



Specialised repository;
on the storing standards of scientific and educational content

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[Outline

- **Importance of multimedia content;**
 - case: Institute of Physics
- **Repository**
 - Solution for storing and reuse of scientific and educational content
 - Organisational aspects (centralised, decentralised, general, specialised)
- **Learning objects**
 - Description by metadata
- **Storing standards**
 - Categories and attributes (IEEE LOM, MERLOT)
 - Extending the LOM: classification schemes
- **Conclusions**

[Problems of storing, search, reuse]

- **Most of content produced at IF is stored by owners at their personal computers**
 - Content is not accessible by other users
 - Content is stored in unsystematic fashion and extremely difficult to locate (even by owners)
 - Great risk of losing the content
- **Some of the content is highly integrated and difficult to reuse**
 - Diploma works, PhD – some parts have a general educational value
 - User have no expertise to extract segments of multimedia (web pages, movie clips...)

[Repository]

Solution for efficient storage, search and reuse of digital content

- **Repositories** are collections of learning objects that have well defined user interfaces and architectures that make them easy to store and search digital content.
 - Online search engines that search the whole web bring back **too many results**
 - increase visibility of content
 - stimulate authors to make their content **accessible** for other users

- With respect to web catalogs, repositories offer possibility to search the content according to **pedagogical characteristics** i.e. with respect to their role in educational process.
 - specification of **primary audience**
 - whether **assignments** are available or not

[Repository]

Indicator of scientific production

- Repository of digital educational content **is indicator of production** (scientific and educational content) of a particular institution, society.

Webometrics Ranking of World Universities

<http://www.webometrics.info/>

Webometric indicators are provided to show the commitment of the institutions to Web publication and to the worldwide Open Access to knowledge.

*If the web performance of an institution is below the expected position according to their academic excellence, university authorities should reconsider their web policy, **promoting substantial increases in the volume and quality of their electronic publications.***

[Repository]

Stimulates new approach to course development

- Repositories can greatly increase dissemination and **access to research results** that can be used in educational process.
- Repositories can influence the way higher education institutions use educational content (shearing, reuse).
- Advances application of e-learning
- Repositories are organised also to **decrease the costs** and time of online course development

[Organisational aspect]

- Organisation of repository with respect to: *where a content is stored*
 - **CENTRALISED:** stores original content and accompanying metadata
 - **DECENTRALISED:** stores metadata and links to original data
 - **HYBRID:** combination of centralised and decentralised approach

Centralised repository

MIT Open CourseWare



The screenshot shows the MIT OpenCourseWare website interface. At the top, the logo for MIT OpenCourseWare is on the left, and navigation links for OCW HOME, COURSE LIST, ABOUT OCW, HELP, and FEEDBACK are on the right. A search bar is located on the left side of the page. The main content area is titled "Chemical Engineering" and includes a breadcrumb trail: "MIT OpenCourseWare > Chemical Engineering". The page features two paragraphs of text describing the department's mission and program focus, followed by a link to the department's website. On the right side, there is a graphic titled "The Nucleus of Discovery" which depicts a hand holding a white cross-shaped puzzle piece. This central piece is surrounded by several overlapping circles, each labeled with a different field of study: Mathematics, Physics, Computer Science, Electrical Engineering, Mechanical Engineering, Civil Engineering, Biology, Chemistry, and Materials Science. The text "The Nucleus of Discovery" is positioned above the hand.

MITOPENCOURSEWARE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

OCW HOME | COURSE LIST | ABOUT OCW | HELP | FEEDBACK

Search
GO
▶ [Advanced Search](#)

- ▶ [Aeronautics and Astronautics](#)
- ▶ [Anthropology](#)
- ▶ [Architecture](#)
- ▶ [Athletics, Physical Education and Recreation](#)
- ▶ [Biological Engineering](#)
- ▶ [Biology](#)
- ▶ [Brain and Cognitive Sciences](#)
- ▶ [Chemical Engineering](#)
- ▶ [Chemistry](#)
- ▶ [Civil and Environmental Engineering](#)
- ▶ [Comparative Media Studies](#)
- ▶ [Earth, Atmospheric, and Planetary Sciences](#)

▶ [MIT OpenCourseWare](#) ▶ [Chemical Engineering](#)

Chemical Engineering

The mission of the Department of Chemical Engineering is to be the global leader in chemical engineering education and research. We train students to be the best in shaping and solving complex problems, particularly the translation of molecular information and discovery into products and processes.

