Challenges of remote handling medical applications

MAGIC - Remote Instrumentation

Julio 2016

Virtual instrument

- A virtual instrument is an instrument that utilizes a hardware-software approach to system implementation. It takes advantage of the high performance of hardware and high flexibility of software to greatly reduce the size of the corresponding traditional instrument without sacrificing much of its functionality.
- Science and engineering are increasingly done in multi-instrument, multi-institutional, multi-disciplinary environments that are always distributed: The required resources are never all in the same place.
- MVIs can be used for, but are not limited to medical research applications, clinical applications, medical design development, healthcare information management systems, and mathematical modeling of physiologic systems
- These instruments generate massive amounts of data, at high rates (hundreds of megabits/sec, and more), and all of this data requires complex analysis.
- Data whose life extends beyond a single experiment are maintained, annotated, and catalogued by discipline experts at their home institutions.

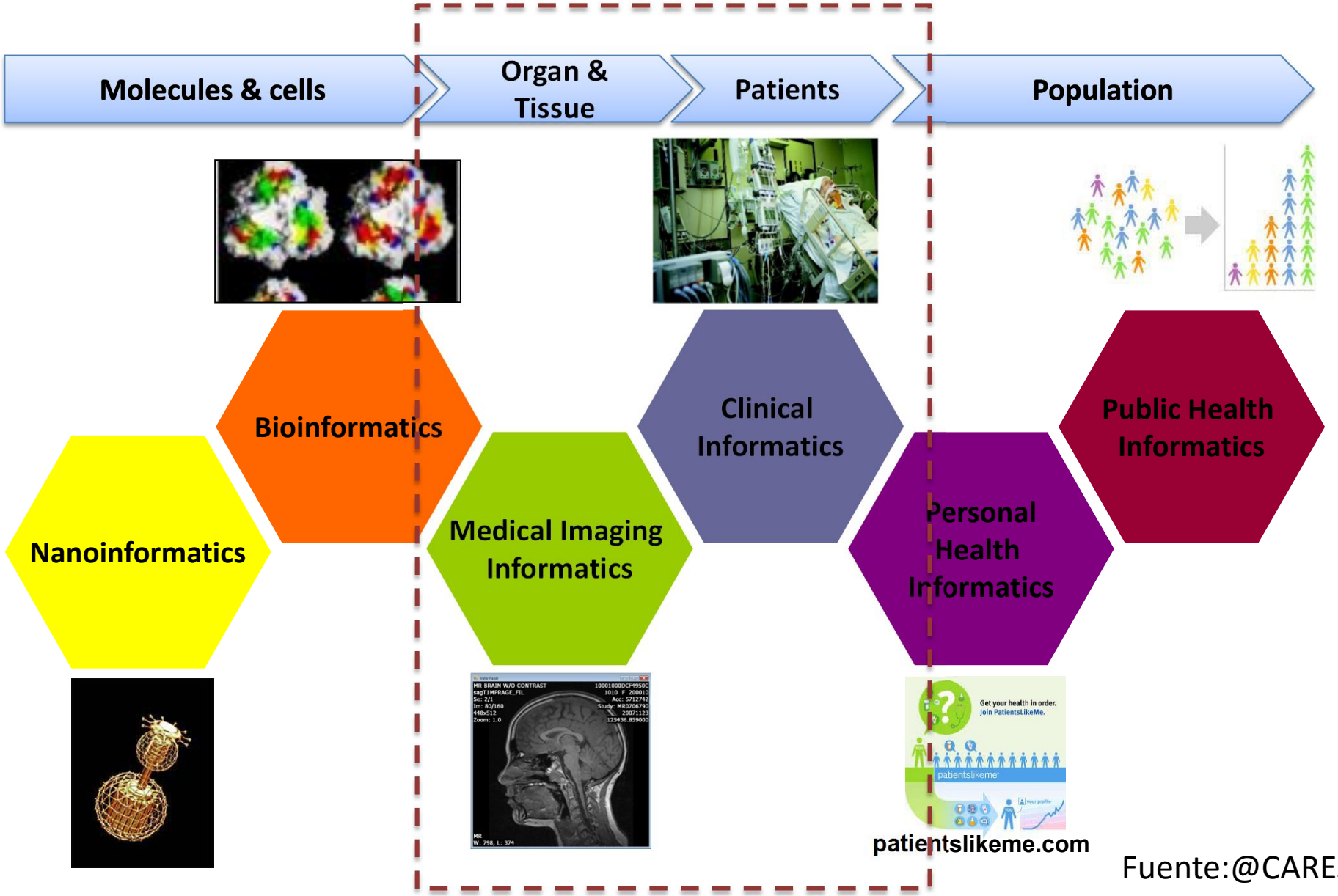
Medical Virtual Instrumentation for Personalized Health Monitoring: A Systematic Review
Olufemi Adeluyi and Jeong-A Lee
Data-Intensive Computing in Widely Distributed Environments

