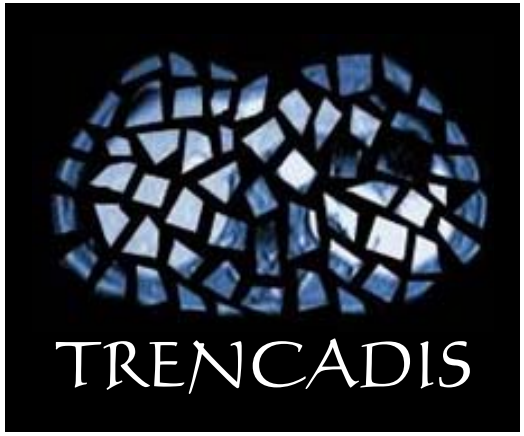

CVIMO – Deployment of a Cyber-infrastructure on top of TRENCADIS Architecture to Share and Create DICOM Studies and Structured Reports

Ignacio Blanquer
Vicente Hernández

Universidad Politécnica de Valencia
Grupo de Redes y Computación de Altas Prestaciones

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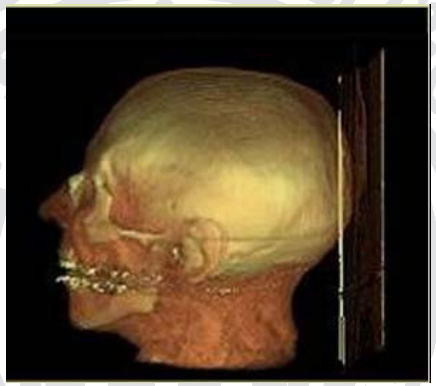
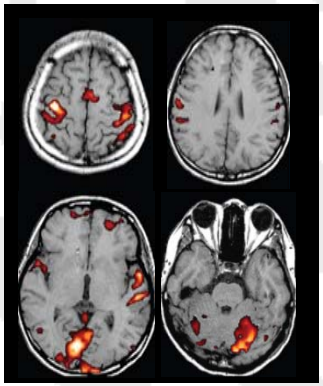
- **Challenges Sharing Medical Images.**
- **CVIMO Technology**
  - TRENCADIS Architecture.
  - Virtual Organisation Structure.
  - Structured Reports.
  - Security Model.
- **Deployment.**
- **Lessons Learnt and Conclusions.**

Medical Image Challenges and HealthGrids

Medical Imaging Concepts

- **Medical Imaging Designates the Ensemble of Techniques and Processes Used to Create Images of the Human Body for Clinical Purposes or Medical Science.**
- **Medical Images Reflect in a Bitmap Structural Parts, Different Functions or Physical Properties of Tissues.**
  - Medical Images are Huge in Size and Information.
  - Medical Images Require PostProcessing
    - To Identify Relevant Tissues and Organs.
    - To Visualize Images in a More Human-Readable Form.
    - To Fuse and Align Different Images.



Challenges Sharing Medical Images

- **Why Sharing?**
  - Training is Mainly Based on Evidence.
  - Research on Rare Pathologies Require Collecting a Large Number of Cases.

- **Inter-Organisation Data Access**
  - Enable Access to Data from Different Federated Centres.
  - Preserve Privacy (Legal and Ethical Issues).
  - Organise Efficiently a Large Number of Cases.
  - Integrate with Existing Devices and Protocols.
    - Firewalls and Private Networks Integration.

CVIMO: Ciberinfraestructura Valenciana para Imagen Médica Oncológica

Ciberinfraestructura Valenciana para Imagen Médica Oncológica

- Platform Developed in the Frame of the Proyect “Creation of a CyberInfrastructure for Learning, Research and Epidemiological Study of Cancer Through Medical Images”.
- Leaded by the UPV with the Participation of 5 Hospital of the Valencian Community and British Telecom.
- The Platform Organises the Images Through Virtual Communities.
- It Enables Creating and Searching Studies Though Structured Reports and High Performance Postprocessing.