Our programs are enriched by an emphasis on leadership; fundamental understanding of physical, chemical, and biological processes; engineering design and synthesis skills; and interdisciplinary perspectives on technological, economic, and social issues. Our focus is education.

For more information, go to <http://web.mit.edu/cheme/>.



The Nucleus of Discovery

PHYSICS
COMPUTER SCIENCE
ELECTRICAL ENGINEERING
MECHANICAL ENGINEERING
CIVIL ENGINEERING
BIOLOGY
CHEMISTRY
MATERIALS SCIENCE
CHEMICAL ENGINEERING

Photo illustration by Greg Sands.

Decentralised repository

Multimedia Educational resource for Learning and Online Teaching

MERLOT
Multimedia Educational Resource
for Learning and Online Teaching

Search Materials:
[advanced search](#) | [search more digital libraries](#) | [search tips](#)

[join now](#) | [log in](#)

[Home](#) | [Communities](#) | **[Browse Materials](#)** | [Contribute Material](#) | [Member Directory](#) | [Help](#)

Browse Materials by Subject

Click on the ▶ symbol to see sub-categories. Click on the category name to see items in that category.


Browse Path: [All](#) > Science and Technology


Agriculture (62)	Astronomy (183)	▶ Biology (1236)
▶ Chemistry (436)	▶ Computer Science (515)	▶ Engineering (401)
Geology (210)	General Science (112)	▶ Health Sciences (528)
▶ Information Technology (782)	▶ Nanotechnology (172)	▶ Physics (1616)
▶ Fire Safety (4)		

Results Path: [All](#) > Science and Technology


5899 Material Matches: *Default sort order by rating* Sub-Search:
Items 1 - 10 shown Resort by: Rating [advanced sub-search](#)

[Physlets](#) (Collection)
Author: Wolfgang Christian
Educational physics applets designed to be scripted in JavaScript for use in quizzes, homework
Location: <http://webphysics.davidson.edu/Applets/Applets.htm>
Added: Mar 14, 1998

 [Peer Reviews](#) (1) avg. ★★★★★
[Member Comments](#) (3) avg. ★★★★★
[Assignments](#) (3)
[Collections](#) (24)



[Virtual Chemistry Laboratory](#) (Simulation)
Author: The IrYdium Project, David Yaron
Here's your chance to mix chemicals without wearing safety goggles. You won't spill any acid on the

 [Peer Reviews](#) (1) avg. ★★★★★
[Member Comments](#) (none)
[Assignments](#) (1)
[Collections](#) (57)

[General vs. specialised]

CARNet's document suggest two scenarios for the organisation of repositories at national level:

- Repository associated with National and University Library (NSK)
 - Provide access to all resources of general interest (e.g. diploma works, PhD)

- Specialised repositories supported by “System of Scientific Information” (SZI <http://www.szi.hr/>)
 - **SZI goal:** transform specialised libraries into information centres that would process information, provide searching facilities and access to information of scientific and academic value.
 - Specialised repositories can greatly increase effect of **cross-fertilization** between different scientific disciplines

[Software solutions]

- **A Guide to Institutional Repository Software**
Open Society Institute
<http://www.soros.org/openaccess/software/>
- They are available via an Open Source license—that is, they are available for free and can be freely modified, upgraded, and redistributed.
- They comply with the latest version of the **Open Archives Initiative metadata harvesting protocols**—this OAI compliance helps ensure that each implementation can participate in a global network of interoperable research repositories.
- - Implementation Guidelines for the Open Archives Initiative Protocol for Metadata Harvesting
 - *<http://www.openarchives.org/OAI/2.0/guidelines-repository.htm>*

Learning Objects

■ Learning object

- A learning object is an object or set of resources that can be used for **facilitating intended learning outcomes**, and can be **extracted and reused** in other learning environments. (*)
- Learning object is defined as **any entity** - digital or non digital - that **may be used for learning**, education or training (\$)

■ Information object(*)

- The intent of a learning object's designer is **to facilitate learning**, while information objects are designed to be a reference, and not necessarily for the purpose of retaining skills or concepts by the user.

