

Renaissance of e-learning is here.  
It comes via standarts and new technologies.

---

Welcome to the workshop on:

# Connectivity



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Utrecht, February 2002

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## WebCT Technology basics

# Introduction :: About myself



- Background is in software development.
- Involved in distance learning since 1995.
- Working on Ph.D. thesis 'Alternative model of integrated LMS'.
- Heading a consulting company metalot.com.
- Technology solutions for a number of EU e-learning projects.
- Since year 2000 working in partnership with Lerneffekt.de.  
During this time created such WebCT tools and extentions as:
  - Formulars for WebCT 3.x,
  - Community Content Manager for WebCT 3.x,
  - Language pack Cross-version Checking Tool for WebCT 3.x, ...

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## WebCT Technology basics

# Introduction :: About you

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- What is your name?
- Where do you come from and what is your background?
- What is your experience with WebCT?
- What are your expectations of this workshop?

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## Connectivity

# Introduction :: Connectivity means ...

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- Connectivity for LMS translates to:
  - Content portability, convertibility,
  - User portability,
  - LMS, Intranet, e-commerce system integration.

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# WebCT Technology basics

## Contents

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- 1<sup>st</sup> part: e-learning standarts and WebCT,
- 2<sup>nd</sup> part: WebCT API's,
- 3<sup>rd</sup> part: WebCT large scale & integration solutions.
- 4<sup>th</sup> part: discussion.

Workshop resources:

<http://dev.lerneffekt.de/workshop/>

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WebCT Technology basics

## e-learning standarts :: Contents

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- Overview of existing standarts,
- More details: IMS standart.

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# Overview of existing standards

## WebCT Technology basics

# Overview of existing standards

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- IMS (<http://www.imsglobal.org>)
- SCORM (<http://www.adlnet.org>)
- AICC (<http://www.aicc.org/>)
- ARIADNE (<http://www.ariadne-eu.org/>)
- DUBLINCORE (<http://www.dublincore.org/>)
- CAN-CORE (<http://www.cancore.org>)
- ...

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## Connectivity

# XML :: Basic points

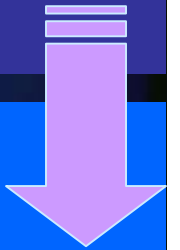
- XML is aimed for:
  - structuring data,
  - separating semantics, layout and content.
- XML is a verbose license free standart.

### Lesson1.html

```
<HTML>
<BODY>
<H1>Lesson1::Step1</H1>
<H2>HTML function</H2>
<P>HTML mixes all (content, layout
and code) into a single
document.</P>
</BODY></HTML>
```

### Lesson1.xml - a content file

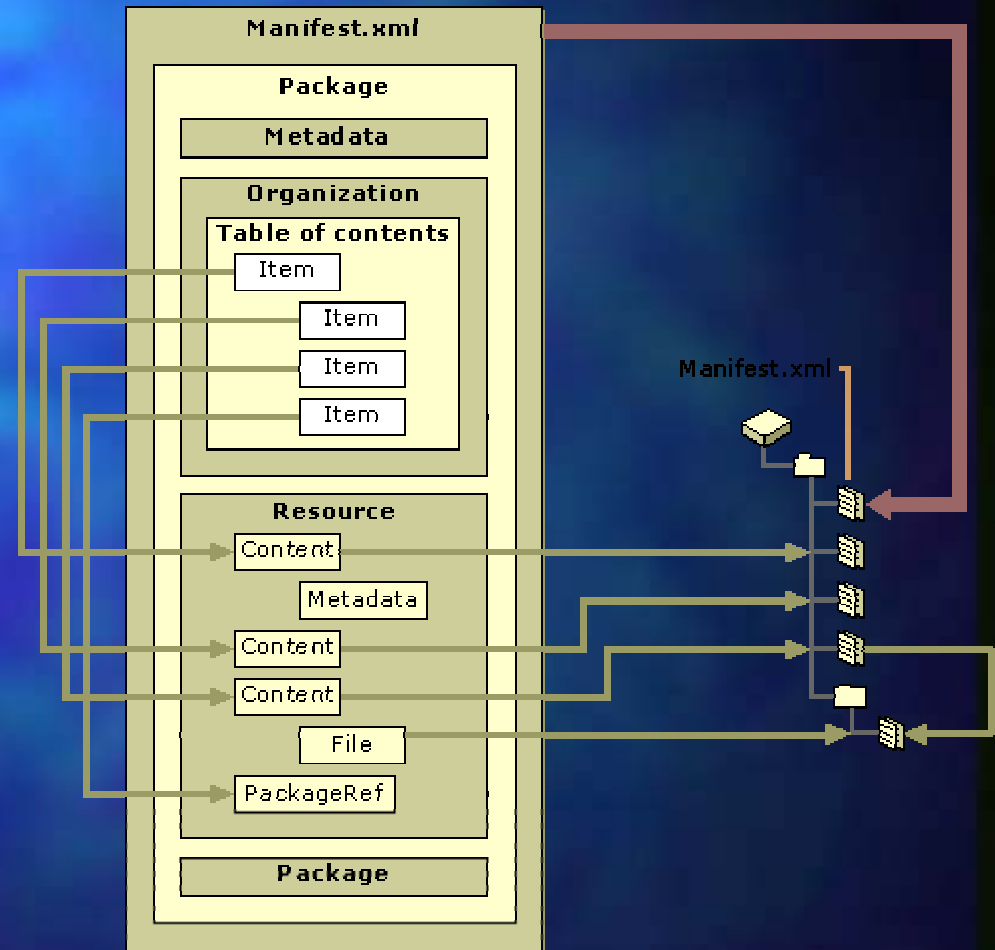
```
<LESSON>
<NUMBER>1</NUMBER>
<STEP>
<NUMBER>1</NUMBER>
<TITLE>XML function</TITLE>
<TEXT>XML separates layout and
information</TEXT>
</STEP>
</LESSON>
```



# Connectivity

## SCORM :: Components

- SCORM:
  - Content Aggregation Model (CAM),
  - Meta-data,
  - Content packaging.