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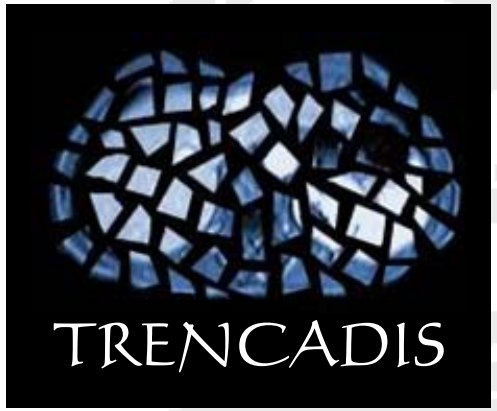
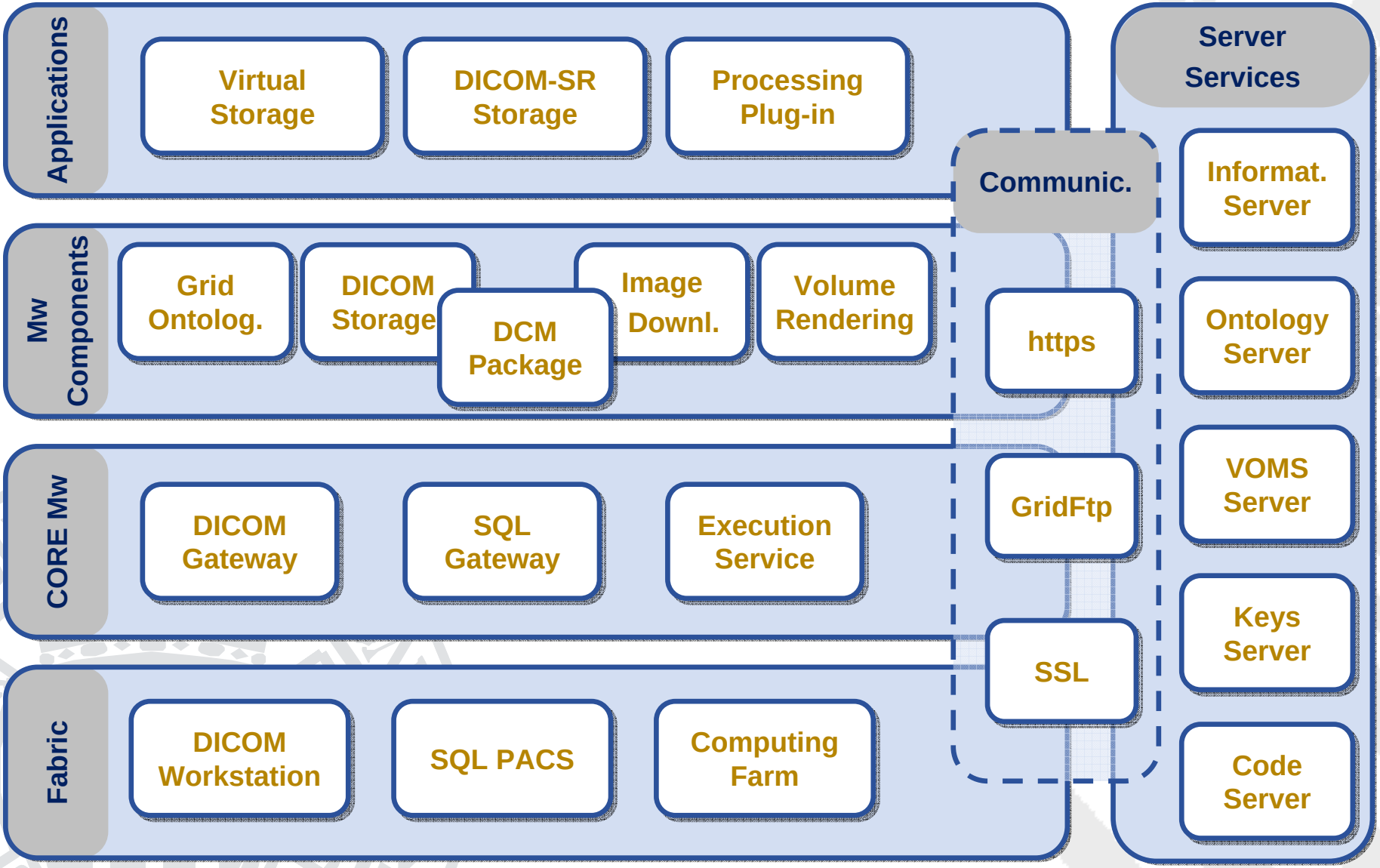
CVIMO Technology: TRENCADÍS

