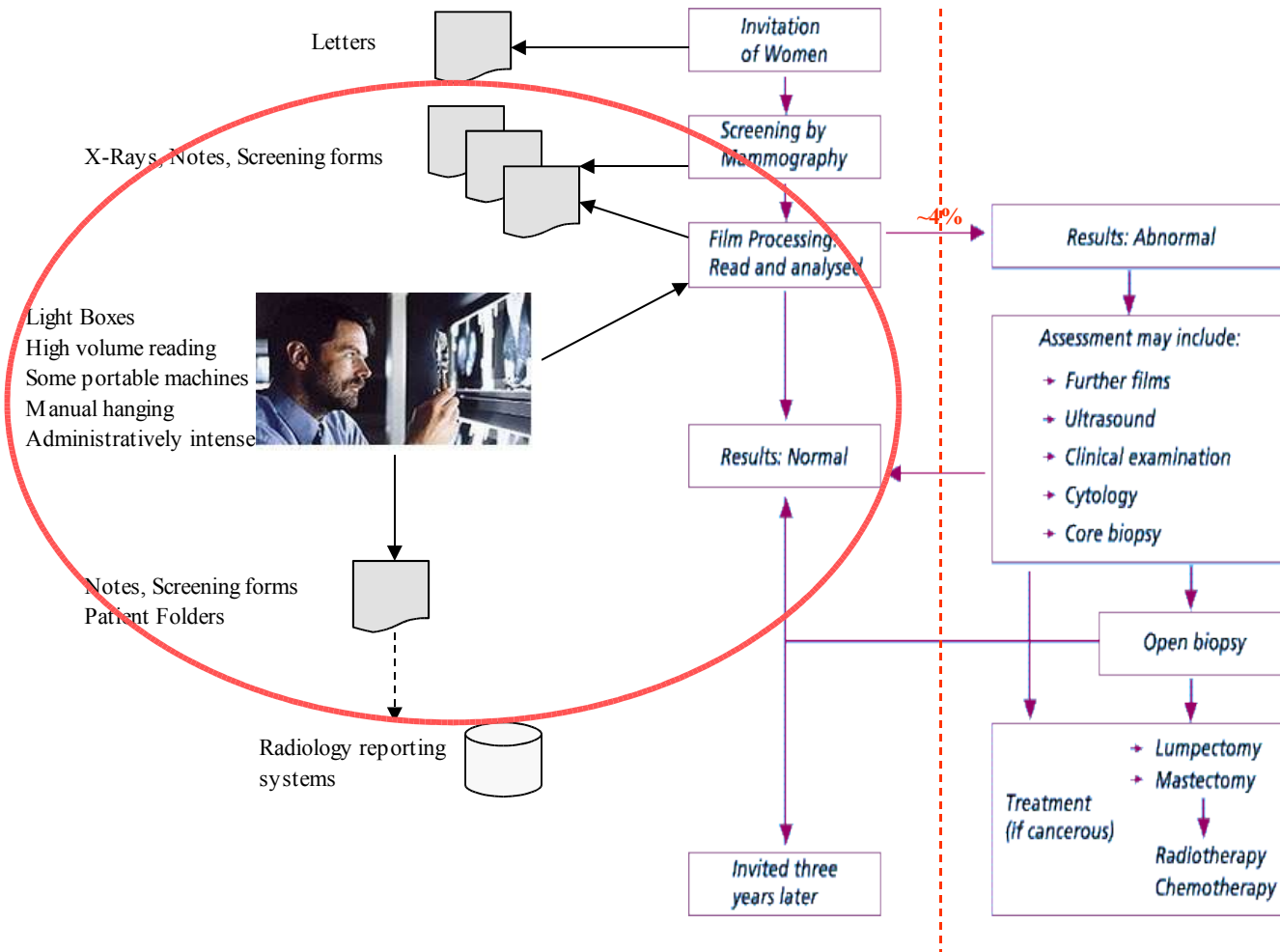
230 - Radiologists (Double Reading)
50% - Workload Increase