What distinguishes an educational resource from other types of resources?

(*) *Sandy Mills AliveTek, Inc.*

(§) *Phil Baker, Institute for Computer Based Learning*

Description of LO by metadata

Metadata are “data about data” – information about digital object that are used to describe learning object and facilitate easier search.

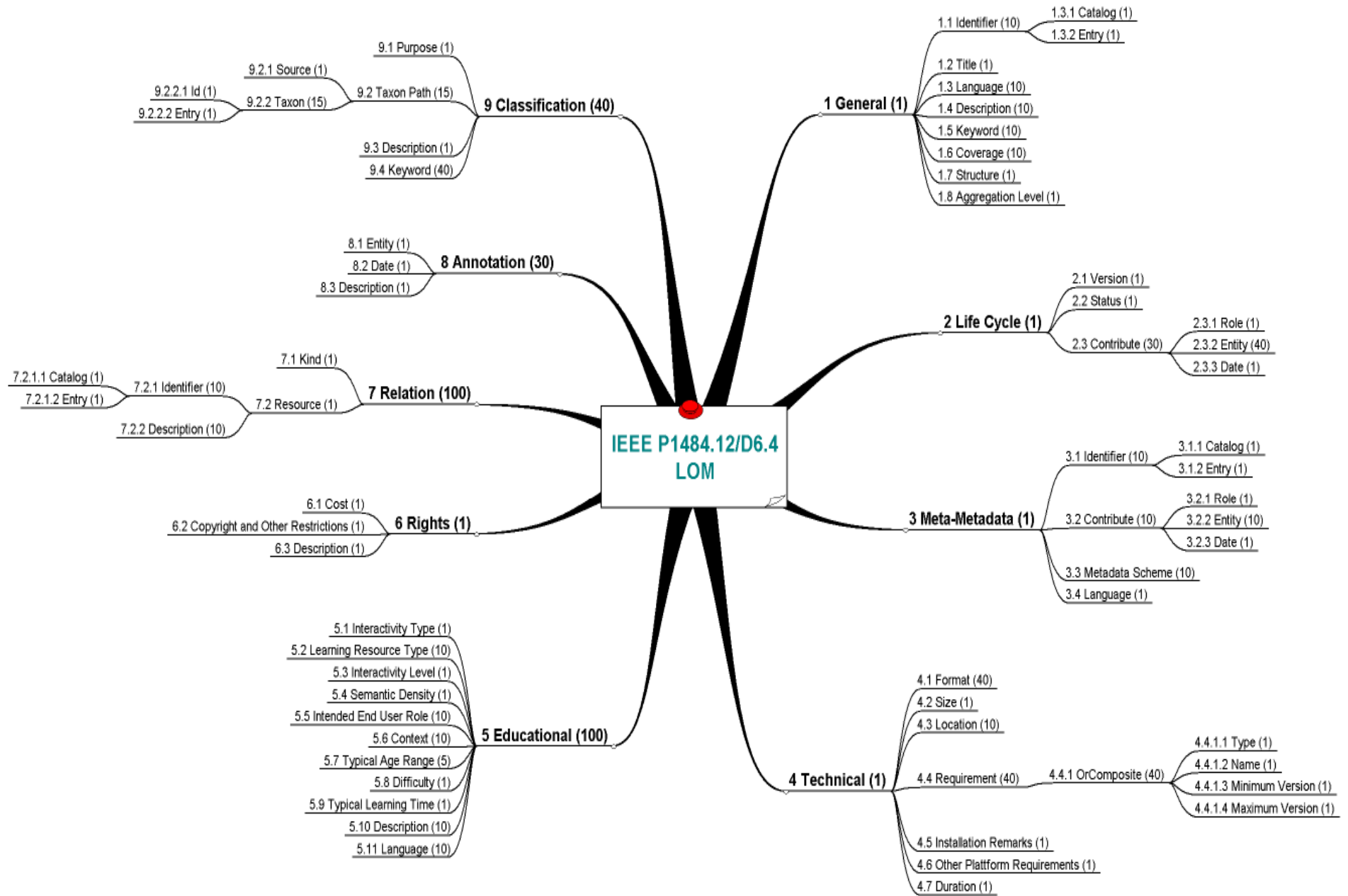
Educational resources are indexed using information grouped into several categories that describe their general, semantic, pedagogical and technical properties.