Distributed Real Time Applications

- **High-speed data** streams result from the operation of many types of online instruments and **imaging systems** and are a staple of modern scientific, healthcare, and intelligence environments.
- The advent of shared, widely available high speed networks is providing the potential for new approaches to the **collection, organization, storage, analysis, and distribution** of the large data objects that result from such data streams.

The Grid: Blueprint for a New Computing Infrastructure.Edited by Ian Fosterand Carl Kesselman. Morgan Kaufmann, Pubs.

Scope



Fuente:@CARES

Healthcare imaging systems

- High data rates for video and image data used for diagnostic purposes are collected at centralized facilities
- Real time cataloging through widely distributed systems
  - Stored, managed, accessed and referenced at locations other than the point of collection
- Healthcare professionals needs to access to image analyst reports, also original image data.
- Tertiary storage is need because hospitals are frequently not the best place to maintain a large-scale digital storage systems.
  - Economy of scale in operational aspects, affordable, easily accessible, high bandwidth network can provide independence

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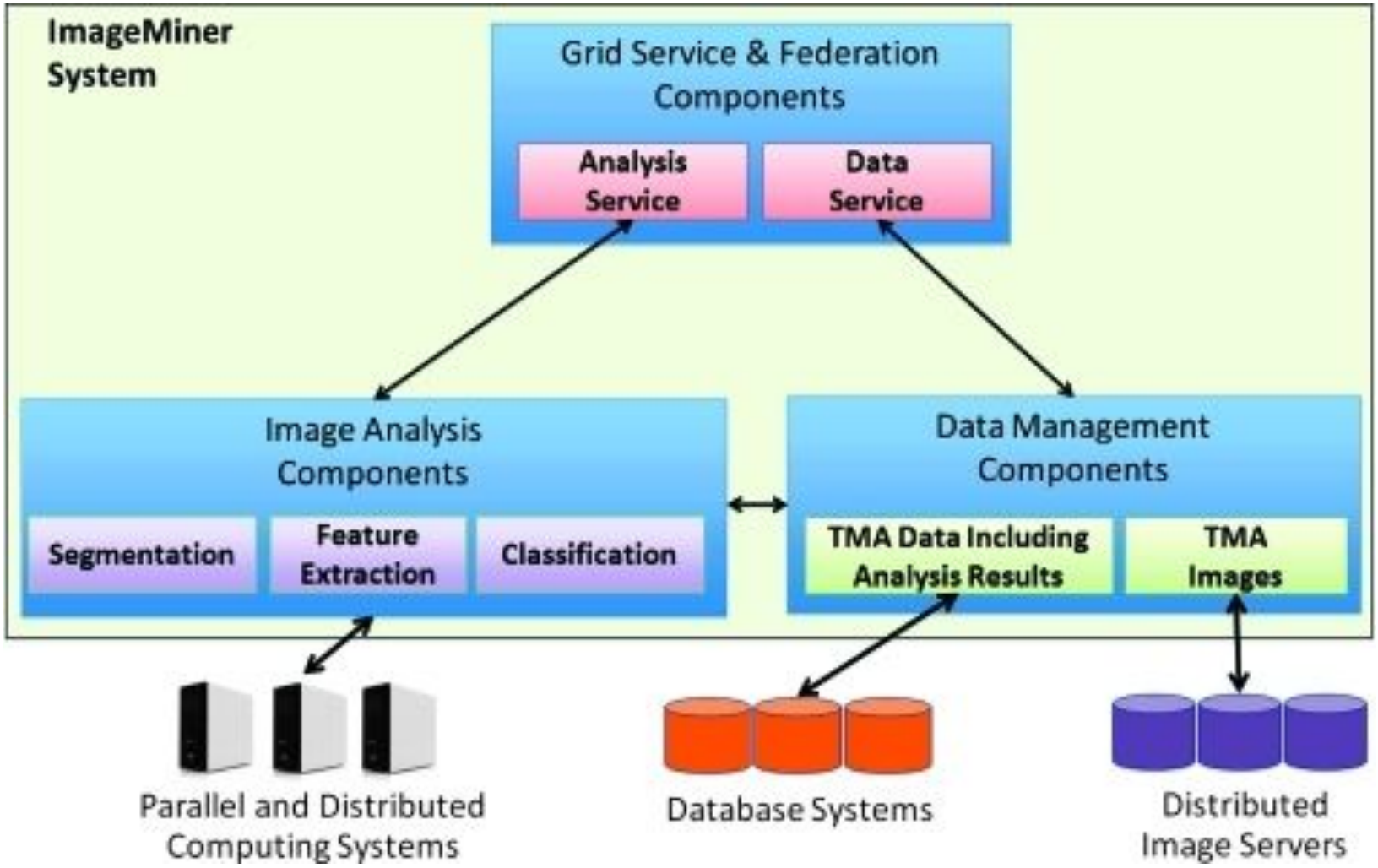
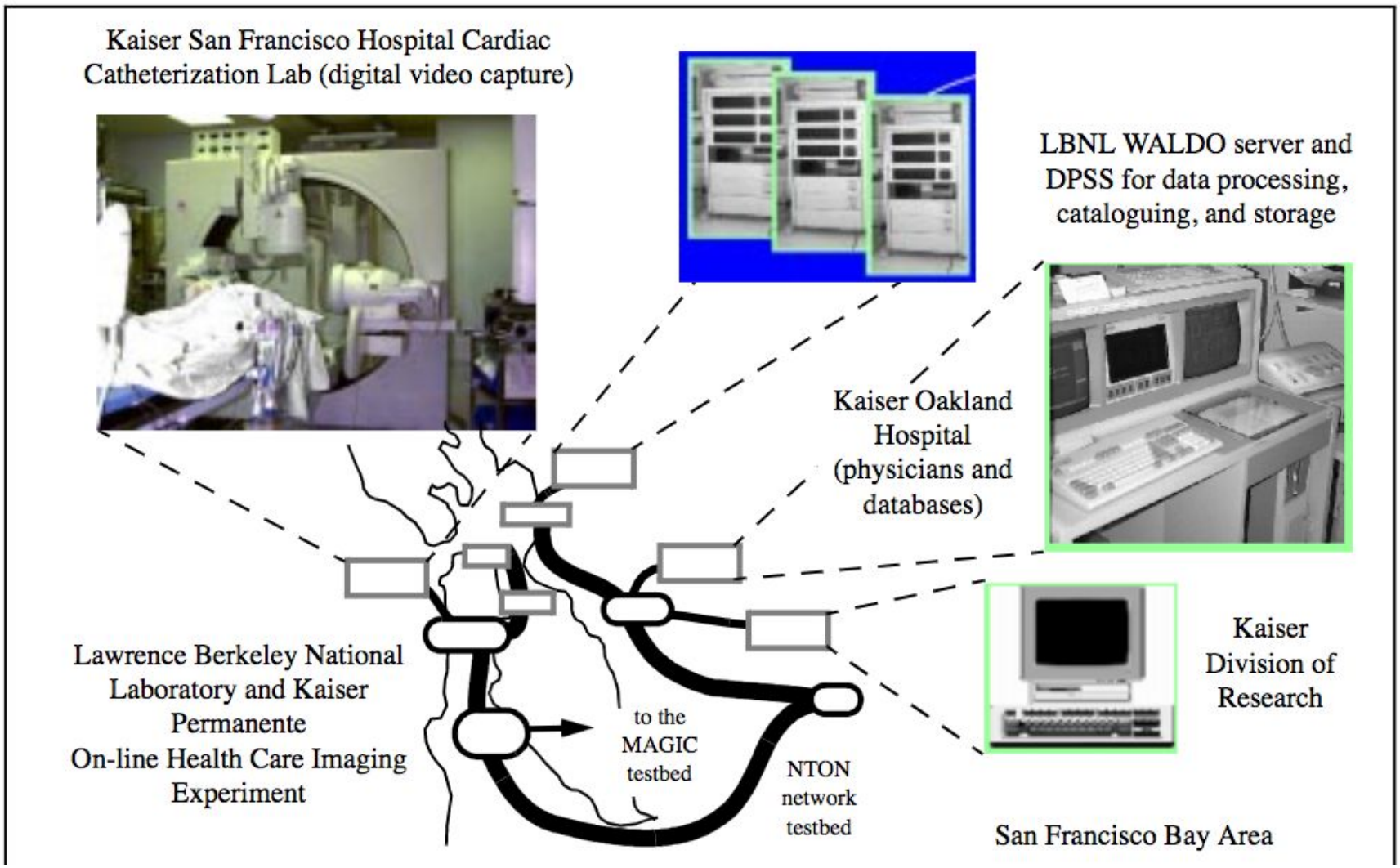
Image Miner System