Breast Screening in the UK - Workflow



~ 100 Breast Screening Units

Breast Screening in the UK - Workflow



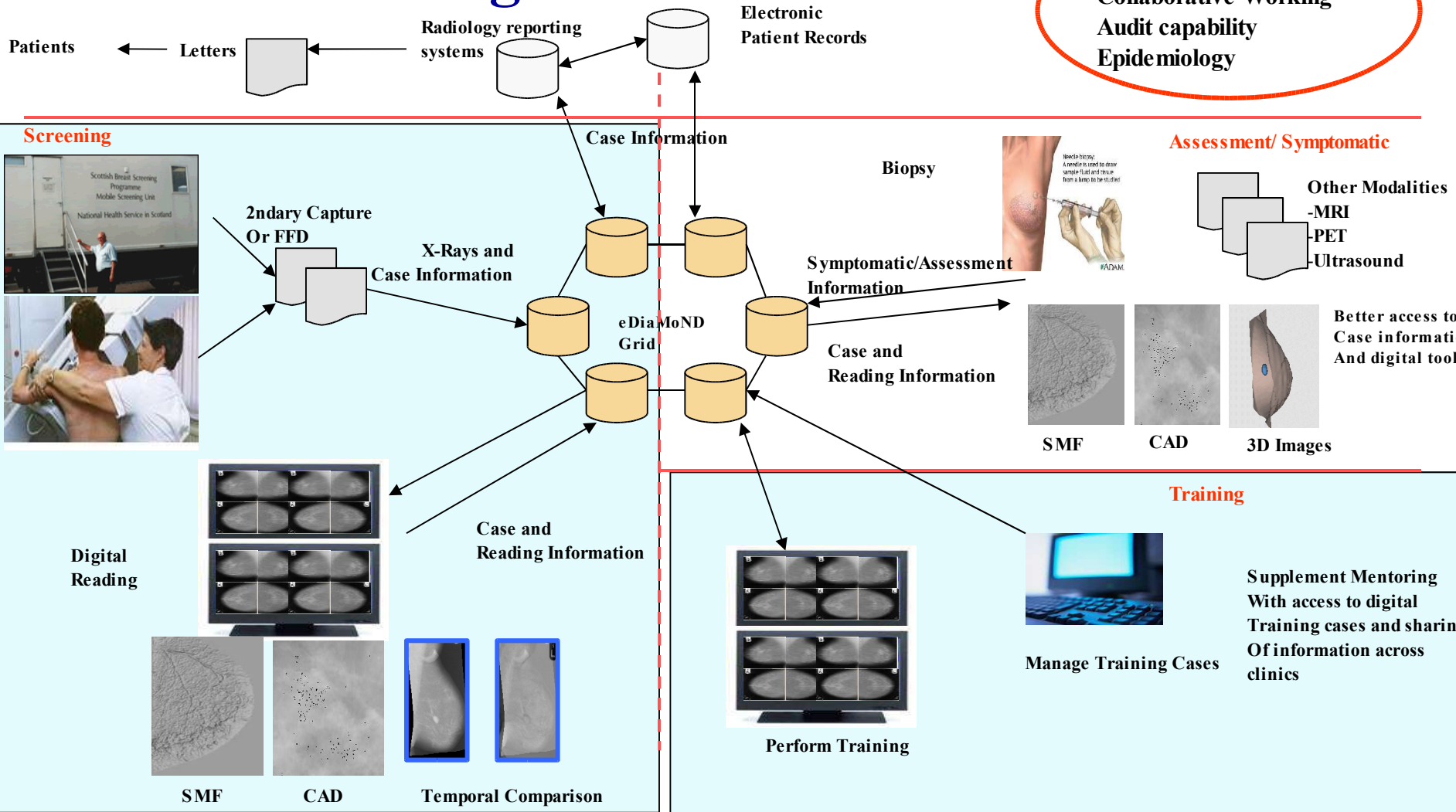
~ 100 Breast Screening Units

Breast Screening – Domain interest

- Primarily non digital, still use films and light boxes → **Transition to digital**
- Reporting systems non standard → **Future integration possibilities**
- Movement of data manual, PACS not used for Mammography → **Grid**
- Reporting very difficult → **Database and Grid**
- Training through Mentoring → **Computer Based Training via Grid**
- Epidemiological Studies local → **Database and Grid**
- Computer Aided Detection not used → **enabled by Grid and Digital Reading**

Breast Screening – Our vision

1 Trust → Many Trusts
Collaborative Working
Audit capability
Epidemiology



Grid Challenges

Image Sizes : 30-40 MB at 50 micron, approx 4 images per screening round per patient plus priors. Dicom Format Images. Storage and Transport of these images important. ‘Lossy’ compression unacceptable for non-repudiation reasons.