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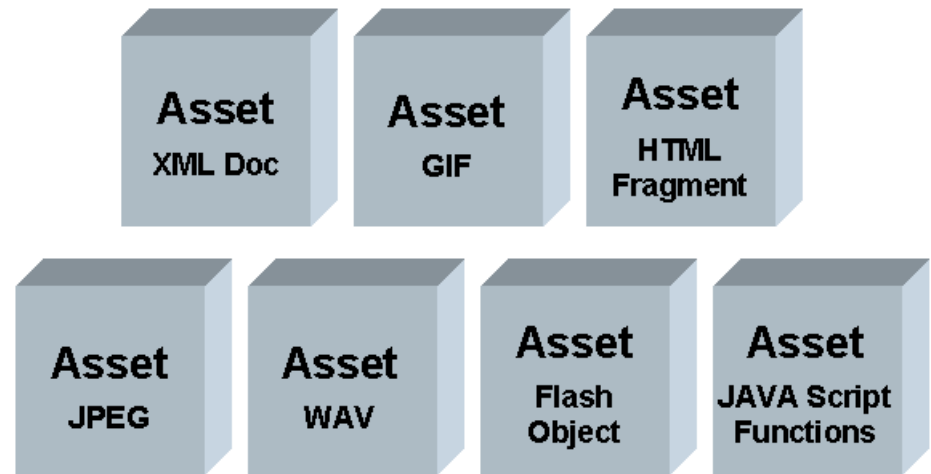
Connectivity

# SCORM :: Content Aggregation Model

## ■ Content Aggregation Model defines:

- Assets,
- Sharable Content Objects (SCO),
- Content Aggregation.

```
<!-- content.htm -->  
api = getAPI();  
var result = api.LMSInitialize("");  
var val = api.LMSGetValue("cmi.abc.xyz");
```



```
var result = api.LMSFinish("");
```

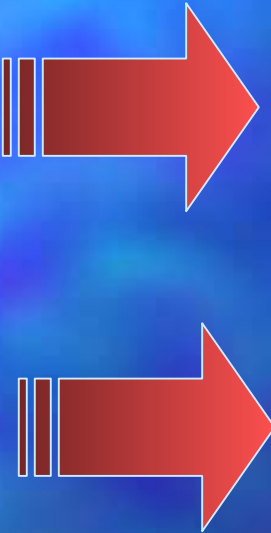
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## Connectivity

# Standarts overview :: Summary

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- There is a great hurry to develop e-learning systems which have content and layout separation.
  - Standarts use parts of other standarts.
  - Stable fundament,
  - IMS - the most comprehensive standart,
  - WebCT implements an increasing IMS standart feature set.
- 
- Different simplifications appear (CANCORE, DUBLIN-CORE etc.) to speed development,
  - Standarts merge using best practice criteria.

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# More details: IMS standart

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# IMS :: Overview

---

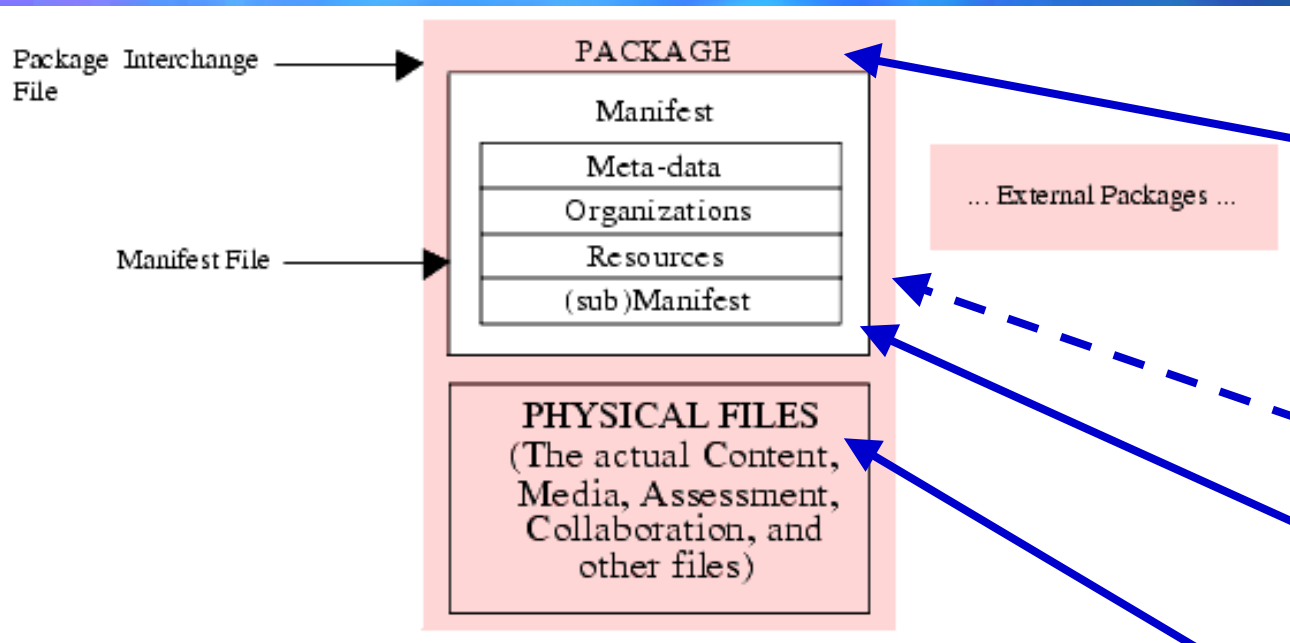
- Content Packaging
- Meta-Data
- Learner Information Package
- Question & Test Interoperability
- Enterprise
- Accessibility
- Competencies
- Learning Design

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# Connectivity

## IMS :: Content packaging :: Package



### Key elements:

- Package Interchange File,
- Package,
- Top-level Manifest,
- Physical Files.