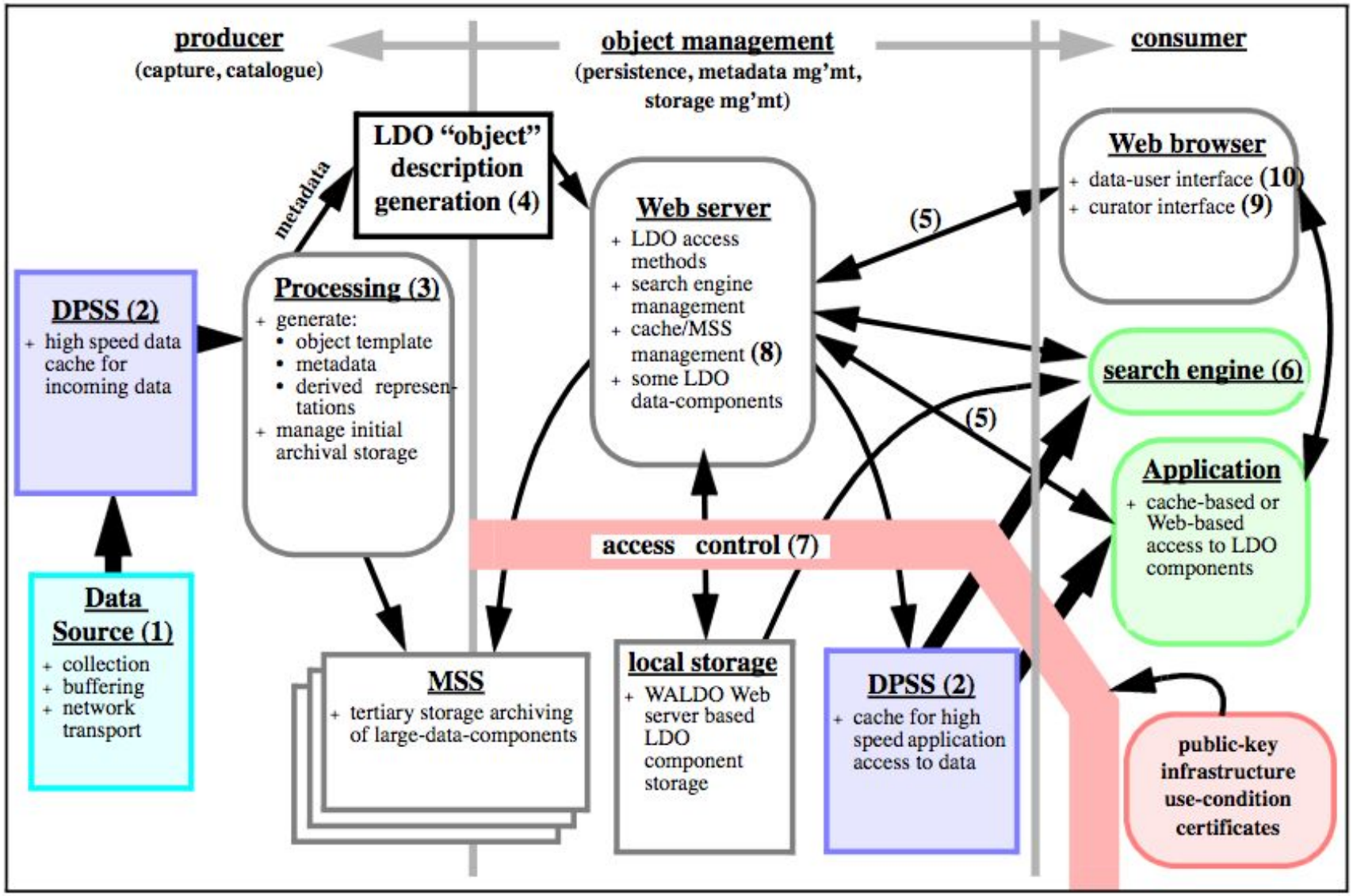


Foran, David J, Lin Yang, Wenjin Chen, Jun Hu, Lauri A Goodell, Michael Reiss, Fusheng Wang, et al. "ImageMiner: a software system for comparative analysis of tissue microarrays using content-based image retrieval, high-performance computing, and grid technology". Journal of the American Medical Informatics Association 18, núm. 4 (el 1 de julio de 2011): 403–15. doi:10.1136/amiajnl-2011-000170.