Response time requirements - 1 case every 30 seconds

***Solution** – Split management of image and non image data. Only move images where absolutely required. Use of IBM Content manager and DB2. Clever caching.*

Security and Access Controls – Non standard policies across the NHS and trust controlled systems requires the development and implementation of fine grained access control mechanisms.

***Solution** – Research techniques and NHS policies, in particular the work of the NHSIA on security. Research technological solutions for implementing this.*

IHE Compliance – Requirement to comply with IHE principals became apparent mid project if eDiaMoND were ever to form part of a solution for the NHS.

***Solution** – Working with IHE consultant, identified potential ‘product(s)’ from eDiaMoND and shortfalls in IHE currently. DICOM and HL7.*

Project Challenges

- **NHS as a ‘potential customer → Clinical Buy in to change**

Digital reading, computer aided training, people versus computers, confidence.

Is the NHS ready for the ‘joined up systems’ approach ?

- **Security → Working with NHS networks and local trust constraints**

Satisfying procurement departments, adhering to and helping to change and set standards

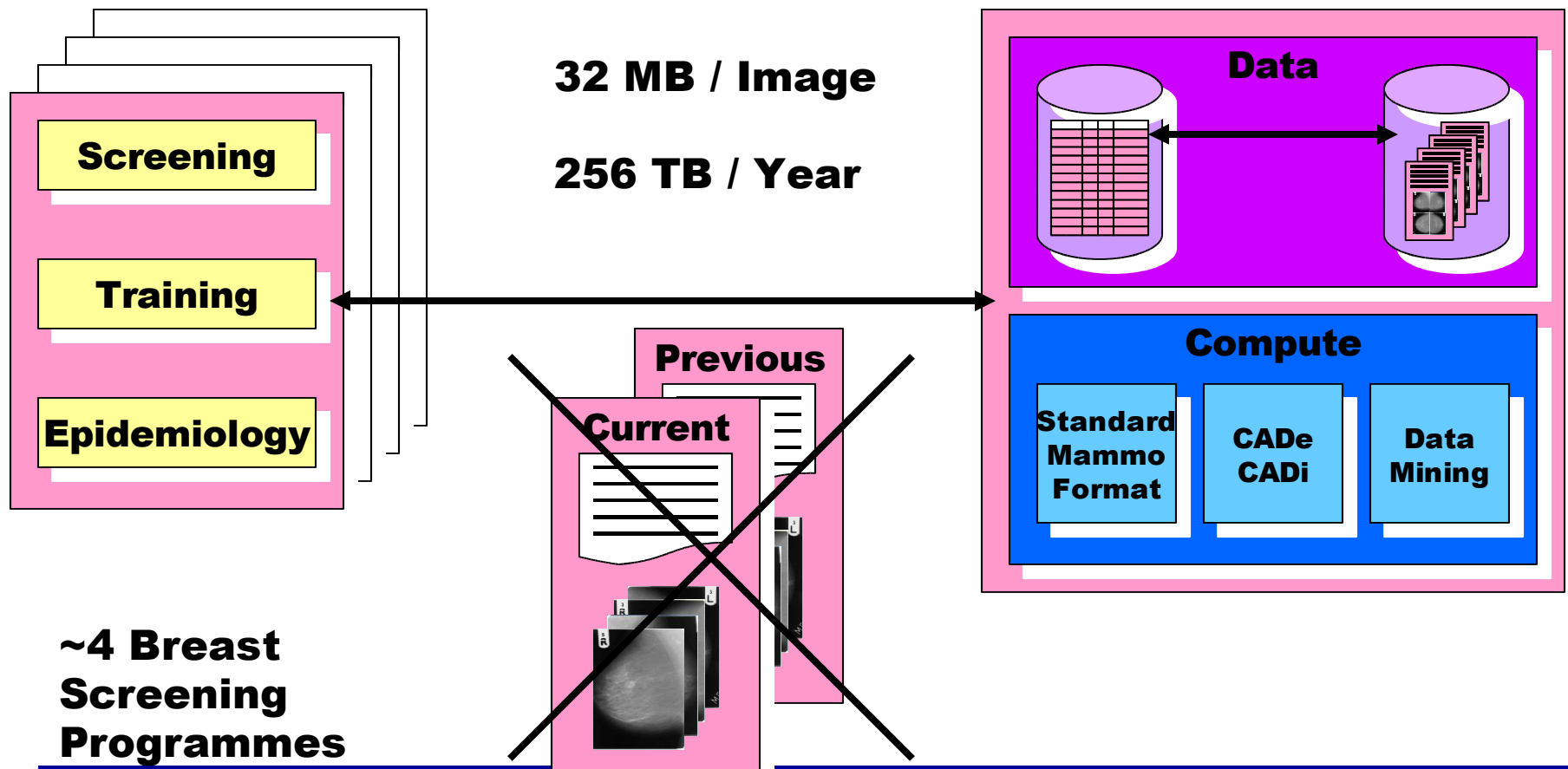
- **Integration with Existing systems → Patient records systems and health records**