<http://www.imsproject.org/content/packaging/index.html>

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# Connectivity / IMS :: Content packaging

## Definition elements:

- Meta-data,
- Organization,
- Resources.

```
<?xml version="1.0"?>
<manifest [identification]>
  <metadata>
    <schema>IMS Content</schema>
    <schemaversion>1.1.2</schemaversion>
    <imsmd:lom> <imsmd:general> <imsmd:title>
    <imsmd:langstring xml:lang="en-US">N1</imsmd:langstring>
    </imsmd:title> </imsmd:general> </imsmd:lom>
  </metadata>
  <organizations default="TOC1">
    <organization identifier="TOC1" structure="hierarchical">
      <item identifier="ITEM1" identifierref="R1">
        <title>Lesson 1</title>
        <item identifier="ITEM2" identifierref="R2">
          <title>Introduction 1</title>
        </item>
        ...
      </item>
      ...
    </organization>
  </organizations>
  <resources>
    <resource identifier="R1" type="webcontent" href="l1.htm">
      <file href="l1.htm"/>
    </resource>
    ...
  </resources>
</manifest>
```



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# IMS :: Question & Test Interoperability

---

- Standards for: question, test and result.
- Question types according input:
  - Logical identifier,
  - X-Y coordinates,
  - String (text),
  - Numeric.
- QTI Specification 1.2:  
<http://www.imsproject.org/question/>

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# WebCT support for IMS

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- Content Packaging
- Meta-Data
- Learner Information Package
- Question & Test Interoperability
- Enterprise
- Accessibility
- Competencies
- Learning Design

Full support

Space to improve

Specs not fully stable

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# Questions to resonate:

Why are standards so important?

What are the benefits of standardization?

What is the future of e-learning standards and LMS?

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WebCT Technology basics

## e-learning standarts :: Contents

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Overview of existing standarts,



More details: IMS standart.

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# Connectivity Contents

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- ✓ 1<sup>st</sup> part: e-learning standards and WebCT,
- 2<sup>nd</sup> part: WebCT API's,
- 3<sup>rd</sup> part: WebCT large scale & integration solutions.
- 4<sup>th</sup> part: discussion.

Web based version: <http://www.metalot.com/utrecht2002/>

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Connectivity

# WebCT API's :: Contents

---

- Standart API,
- IMS Enterprise API,
- IMS Content Migration Utility.

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# WebCT Standart API

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WebCT API's

# WebCT API :: Features

---

- LMS data manipulation:
  - user management (global and course databases),
  - **content management,**
  - **test and question management.**
  
- Pros:
  - backward compatibility,
  - well known data manipulation techniques.
  
- Cons:
  - less possibilities,
  - no standart compatibility.

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WebCT API's

# WebCT API :: Functions

---

## ■ User data manipulation:

- add,
- delete,
- change id,
- update,
- find,
- find WWUI (WebCT Unique Universal Identifier),
- find IMS ID,
- add from file,
- delete from file,
- change from file.

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## WebCT API's

# WebCT API :: Web based access

---

- Shared secret - a part of system identity and security,
- Creating Message Authentication Codes (MAC),
- Assembling HTTP request.

### Syntax:

<GET | POST>

```
/webct/public/serve_webctdb?OPERATION=<operation>&DB=<db>&
COURSE=<course_id | placeholder> &AUTH=<32_byte_mac>
[&User%20ID=<user_id> | &WebCT%20ID=<webct_id>]
[&IMS%20ID=<ims_id>] [&USER%20TYPE=<1_or_0>]
[&ENCRYPTED=<1_or_0>]
[&field1=<field1>] [&fieldn=<fieldn>] HTTP/1.0
```

WebCT API's

## WebCT API :: Possible solutions

---

- E-learning portal with e-commerce features,
- LDAP and WebCT database synchronization tool,
- Campus DBMS gateway to WebCT,
- ...

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Connectivity

# WebCT API's

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- ✓ Standart API,
- IMS Enterprise API,
- IMS Content Migration Utility.

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# WebCT IMS Enterprise API

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WebCT API's

# WebCT IMS Enterprise API :: Features

---

- LMS data manipulation:
  - user management (global and course databases),
  - **content management,**
  - **test and question management.**
  
- Pros:
  - better optimization,
  - standart compatibility,
  - more functionality.
  
- Cons:
  - Not 100% full IMS Enterprise implementation.