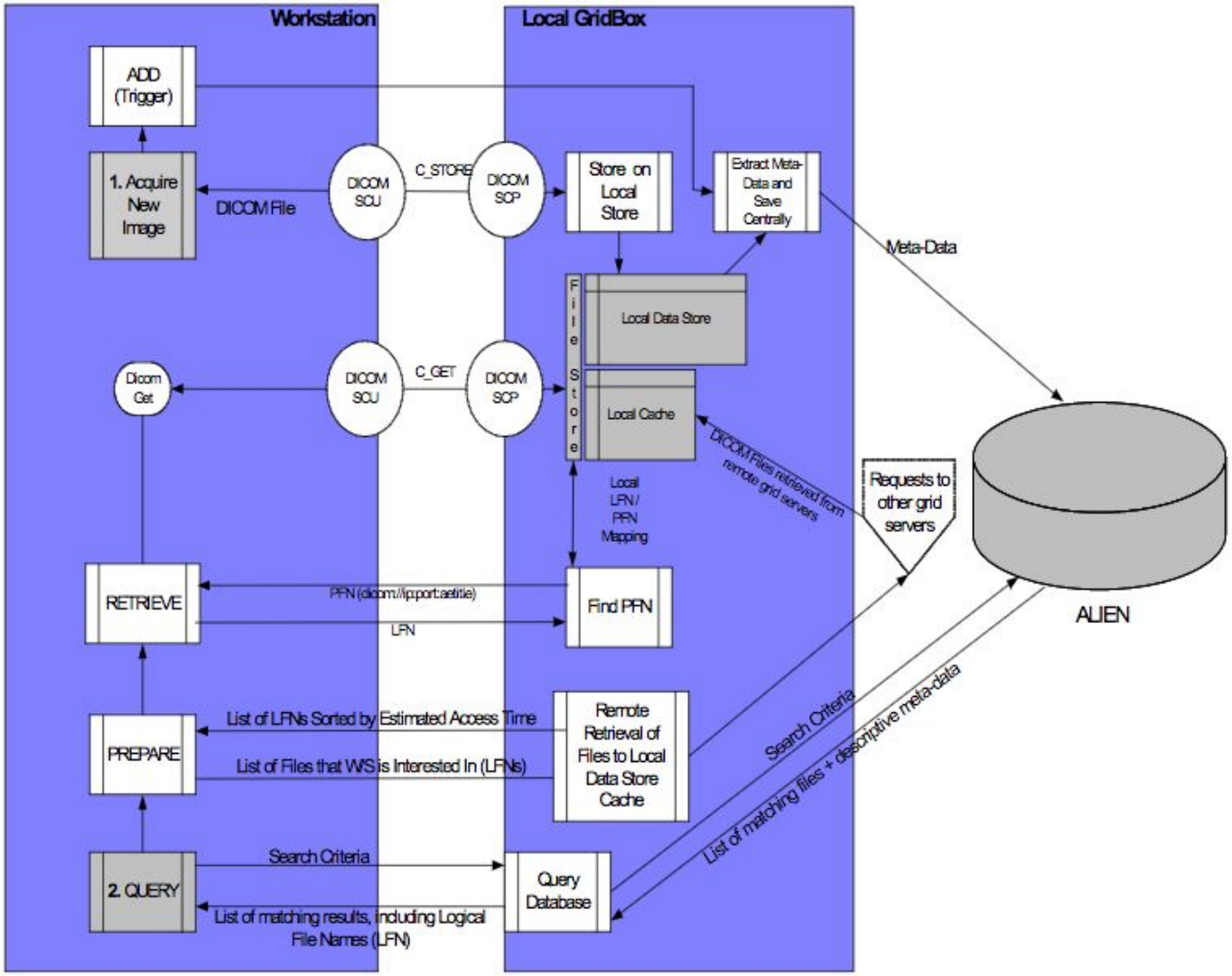
Distributed health care imaging application



Architecture and data flow



Data-flow between the radiologist workstation



Grid databases for shared image analysis in the Mammogrid project

Challenges in e-Endoscopy Sessions

Live Sessions - features

1. Real-time interaction
2. Hands free – communication
3. Visualization of the operation field is fundamental
4. Video-recording
5. Automatic still images
6. Streaming
7. Media storage
8. Institutional repository
9. Linked to clinical findings reports
10. Remote administration from centres with limit technology support
11. Multiple stakeholders

e-Endoscopy Sessions Success

- Access to technology
  - Adequate
  - Affordable
  - Easy to use
  - Skills
- Infrastructure
  - Videoconference equipment
  - Broadband - Connectivity
  - Network
  - Adequate operating and VC room
- Professional Community
  - Committed to new training models
  - Clinicians and Students obtain what they are looking for
  - Part of Clinical Routine, minimize effort
  - Schedules aligned

Prepared to implement e-Endoscopy Routine

- Define key design elements to clinical education facilities in endoscopy
  - Laboratory and operation room settings including broadband connectivity
  - Medical, audio, video and videoconference equipment interoperability
  - Confidentiality and safety in biomedical environments
  - Define performance indicators
    - Network
    - User experience
- Develop technical guidelines
- Develop skills to provide technical support in live sessions
  - Interdisciplinary teams

Conclusion

- Integration of medical instruments into e-Infrastructure empowers possibilities in conducting medical diagnostics and training.
- VMI require a large scale research Infrastructure with a joint effort from international scale.

THANK YOU