No systems to integrate to yet. Radiology reporting systems sporadic and no standard.

eDiaMoND prototype – Scope

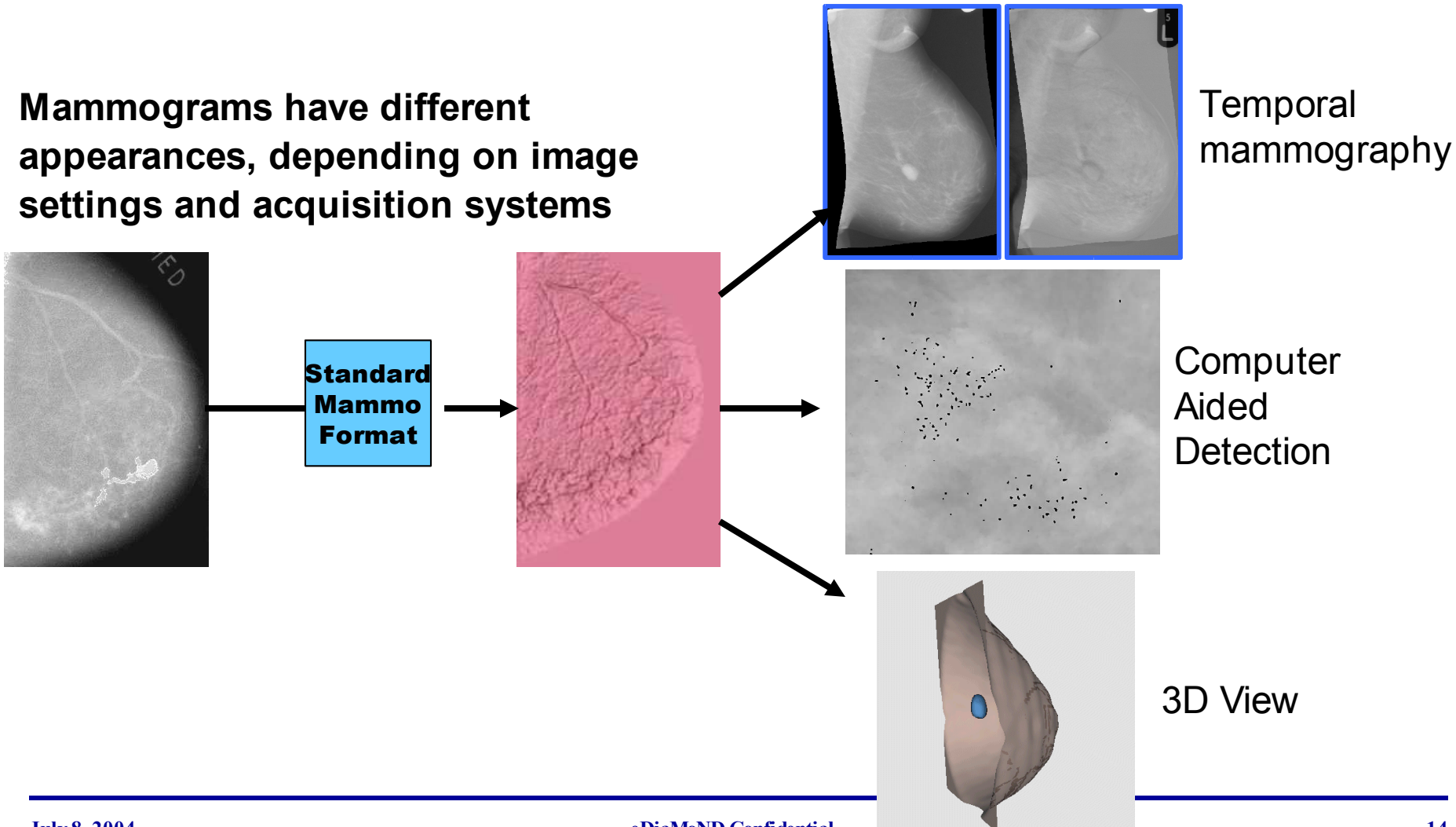
Workstation

Grid

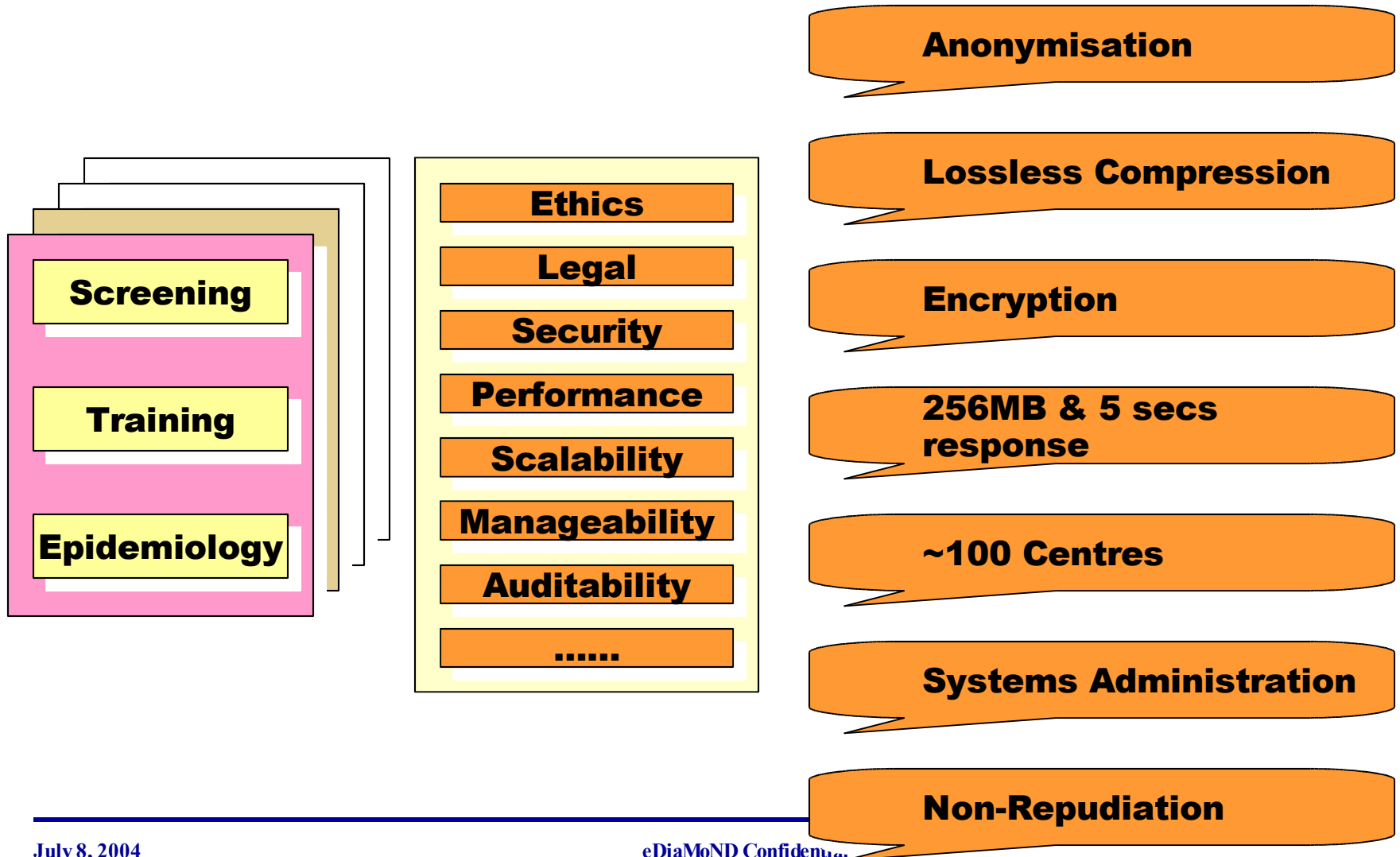


eDiaMoND – Compute