[Metadata standards]

- **IEEE LOM (Learning Object Metadata) 1484.12.1**
- Built on work undertaken by:
 - US IMS Project (now IMS Global Learning Consortium).
 - EU ARIADNE Project (now ARIADNE Initiative).
 - Dublin Core Metadata Initiative.

- Standard IEEE LOM is complex and it contains nine categories
 - General
 - Lifecycle
 - Meta-metadata
 - Technical
 - Educational
 - Rights
 - Relation
 - Annotation
 - Classification

- **MERLOT (Multimedia Educational Resource for Learning and Online Teaching)**
 - Standard IEEE LOM is complex in its structure and has several fields that are not obligatory.
 - In practice it is not necessary to use all elements allowed by standards. CARNet's paper suggests reduced implementation used by MERLOT.



Overview of LOM draft 6.4

The numbers in parenthesis show the multiplicity of the element. Numbers greater than 1 indicate the smallest permitted maximum of entries an implementation must allow. This mind map was prepared by Thomas Herrmann, Teleteach GmbH, Germany. Please send any comments to th@teleteach.de

Advanced Search For Materials

Search Options

• **General Search:**

Search for: all words any words exact phrase

Enter values for specific fields below:

Subject Category:

Sub - Category:

Material Type:

Title or Name:

Content URL:

Description:

Primary Audience:

Technical Format:

Learning Management System Compatibility:

Language of Material: please enter the two letter [ISO 639-1 code](#) in the text box to search for a specific language.

Section 508 Compliant: yes

Cost for Use: no yes

Copyright Restrictions: no yes

Source Code Available: yes

Author's Name:

Author's Email:

Author's Organization:

Peer Reviews Available: yes

Minimum Panel Rating:

Member Comments Available: yes

Minimum User Rating:

Assignments Available: yes | [advanced assignment search](#)

Author Snapshot Available: yes [What's this?](#)

Restrict this search to the last days.

Fields used by the MERLOT Search:

For Materials Searches:

- Title
- Description
- Author
- Subject Category

For Members Searches:

- First Name
- Last Name
- Organization
- Address
- Phone
- Email
- Associations

[Specialised repositories]

Need for improved access to data

- Keyword searches have a tendency to return large amounts of irrelevant information
- The use of **classification schemes** offers one solution to providing improved access to repository resources
- Advantages of using classification schemes include
 - Improved subject browsing facilities
 - Potential multi-lingual access
 - Improved interoperability with other services.
 - Possibility of broadening and narrowing searches: classification schemes are hierarchical and therefore can be used to broaden (i.e. for improved recall) or narrow a search when required.

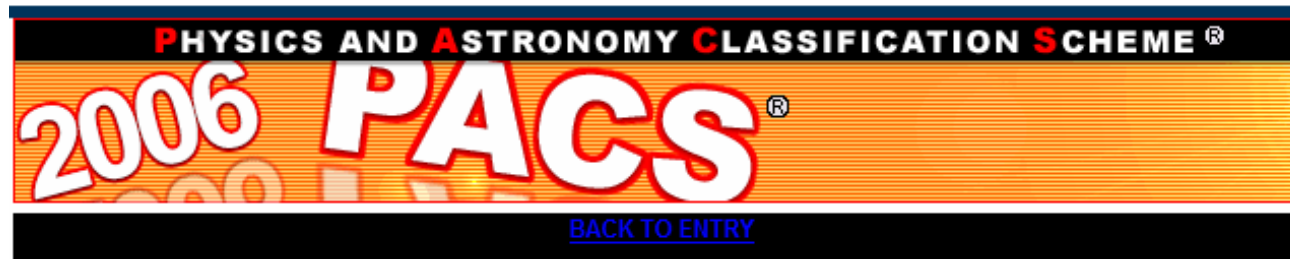
[classification schemes]