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## WebCT API's

# WebCT IMS Enterprise API :: Overview

---

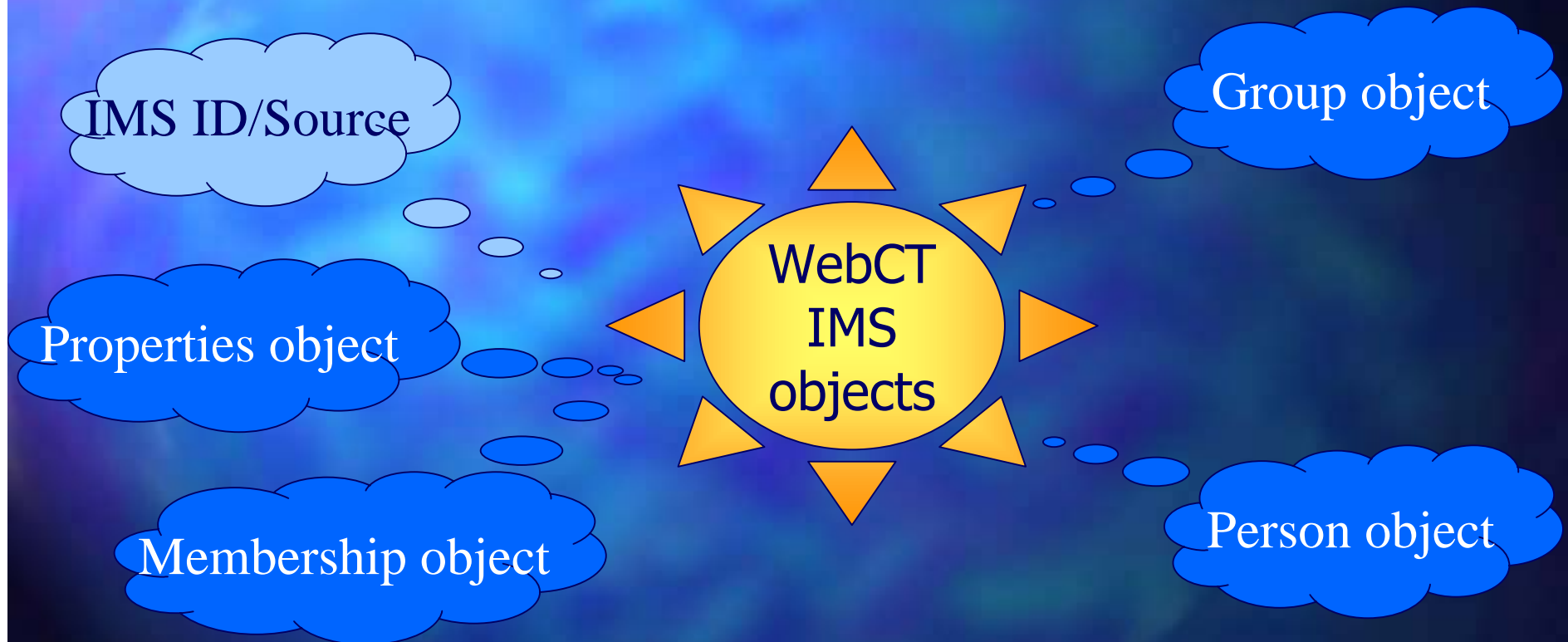
- Import:
  - Create/modify/delete course instances,
  - Create/modify/delete course users,
  - Register/unregister users from courses.
- Export:
  - Create descriptor (XML) of all user, course, and course membership information.
  - Create descriptor (XML) for student,
  - Create descriptor (XML) for student progress (grades midterm and final),
- Configure:
  - Add/update IMS data: IMS Source, IMS ID etc.

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WebCT API's

# WebCT IMS Enterprise API :: Objects



Technical reference guide, page 25

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WebCT API's

# WebCT IMS Enterprise API :: Functions

---

- Modification object XML description file,
- Modification actions:
  - import,
  - export,
  - configure.
- Action options:
  - import: restrict, unrestrict,
  - export: snapshot, person\_record, group\_record, group\_final\_grades, group\_midterm\_grades,
  - configure: set\_group\_ims\_info, import\_group\_ims\_info, get\_person\_ims\_info.

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## WebCT API's

# IMS Enterprise API :: Web access

---

- Shared secret - a part of system identity and security,
- Creating Message Authentication Codes (MAC),
- Assembling HTTP request.

### Syntax:

<GET | POST>

```
/webct/ims/serve_ep_api.pl?ACTION=<action>&OPTION=<option>  
&TIMESTAMP=<unix_epoch_time> &AUTH=<32_byte_mac>  
[&INLINEMODE=<inlinemode>] [&COURSE=<course>]  
[&DATASOURCE=<datasource>] [&TARGET=<target>][&ID=<id>]  
[&SOURCE=<source>] [&SCTMODE=<sctmode>] HTTP/1.0
```

WebCT API's

# WebCT IMS Enterprise API :: Solutions

---

- Similar as with WebCT API, but more robust:
  - E-learning portal with e-commerce features,
  - LDAP and WebCT database synchronization tool,
  - Campus DBMS gateway to WebCT,
  - ...

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Connectivity

# WebCT API's

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- ✓ Standart API,
- ✓ IMS Enterprise API,
- IMS Content Migration Utility.

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# WebCT IMS Content Migration Utility (CMU)

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Integration & API's

# WebCT IMS Content Migration Utility

---

- IMS Content Migration Utility (IMS CMU) - WebCT step toward Shared Content Objects.
- Support for:
  - Content Packaging Specification Version 1.1,
  - Question and Test Interoperability Specification Version 1.1,
  - Meta-data Specification 1.2.

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## Connectivity

# WebCT support for IMS

---

- Content Packaging (WebCT IMS CMU)
- Meta-Data (WebCT IMS CMU)
- Learner Information Package
- Question & Test Interoperability (WebCT IMS CMU)
- Enterprise (IMS Enterprise API) **Full support**
- Accessibility **Space to improve**
- Competencies **Specs not fully stable**
- Learning Design

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## WebCT API's

# WebCT IMS Content Migration Utility

### Can Import/Export

- an empty course,
- a course that includes content for the following tools: **Content Module, Glossary, Syllabus, Quiz, Self Test.**
- a course that includes any or all of the following: **Organizer Pages, WebCT tools, data files containing content for Content Module, Glossary, Syllabus, Quiz, and Self Test; properties files for course, Homepage, Organizer Pages, Content Module, Quiz tool, individual quiz, individual assignments.**

### Can not Import/Export

- Content for the following tools: **Assignment, Calendar, Cdrom, Chat, Discussions, Image, Database, Index, Mail, My Grades, My Progress, Student Presentation, Student Homepages, Student Tips, Whiteboard,**
- individual **Organizer Pages and WebCT tools,**
- individual files containing content for tools,
- individual properties files,
- any student or teaching assistant data,
- any information that depends on the type of user or time of delivery.

