

# **INTERNET TECHNOLOGIES FOR THE DISTRIBUTION OF DICOM STRUCTURED REPORTS WITHIN HEALTHCARE INTRANETS**

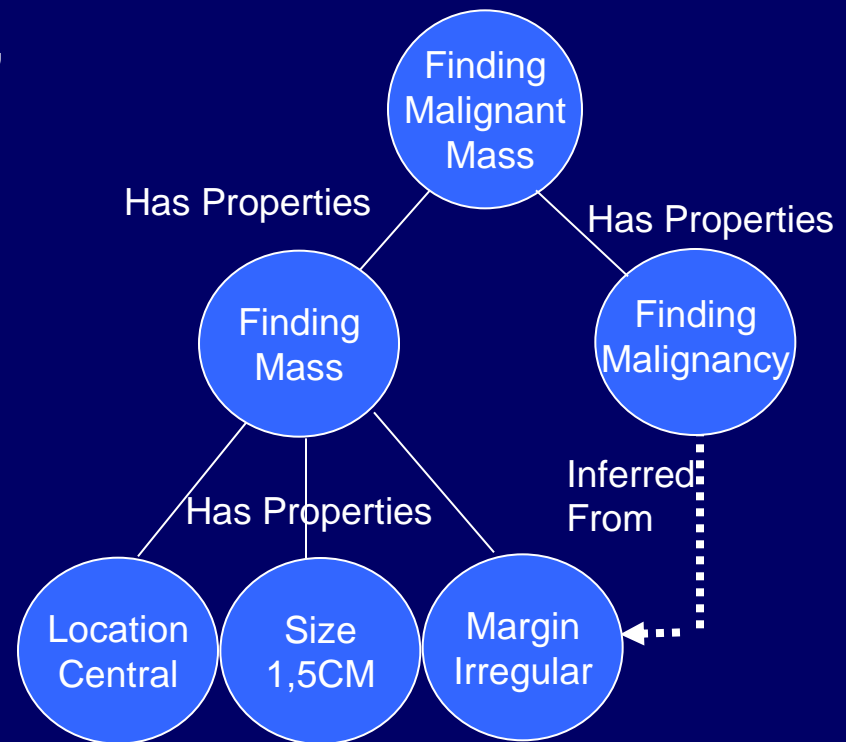
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# DICOM Structured Reports

- a way of encoding structured information
  - hierarchical tree of content items, using DICOM object syntax
- provides strict and clear documentation of meaning
  - text, categorical codes, numeric measurements, inter-item relationships
- includes links to the source diagnostic data
  - references to UIDs of DICOM images, waveforms, etc.

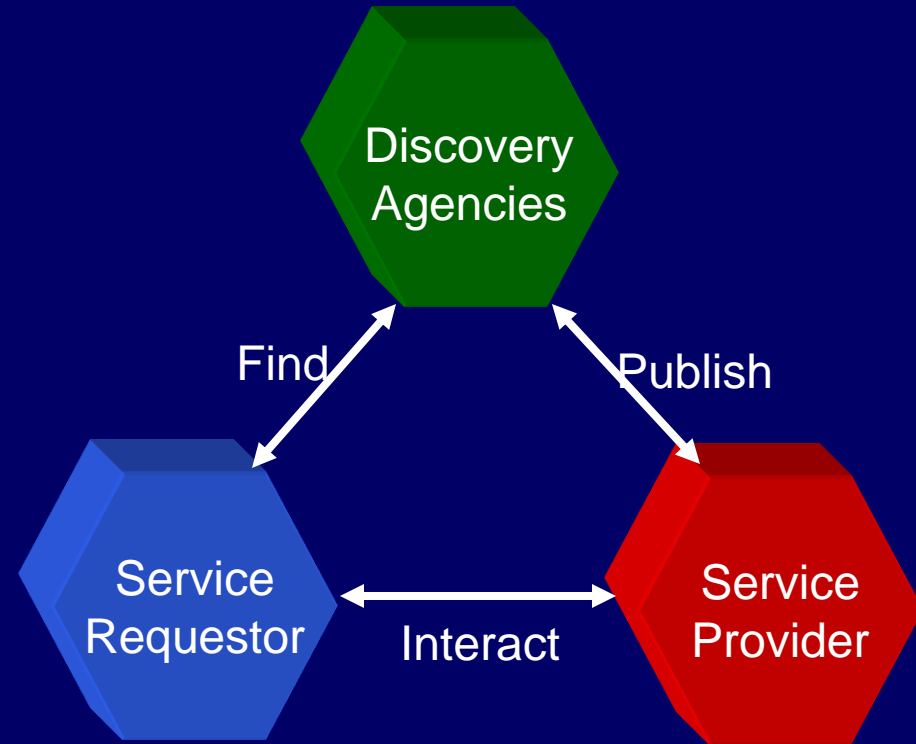


# DICOM SR Documents in XML

- **exchange radiology reports and related data easily across the healthcare enterprise**
- **make radiology reports concurrently:**
  - machine processable
  - human readable
  - web enabled
- **data integration with general purpose research and academic tools**