Mammograms have different appearances, depending on image settings and acquisition systems



eDiaMoND – Non-Functional

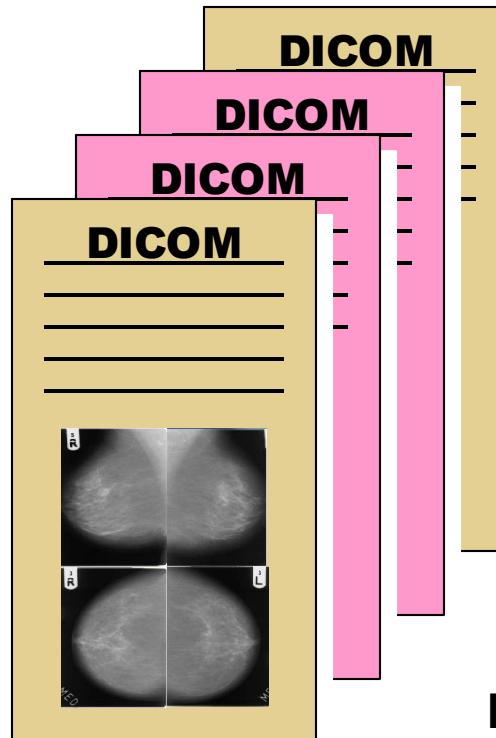


eDiaMoND – Data

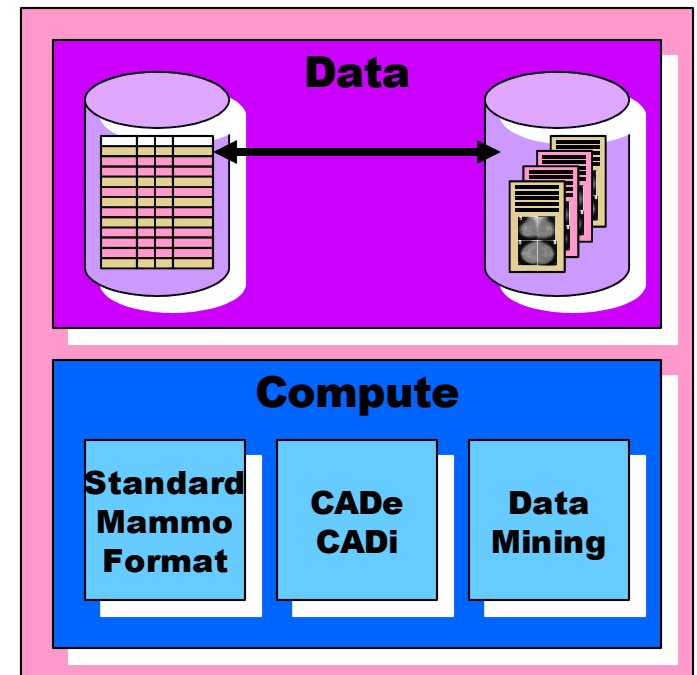
Data

Patient	Age	...	Image
107258	55	...	1.dcm
236008	62	...	2.dcm
700266	59	...	3.dcm
895301	58	...	4.dcm
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Images



Grid



Logical View is One Resource

Project Approach and Deliverables

1. A prototype solution for the UK Breast Screening programme to demonstrate screening, training, epidemiology, CADe and data mining.