- **classification schemes** group documents into a hierarchical structure of subject categories
- Classification schemes vary in scope and methodology, but can be divided into universal, national general, subject specific and home-grown schemes.
- **GENERAL:** Dewey Decimal Classification (DDC); Universal Decimal Classification (UDC); Library of Congress Classification (LCC);
- **SUBJECT SPECIFIC:** Physics and Astronomy Classification Scheme (PACS), National Library of Medicine (NLM); Engineering Information (Ei); Mathematics Subject Classification (MSC) and the ACM Computing Classification System (CCS).

Physics and Astronomy Classification Scheme

1931-2006
AMERICAN INSTITUTE OF PHYSICS
75 Years of Service

home



To connect to any category of PACS 2006, please click on the blue link of your choice, listed below.

A green background color has been used for all new codes.

- ▶ [PACS Category 00: General](#)
- ▶ [PACS Category 10: The Physics of Elementary Particles and Fields](#)
- ▶ [PACS Category 20: Nuclear Physics](#)
- ▶ [PACS Category 30: Atomic and Molecular Physics](#)
- ▶ [PACS Category 40: Electromagnetism, Optics, Acoustics, Heat Transfer, Classical Mechanics, and Fluid Dynamics](#)
- ▶ [PACS Category 50: Physics of Gases, Plasmas, and Electric Discharges](#)
- ▶ [PACS Category 60: Condensed Matter: Structure, Mechanical and Thermal Properties](#)
- ▶ [PACS Category 70: Condensed Matter: Electronic Structure, Electrical, Magnetic, and Optical Properties](#)
- ▶ [PACS Category 80: Interdisciplinary Physics and Related Areas of Science and Technology](#)
- ▶ [PACS Category 90: Geophysics, Astronomy, and Astrophysics](#)
- ▶ [Appendix to 43: Acoustics](#)
- ▶ [Appendix to PACS 91-94, 96: Geophysics](#)
- ▶ [Alphabetical Index](#)

Hierarchical structure of subject categories

70. CONDENSED MATTER: **ELECTRONIC STRUCTURE,**
ELECTRICAL, MAGNETIC, AND OPTICAL PROPERTIES

73. Electronic structure and **electrical properties of surfaces,**
interfaces, thin films, and low-dimensional structures

73.20.-r **Electron states at surfaces** and interfaces

73.22.-f **Electronic structure of nanoscale materials:** clusters,
nanoparticles, nanotubes, and nanocrystals

73.40.-c **Electronic transport** in interface structures

[Extending the LOM]

- LOM conceptual data schema may be extended by:
 - Adding new vocabularies to existing elements
 - Adding new elements.
- Current recommended practice is to use Category 9 ***Classification*** elements to accommodate extensions.
- By adding new terms to *Classification*. ***Purpose*** vocabulary and identifying **classification schemes** to describe these terms can accommodate characteristics not be covered elsewhere. (\$)

(\$) *Phil Baker, Institute for Computer Based Learning*

[Specialised repository]

case: Institute of Physics

Institute of Physics produces large amount of information that have **scientific and educational value** that are not visible and accessible even to institute's employees

- The goal is to organise repository of:
 - Scientific content in the field of **solid state physics, atomic, molecular and optics**
 - Educational content of related to the scientific expertise of the Institute
 - Educational material of **general interest**