- **Towards a Grid Environment for Processing and Sharing DICOM Objects**
  - TRENCADIS Aims at the Development of a Middleware to Create Virtual Repositories of DICOM Images and Reports.
  - It Uses a Semantic Model to Organise the Data.
  - Data is Encrypted and Decrypted to Ensure Privacy Protection.
  - OGSA Architecture Totally Based on WSRF.

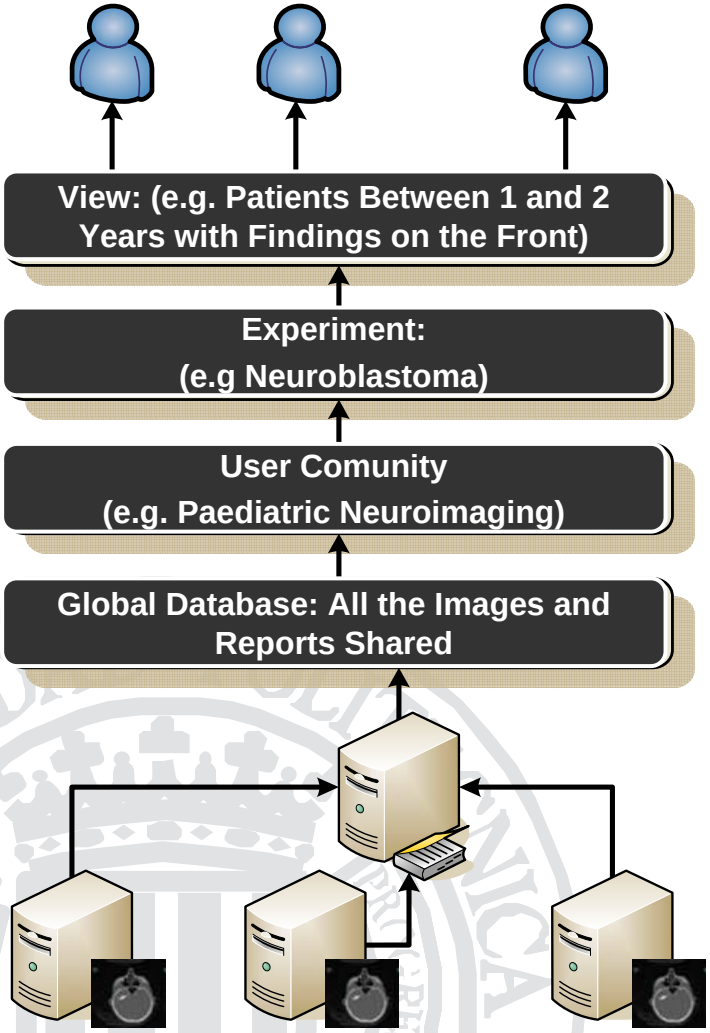


- **Objective: Creation of Virtual Shared Repositories of Medical Images.**
  - Complementary to PACS.
  - Intended Mainly for Research and Training.
  - Data to be Shared is Explicitly Selected.
  - Data is Pseudoanonimised Before Entering in the System.