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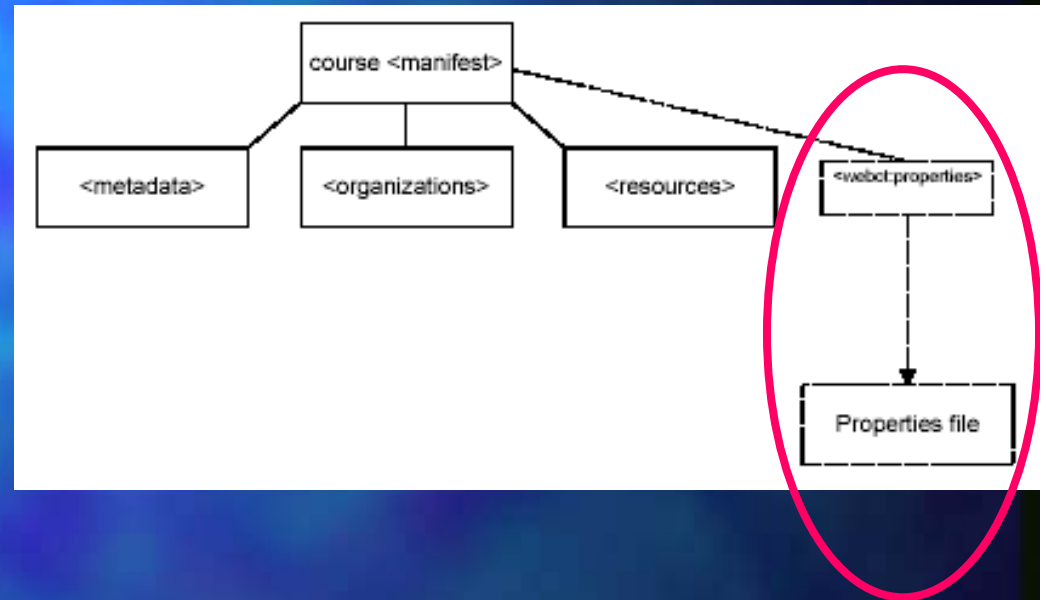
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## WebCT API's

# WebCT IMS CMU :: IMS extensions

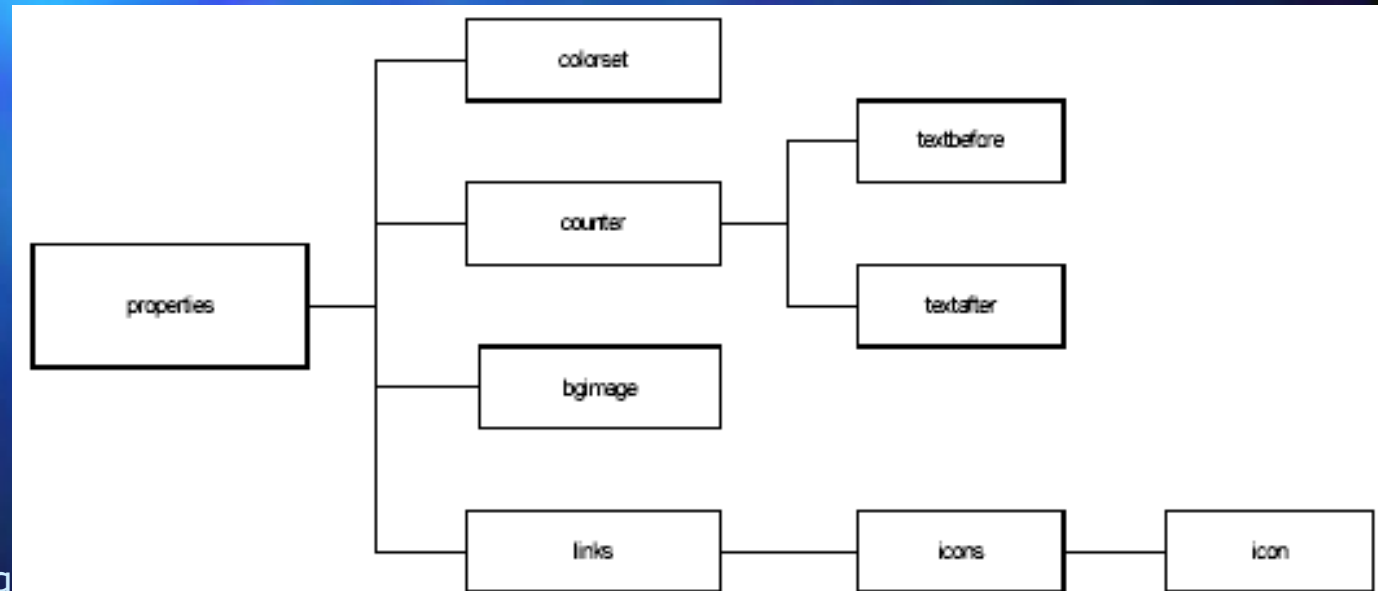
- `<webct:properties>`,
- QTI `<PRESENTATION>` element extensions,
- `<resprocessing>`,
- Extension for short answer questions:  
`<webct:x_webct_v01_var regex>`.



