Web-Service Based Information Retrieval in Conventional DICOM Repositories to Support Teaching and Research in Radiology

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supporting medical teaching & research

- major achievement
  - information dissemination
  - towards advanced information management

- current challenge
  - bridge healthcare enterprise with academic and research environment
  i.e.
  - integrate clinical data with teaching and research software tools
the case of Radiology

DICOM server

DICOM

DICOM

DICOM

intranet or internet

web browser

research & education
DICOM

basic communication:
FIND – MOVE – STORE

search based only on
certain attributes and
of a specific information
entity at a time

patient

is subject of
1, n

study

contains
1, n

series

contains
1

image

waveform

overlay

look-up table

structured report

…
requirements

- **flexibility**
  - change and adapt easily, and expand to cover emerging needs

- **easiness to implement**
  - does NOT require expensive infrastructure & long development times

- **security**
  - data anonymization & integrity

- **adherence to open standards**
  - accommodate synergy with disparate systems & the open standards academic and research infrastructure
our approach

- teaching & research
- end-user applications

- added-value web services

- web services acting as wrappers

- conventional clinical information systems

DICOM

non-DICOM
web service paradigm

- middleware technology for program-to-program interactions
- URI-addressable software with certain functionality
- can act as wrappers for legacy applications
web service paradigm

- enable disparate systems to work together
- based on open internet standards
- broad industry support
complex DICOM search

end-user application

information retrieval

DQM web service

attribute database

XML/SOAP

DIM web service

XML/SOAP

DICOM

DICOM sources
The database model includes the following tables:

- **DicomObject**
  - **PK**: DicomObjectID
  - DicomObjectFileName
  - SeriesUID

- **DicomAttribute**
  - **PK**: DicomAttributeID
  - DicomObjectID
  - Tag
  - TagDescription
  - TagValue
  - DataType
  - ItemID
  - SequenceID

- **Sequence**
  - **PK**: SequenceID
  - FK1: DicomObjectID

- **TagReference**
  - **PK**: TagReferenceID
  - FK1: DicomAttributeParentID
  - FK2: DicomAttributeChildID

- **Item**
  - **PK**: ItemID
  - FK1: SequenceID
implementation issues

- technologies
  - C# (MS .Net Framework 1.1)
  - DicomObjects 4.1 (Medical Connections)

- system requirements
  - MS Internet Information Server >5.x
  - MS .Net Framework 1.1
  - MS SQL Server 2000 Desktop Engine (MSDE)

- security
  - SSL, user authentication, role-based data anonymization

http://iris.med.duth.gr/
DICOM search engine

DICOM sources

XML/SOAP

DQM

information retrieval

XML/SOAP

DIM

image retrieval

XML/SOAP

DICOM sources

DICOM
Medical School Intranet

- Generic learning management system
- Supporting tools
- Medical information
- Internet & the Web
- Video & audio transmission
- Surgery
- Clinic

Healthcare information systems
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