TRENCADIS Architecture



TRENCADIS: Data Indexation



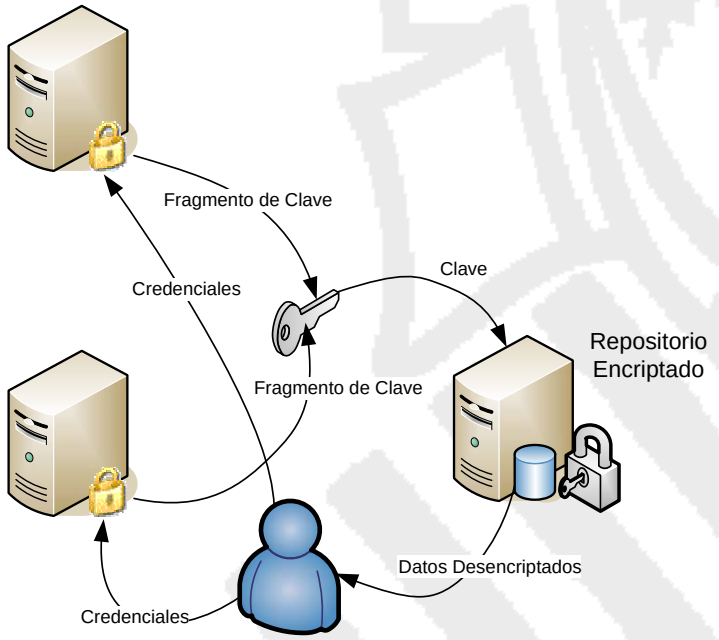
- **Semantic Organisation**
  - Users Organise Themselves on VOs.
  - From the Studies Available, Only Those Matching the Selection Criteria of the VO Profile are Accessible.
  - From the Images Available to a Virtual Community, a User Can Create an Experiment with the Studies Matching a Set of Restrictions.
  - From this Experiment, More Detailed Views can be Obtained.
  - The Criteria for the Selection of the Relevant Information Relies on the DICOM Tags of the Image and the Structured Report.

Structured Reporting

- **Seven Templates Have Been Generated By the Experts**
  - Report for the Staging of Malignant Liver Neoplasia, Small and Non-Small Cell Lung Cancer and Intraaxial Tumours of Central Nervous System.
  - Follow-up Reports for Liver Metastasis, Lung Carcinoma and Intraaxial Tumours of Central Nervous System.
- **The Reports are Structured and Coded Using the Rules of DICOM-SR.**
- **Standard Coding (Mainly DICOM) Has Been Used When Possible, Following the DICOM-SR Rules To Introduce New Coding Schemas.**
- **The Reports Generate Automatically the TNM Staging Code (From the Radiological Information) in the Cases of Liver and Lung.**