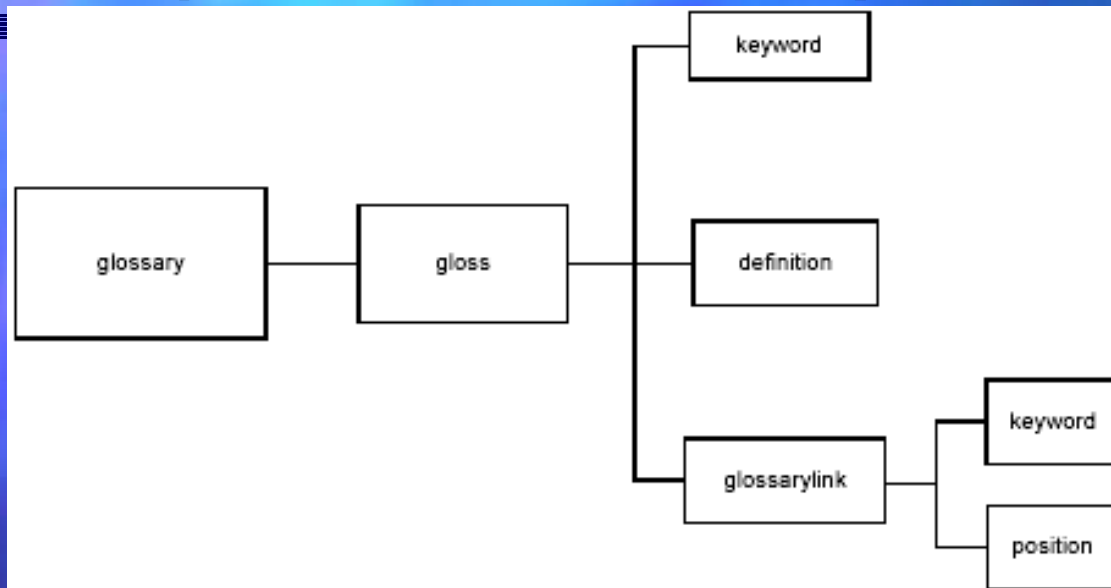
WebCT API's :: IMS CMU :: Samples

## <webct:properties> :: Colorset

```
<colorset type="Content" name="Custom"  
bgcolor="#FFFFFF" textcolor="#000000"  
vlinkcolor="#660066" linkcolor="000099"/>
```



# WebCT API's :: IMS CMU Samples :: Glossary



```
<gloss><keyword>visual file</keyword>  
<definition> include image files.</definition>  
<glossarylink>  
  <keyword>image</keyword> <position>2</position>  
</glossarylink></gloss>
```

```
<manifest ...  
<metadata>  
...  
</metadata>  
<organizations>  
...  
</organization>  
</organizations>  
<resources>
```

```
<resource  
  identifier="GLY_2825747"  
  type="webctglossary">  
<file  
  href="COURSE_2825622_M/  
  data/GLY_2825747.xml"/>  
</resource>  
</resources>  
</manifest>
```

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WebCT API's

## IMS CMU :: Command line access

---

- IMS package import (compressed and uncompressed) ,
- IMS package export (compressed and uncompressed).

Syntax:

```
<webct_install_dir>/webct/webct/generic/ims/cp_api.pl -action=import  
-course=Biology101  
-pkgloc=test_packages/bio101.tgz  
-passwd=1234
```



IMS standart packages:  
zip, jar, tgz.

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WebCT API's

# WebCT IMS CMU & External tools

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- External tools:
  - Microsoft LRN 3.0  
(<http://www.microsoft.com/elearn>),
  - Macromedia Dreamweaver and Extentions,
  - Docent Outliner (<http://www.docent.com>),
  - NETg NLO+ (<http://www.netg.com/>),
  - few more,
  - more coming.

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# WebCT API's

# WebCT IMS CMU & MS LRN 3.0

<http://www.microsoft.com/elearn>

The screenshot displays two overlapping windows from the Microsoft Learning Resource iNterchange (LRN) 3.0 suite. The background window is the 'LRN Toolpad', which provides a central hub for managing course content. It features a list of tools on the left, including 'Convert Manifest File', 'Convert FrontPage Web', 'Convert PowerPoint Presentation', 'Edit Manifest File', 'Validate LRN Package', 'Open LRN Viewer', and 'Generate LRM File'. A descriptive text on the right explains that the LRN Toolpad is the point of access to all available LRN tools and provides a description of each function.

The foreground window is the 'Campus Demokurs - LHN Editor'. It shows a hierarchical tree view of course content on the left, organized into 'Manifest', 'Organizations', and 'Resources'. The right pane displays the details of the selected 'resource' element, showing its identifier (CMD\_3738072), type (webcontent), href (COURSE\_3738048\_M/my\_files/plattform.htm), and xml:base. Below this, a preview of the web content is shown, featuring a logo for 'Die Plattform WebCT' and a paragraph of text describing the 'Lerneffekt WBT' platform, which has been developed since 1994 and is used in various countries including France, Spain, Sweden, and Finland.

At the bottom right of the LHN Editor window, a diagram illustrates the interaction between the 'Nutzer' (User) and the 'Server und WebCT-Lerneffekt Plattform' (Server and WebCT-Learning Effect Platform). An upward-pointing arrow indicates the user's access to the platform, while two downward-pointing arrows represent the platform's delivery of content to the user.

WebCT API's

# WebCT IMS CMU :: Solutions

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- **Content operations (export, editing, import):**
  - Exporting existing WebCT course & editing content with external IMS compliant content editor,
  - Preparing stand alone IMS compliant SCO and integrating into existing course using external content packagers,
  - Importing content packages (courses) from other IMS compliant environments.
  
- **Integration to other tools, environments:**
  - External content processing in real-time,
  - Exports for external data manipulations, statistical analysis etc.
  - ...

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WebCT API's

## WebCT IMS standart summary

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- IMS standart is developed to a stable working version.
- WebCT has sufficient tools for interoperability with other tools, platforms.
- More is coming...

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WebCT API's

# WebCT Technologies with practice

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Subscribe for the course

'WebCT: Technology basics'

[http://www.lerneffekt.de/kurse/webct\\_technology\\_basics.html](http://www.lerneffekt.de/kurse/webct_technology_basics.html)

or write an e-mail:

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Connectivity

# WebCT API's

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- ✓ Standart API,
- ✓ IMS Enterprise API,
- ✓ IMS Content Migration Utility.

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# Connectivity Contents

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- ✓ 1<sup>st</sup> part: e-learning standards and WebCT,
- ✓ 2<sup>nd</sup> part: WebCT API's,
- 3<sup>rd</sup> part: WebCT large scale & integration solutions.
- 4<sup>th</sup> part: discussion.

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Connectivity

# Large scale & integration solutions

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- Security,
- Load balancing,
- Centralized databases,
- Building extensions.

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## Large scale solutions

# Centralized services: pros and cons

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### ■ Pros:

- shared fixed and variable costs:
  - more power@ same price,
  - centralized licensing,
  - administration,
  - updates and standarts,
  - extensions,
  - integration,
  - user space.