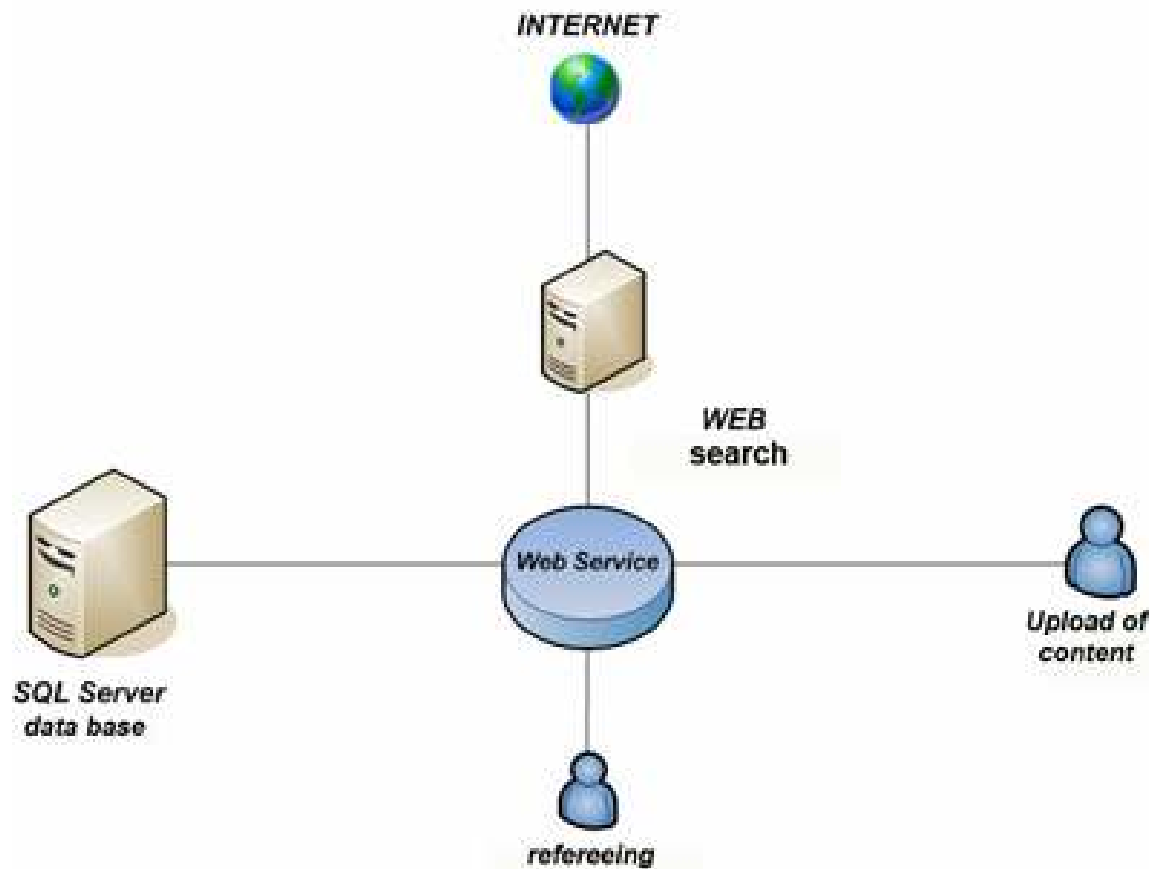
- It is planed to be centralised repository

- Implementation of IEEE LOM standards (MERLOT application)

- We will use **classification schemes** to improve access to repository resources

Institute of Physics repository

Centralised repository



Upload and search are executed through platform independent **WEB service**

Role of referee

(protection from junk LO)

All documents are uploaded with the status – **unpublished**.

Only referee can change the status to **publish or to delete** the content from the data base.

[Conclusions]

- Organisation of repositories (general and specialised) is necessary step to advance e-learning at all academic levels
- Repository should comply with the **Open Archives Initiative metadata harvesting protocols**
- IEEE LOM standard with MERLOT “reduction” is applicable for description of LO in most of repositories.
- The use of classification schemes offers one solution to providing improved access to resources of specialised repositories