Delivered in 3 phases :

- Initial end August 2003, single node proof of concept
- Summer 2004, multi-node, data acquisition and basic screening
- May 2005 all applications, refined

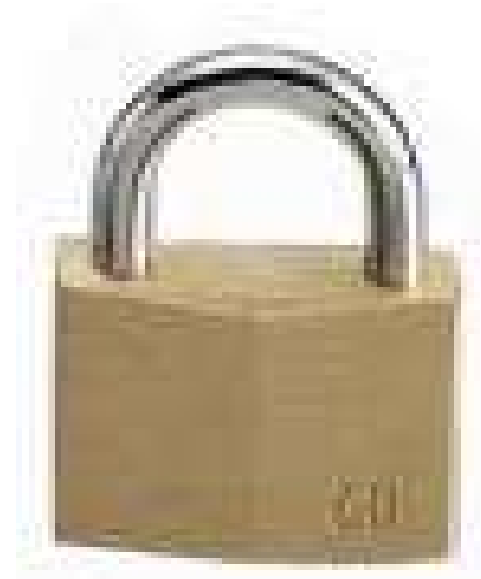
2. A blueprint document that provides ideas for the future, proposals on how to implement and a roadmap to commercialisation

Grid Architecture

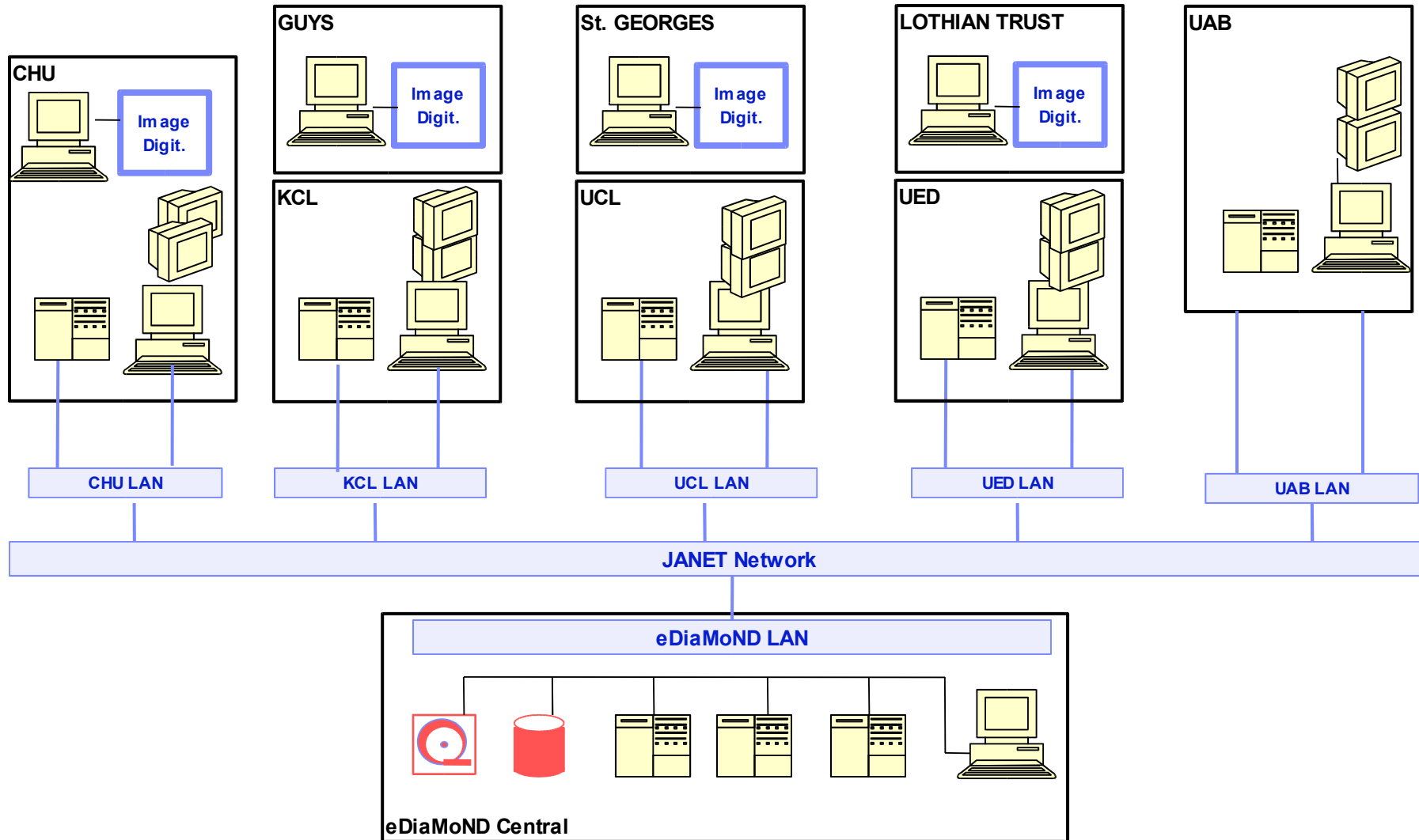
- Core eDiaMoND system, middleware and virtualised medical image store to support data grid concept
- Physical databases on grid nodes, 1 per screening unit
- Unite as single logical resource through data federation
- Using :
 - GT3, Grid Services
 - IBM Content Manager
 - OGSA-DAI
 - Websphere
 - DB2
 - Visual Age C++