# What are Web Services?

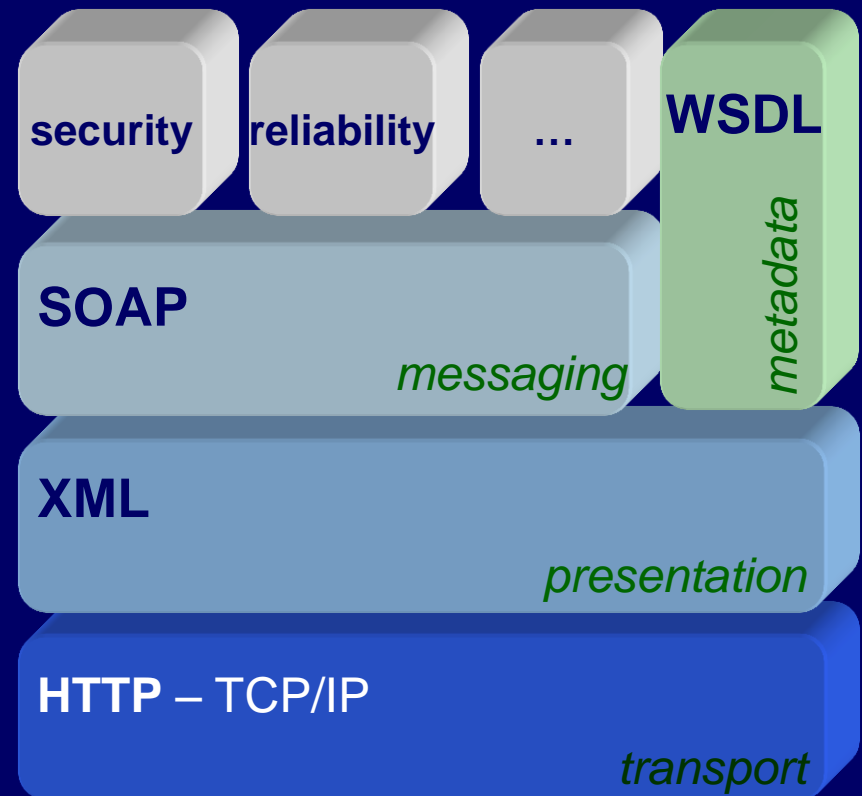
- a middleware platform that facilitates program-to-program interactions
- is a URI-addressable software resource with certain functionality
- can be located by its registration in discovery agencies