### ■ Cons:

- less control over the system,
- no direct administrative ownership.



Application  
service provider

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# Security

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Large scale solutions

# Security :: Intro

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- Standart secure connection implementation:
  - most browsers include by default,
  - no extra special programming,
  - more server power needed.
- Easy session handling.
- Variety of security algorithm choices provide options for security level.

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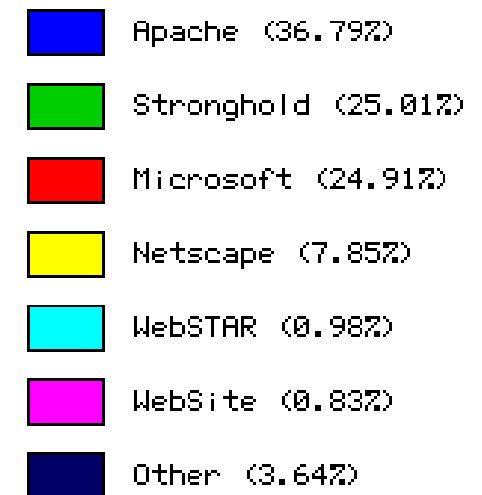
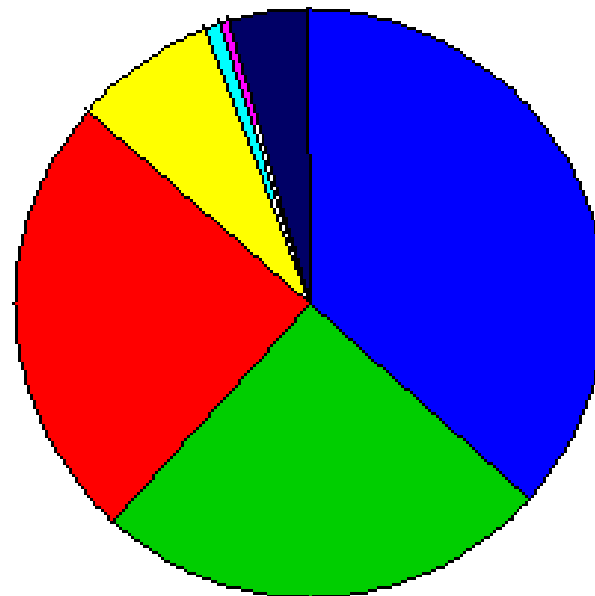
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Large scale solutions

# Security :: Secure server statistics

## ■ Secure server (SSL) statistics for 2001

Server	December Count	December %
Apache	21383	36.79%
Stronghold	14537	25.01%
Microsoft	14475	24.91%
Netscape	4561	7.85%
WebSTAR	568	0.98%
WebSite	480	0.83%
Other	2113	3.64%





Large scale solutions

# Security :: Implementation costs

---

- Server administration:
  - Including encryption into the Web server,
  - Requesting security certificate at VeriSign,
  - Integrating WebCT with updated Web server.
- Extra power for encryption overheads.

# WebCT Expertise :: Practice

---

Expert solutions at [lerneffekt.de](http://lerneffekt.de)

Check out secure WebCT implementation:

[https://dev.lerneffekt.de  
messedemo/messedemo](https://dev.lerneffekt.de/messedemo/messedemo)

[info@lerneffekt.de](mailto:info@lerneffekt.de)



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Connectivity

# Large scale & integration solutions

---

- ✓ Security,
- Load balancing,
- Centralized databases,
- Building extensions.

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# Load balancing



Large scale solutions

## Load balancing

---

- Load balancing (LB) is performance, robustness & high availability.
- Software/hardware, intelligent/bulk LB etc.
- Load balancing - possible implementations:
  - DNS round-robin,
  - Network Load Balancing Service (Windows),
  - Central redirector sorts requests accross server farm.  
Least busy factors: user number, CPU/Hard drive load etc.

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Large scale solutions

# Load balancing :: statistics

- Least costly implementation - DNS round-robin: year 2001 statistics.

DNS Entries	Number of Servers	Percent
2	25076	38.7%
3	4897	7.6%
4	14275	22.1%
5	477	0.7%
6	2657	4.1%
7	537	0.8%
8	224	0.3%
9	312	0.5%
10	124	0.2%
11	29	0.0%
12	38	0.1%
13	61	0.1%
14	4	0.0%
15	44	0.1%
16	17	0.0%
17	9	0.0%
18	6761	10.4%
19	6	0.0%
20	8393	13.0%
21	1	0.0%
22	2	0.0%
23	761	1.2%
24	1	0.0%
28	7	0.0%
47	1	0.0%