Grid Architecture – Security Considerations

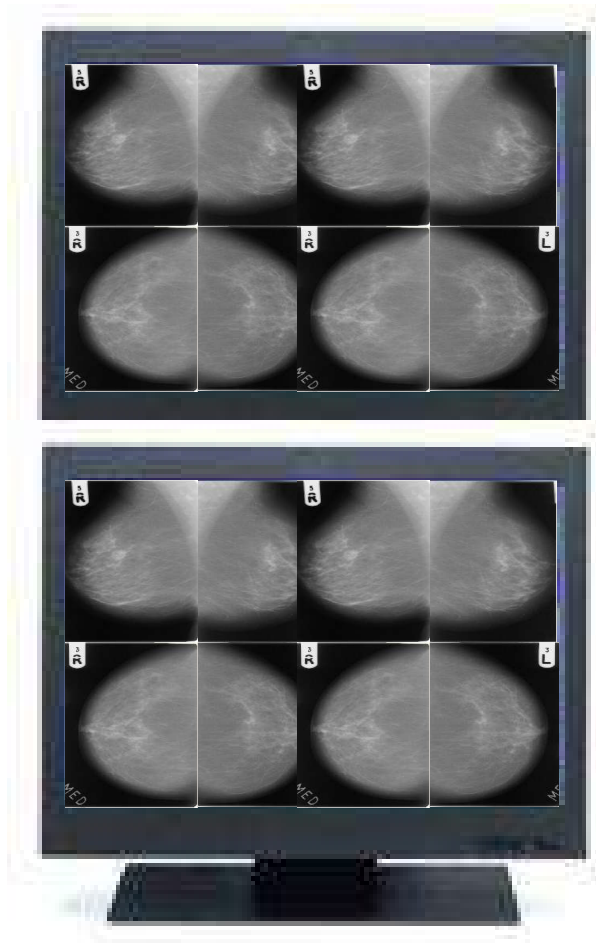
- Data Encryption
- VPNs
- Secure ID/Passwords
- Use of Certificates
- Research into flexible access control systems



Prototype Architecture



eDiaMoND – Prototype Workstation



Two IBM T221

Each 9.2 Megapixels – 3840 x 2400

Each 200dpi

What Next ?

- Complete deployment of grid architecture
- Acquire valuable dataset
- Completion of development of applications
- Clinical trial use of technology and data

... then post May 2005

What Next ?

- Potential new project in generic architecture for health
- Potential future projects in clinical applications and clinical trial of new architecture
- Valuable research data intended for reuse by research community
- An effective team that has learnt to work together

Research areas

- Publications in security, data management for scalability for the health domain, building clinical applications and requirements management

New research areas identified in terms of technology, knowledge management and project management techniques

Will eDiaMoND be successful ?

- Immense interest from clinicians in the benefits Grid technology can offer
- Excellent dataset will be created
- Experience of building grid architecture from 3rd party products obtained by project teams
- Domain knowledge extensive
- Publications
- Knowledge of further potential projects gained
- PR for partners
- A great team!

So... yes ... and an excellent project to manage

Any Questions?