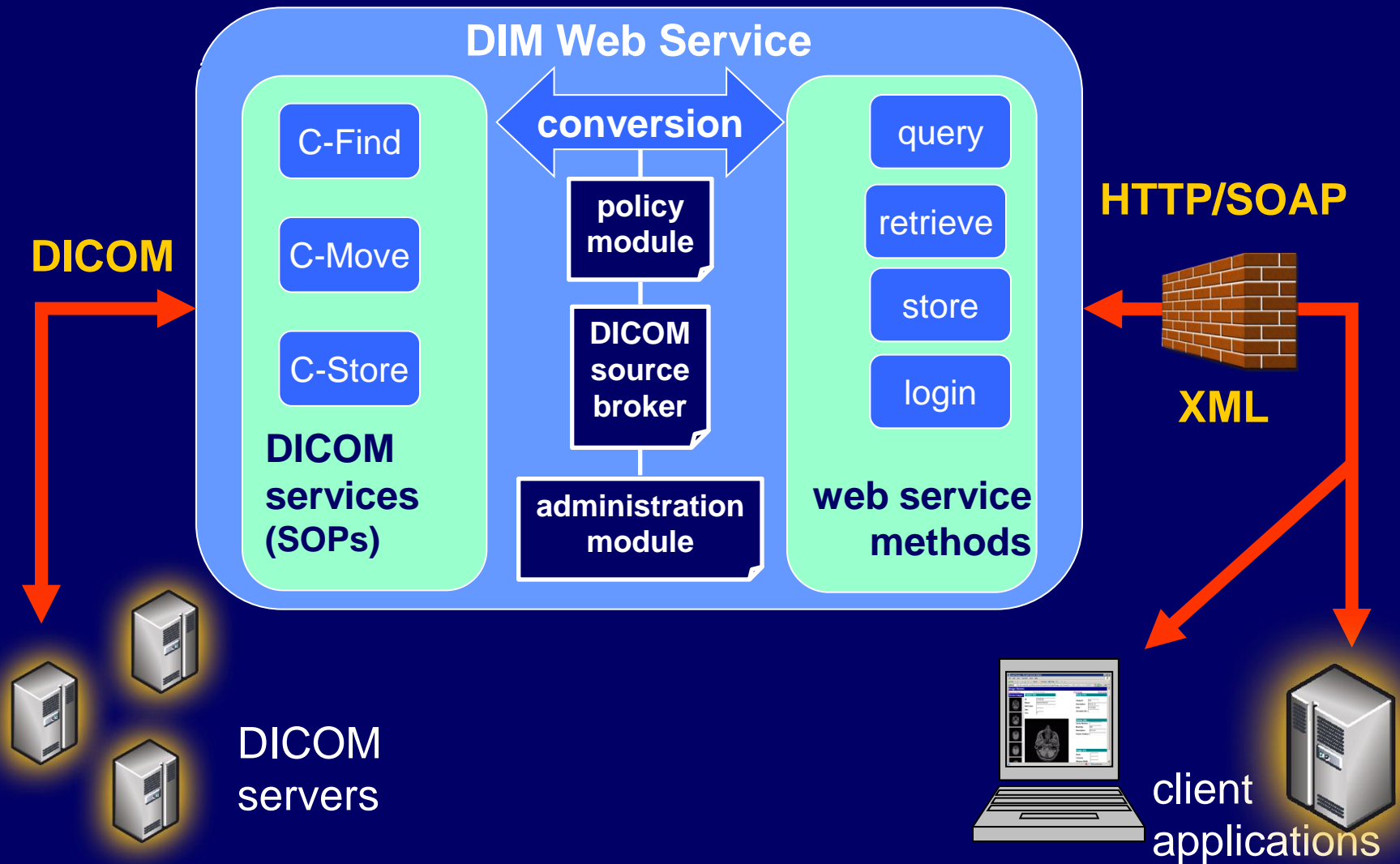
Service Oriented Architecture

# Web Services Technologies

- uses XML based messages conveyed by internet protocols
- offers a mechanism for the description of its own interface
- provides security mechanisms



# Web Service System Overview



# DIM Web Service Functionality

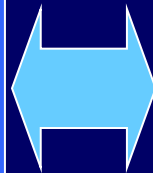
- **offers facilities to handle SR documents:**
  - search at different levels of the DICOM information model
  - retrieve in XML format
  - store as DICOM
- **supports various access policies based on predefined user roles**
  - user authentication
  - different access levels

# DICOM SR to XML

- look-up table for DICOM-to-XML tag translation
- XSLT transformation to convert to another XML schema

## DICOM SR Document

```
...  
(0040,a730)  
(0040,a010) - "CONTAINS"  
(0040,a040) - "TEXT"  
(0040,a043)  
(0008,0100) - "121060"  
(0008,0102) - "DCM"  
(0008,0104) - "History"  
(0040,A160) - "67 year old  
male ... "  
...
```