TRENCADIS: Security

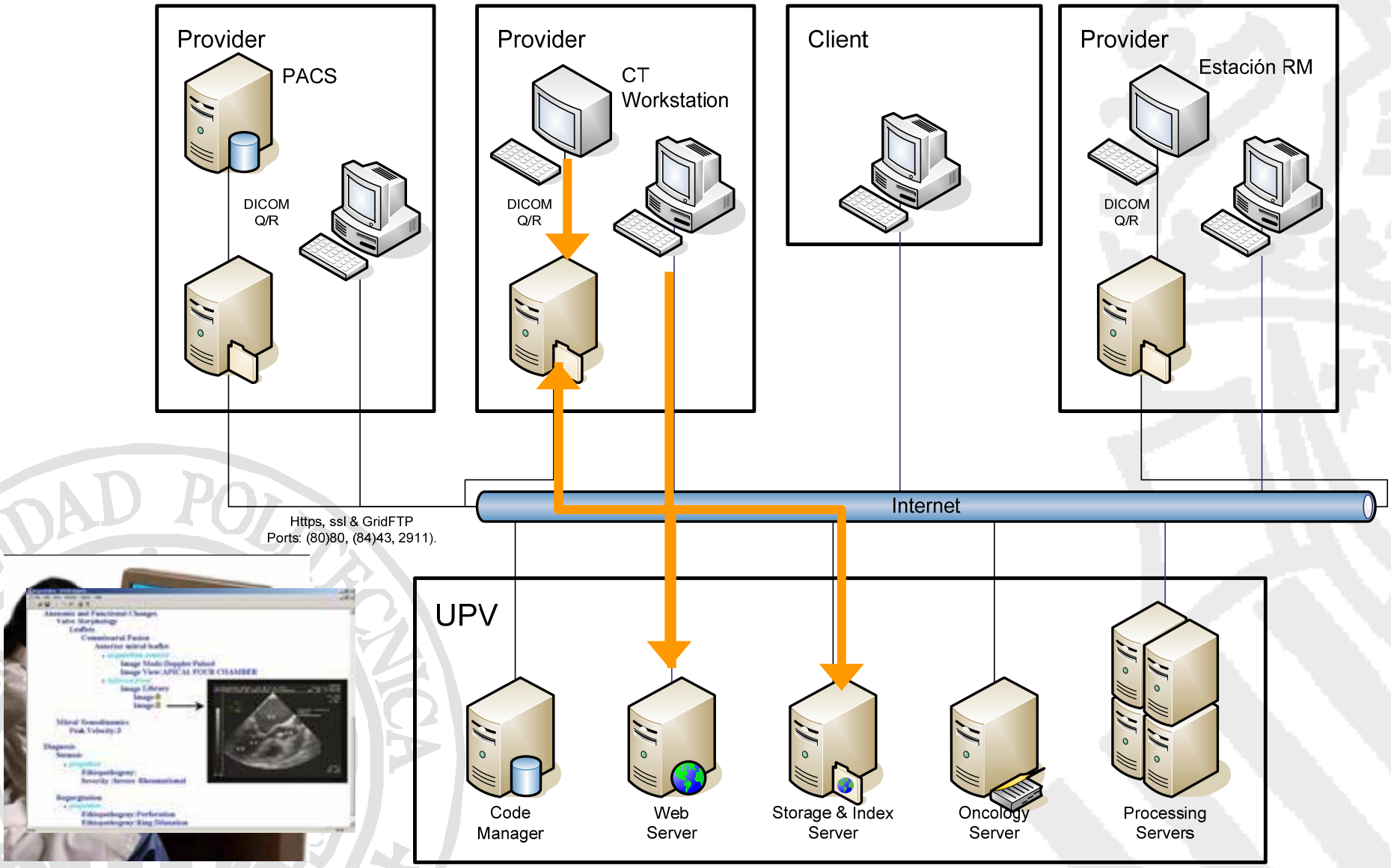
- **Authentication and Authorisation**
  - Users are Authenticated Through X.509 Certificates in an “Single Sign-on” Procedure (Using Proxies).
  - Roles of the Users (And Though the Virtual Community and the Access Permissions) are Managed Through VOMS proxies.
- **Privacy**
  - All Transactions are Based on Secure Protocols.
  - Data is Encrypted on the Grid Storage to Avoid The Access of Users with Privileges.
  - Keys are Split and Shared Through the VO Group.



Deployment

- **Each Hospital has a Local Storage**
  - Communicates to PACS/Scanner Though DICOM Query/Retrieve.
  - Images Stored are Directly Selected Trhough the Medical Workstation.
  - It Also Stores the Structured Reports Generated For These Images.
- **Local Storage is Accessible By External Users of the VO**
  - Protocols Involved: Https, SSL and GridFTP.
  - Problems to Overcome: Firewalls, Port Configurations, Private IPs.
- **Indexing and Processing Resources on a General Repository (Accessible by all Centres and Users).**
- **Own Certification Authority.**

Deployment


Provider
PACS
DICOM
Q/R
Provider
CT
Workstation
DICOM
Q/R
Client
Provider
Estación RM
DICOM
Q/R
Internet
Https, ssl & GridFTP
Ports: (80)80, (84)43, 2911).
UPV
Code
Manager
Web
Server
Storage & Index
Server
Oncology
Server
Processing
Servers

Conclusions and Lessons Learnt

- CVIMO is an Infrastructure to Share Radiological Studies Throughout a Content-Oriented Organisation.
- It Enables Linking with High-Performance Services.
- The Involvement of Users from the Very Begining is a Key Issue, But Also Computer Department of Hospitals Must Be Considered.
- Deployment is not Straightforward.
- Privacy Regulations are Difficult to Meet Even Dissociating Data.

Contact

Ignacio Blanquer

Vicente Hernández

Universidad Politécnica de Valencia

Camino de Vera s/n

46022 Valencia, Spain

Tel: +34-963879743

Fax. +34-963877274

E-mail: iblanque@dsic.upv.es
vhernand@dsic.upv.es