## XML SR Document

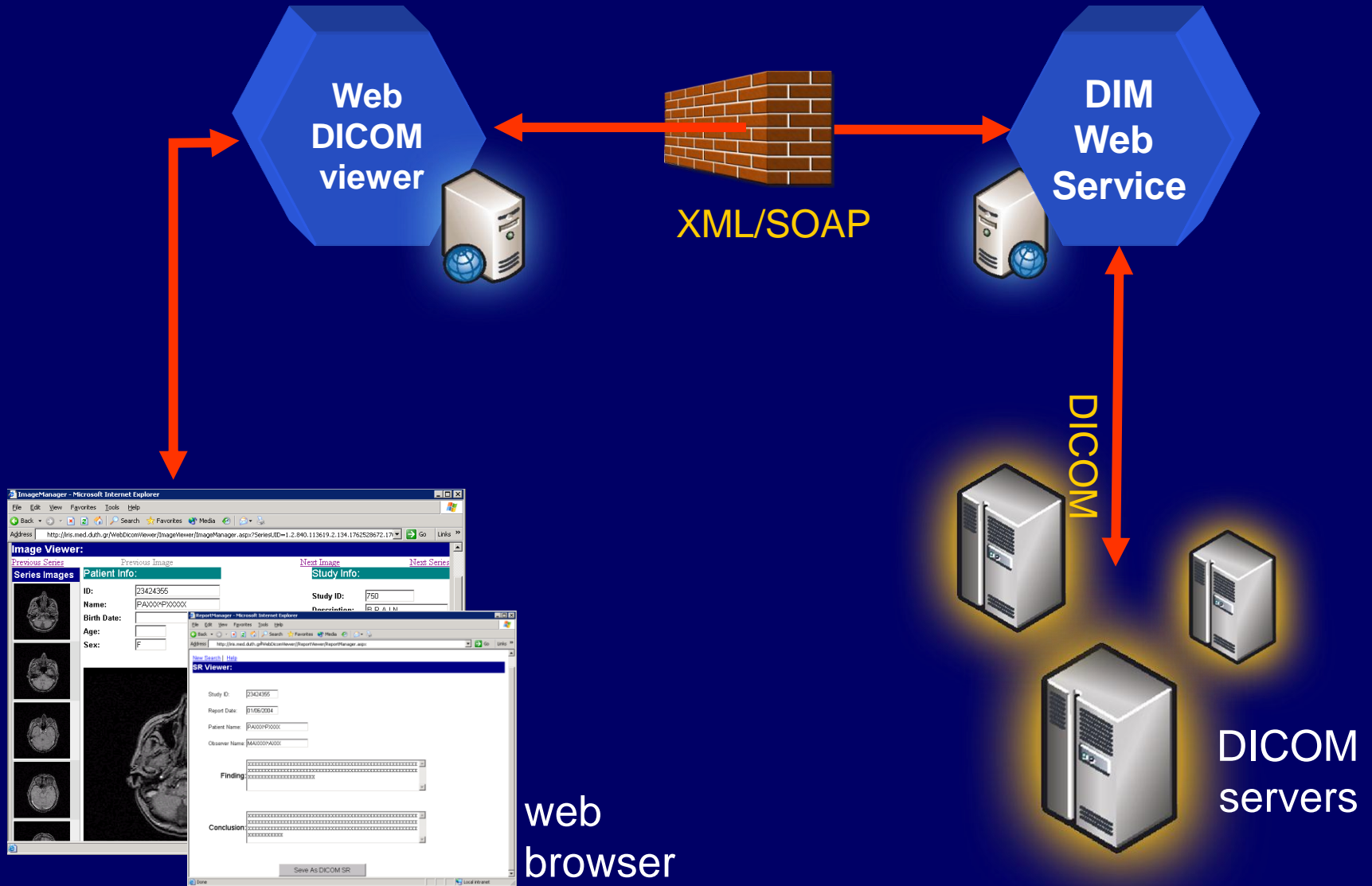
```
...  
<contentSequence>  
  <documentRelationshipMacro  
    relationshipType="CONTAINS" />  
  <documentContentMacro  
    valueType="TEXT"  
    textValue="67 year old male... " >  
    <conceptNameCodeSequence  
      codeValue="121060"  
      codingSchemeDesignator =  
        "DCM"  
      codeMeaning="History" />  
    </documentContentMacro>  
</contentSequence>  
...
```



# Implementation Issues

- **technologies**
  - C# (MS .Net Framework 1.1)
  - DicomObjects 4.1 (Medical Connections)
  - XML/SOAP
- **system requirements**
  - MS Internet Information Server >5.x
  - MS .Net Framework 1.1
  - MS SQL Server 2000 Desktop Engine (MSDE)
- **security**
  - SSL, user authentication

# Demo Application



# Towards Integration with Educational Tools

- **integration with data and medical images directly from DICOM sources**
- **assistance for dynamic teaching files generation**
- **easy development without prior knowledge of DICOM standard**
- **security on different levels**

# current work

towards a cluster of web services

- 1<sup>st</sup> tier: facades for legacy systems
- 2<sup>nd</sup> tier: added value services:  
data mining & knowledge extraction

# Conclusion

**a web service to support communication and integration of DICOM SR servers with other applications using internet standards**

- teaching file authoring tools**
- internet based medical e-learning environments**
- medical research support tools**
- medical expert systems**
- other healthcare information systems**

# Acknowledgements

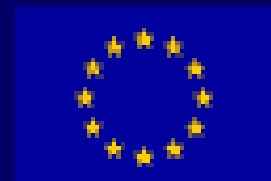
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## **cite as**

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