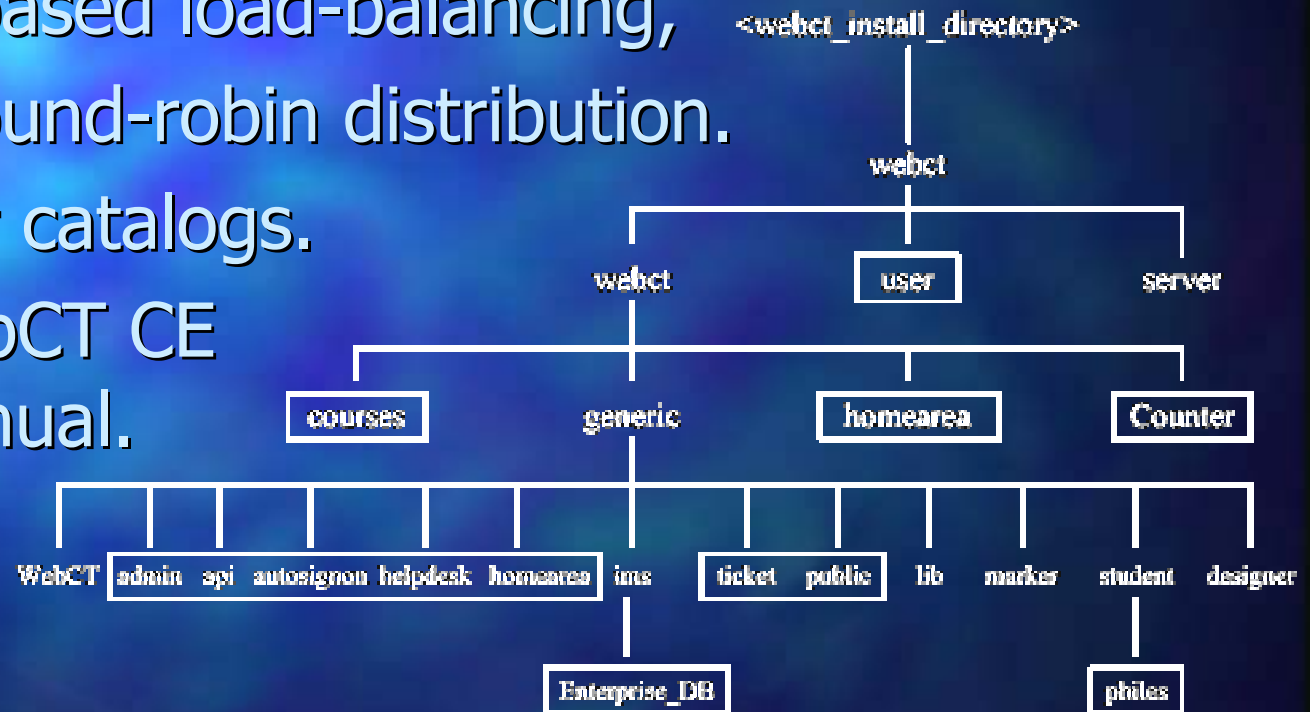
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Large scale solutions

# Load balancing :: WebCT specifics 1

- Front director:
  - hardware based load-balancing,
  - software round-robin distribution.
- Shared server catalogs.
- Details in WebCT CE sysadmin manual.



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# Large scale solutions

# Load balancing :: WebCT specifics 2

WebCT Administrator - Microsoft Internet Explorer

Address <http://dev.lerneffekt.de:8800/webct/admin/admin.pl>

**Load Balancing:** **Note:** If you are load balancing WebCT, specify the addresses and ports of the servers that will be used for the Chat and Whiteboard applications. These will most likely be the addresses of servers in your load balancing cluster. For example: http://load.webct.com Port 8900

Whiteboard:  Port:

Chat:  Port:

**User Authentication:**  Use ticket based authentication.

Display Logout link in course Menu Bar.

**Note:** The shared secret value should be random alpha-numeric characters, much like a password. It is encrypted into the ticket, stored in the browser, and is part of the ticket based authentication.

Ticket shared secret

Tickets remain valid for  minutes.

Allow WebCT Authentication across a domain.

Do **not** allow WebCT authentication across a domain.

**Note:** The domain you enter below must contain two periods, as in the domain .webct.com

Please specify your domain:

Admin **Server Mgmt:** License Publisher Partnership  
Settings Statistics Server Lockdown

Done Internet



Large scale solutions

# Load balancing :: More resources

---

- **General info:**

<http://loadbalancing.net>

- **Linux high-availability load balancing server: Virtual server project**

<http://www.linuxvirtualserver.org/>

- **Microsoft specifics:**

<http://www.microsoft.com/ntserver/ProductInfo/faqs/FAQ.asp>

Connectivity

# Large scale & integration solutions

---

- ✓ Security,
- ✓ Load balancing,
- Centralized databases,
- Building extensions.

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# Centralized databases: LDAP, Kerberos and more

# Integration

## LDAP tree administration :: Practice

- Using existing company LDAP tools,
- LDAP explorer.

Check out sample LDAP admin:  
<http://dev.lerneffekt.de/ldap/>  
password: webct

The screenshot shows the LDAP Explorer interface in Microsoft Internet Explorer. The address bar displays `http://dev.lerneffekt.de/ldap/index.php`. The left pane shows the LDAP tree structure for `dev.lerneffekt.de`, including `dc=lerneffekt, dc=de`, `cn=Manager`, `ou=Group`, and `ou=People`. The right pane shows the details for the selected entry, including `Distinguished Name`, `mailLocalAddress`, `mailRoutingAddress`, `mailHost`, `objectClass`, and `person`. A yellow circle labeled "Step 2" is overlaid on the browser's navigation buttons. Another yellow circle labeled "Step 1" is overlaid on the "LDAP server (host:port)" field in the configuration pane, which is set to `dev.lerneffekt.de`. Other configuration fields include `Base DN` (`dc=lerneffekt, dc=de`), `Bind DN As` (`cn=manager, dc=lerneffekt, dc=de`), `Bind Password` (masked), `Filter` (`objectclass=*`), and `Search Scope` (`one level`). Buttons for `New/Add`, `Modify`, `Delete`, and `Re` are visible at the bottom of the configuration pane. The status bar at the bottom right shows `metalot.com` and the page number `68`.



Integration

# What is LDAP?

---

- LDAP is a tree-structured directory,
- Optimized for large number reads and high volumes of data,
- Does not implement:
  - file or record locking,
  - transaction services.
- In principle has not been designed as a multiple read/write database.

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## Integration

# WebCT authentication using LDAP

---

- ① User authentication from LDAP database.
- ② User authentication from WebCT global database.  
For myWebCT user page user is authenticated from global database. The authentication is carried out by internal scripts of WebCT.
- ③ When accessing some course user is automatically authenticated via standard Apache auth\_dbm technology.

## Integration

# LDAP authentication :: Tech.details

- WebCT CE sends to LDAP server all connection data, user name and password.
- The response is success or failure.

```
Jul 20 22:12:53 dev slapd[18952]: daemon: conn=316 fd=13 connection from IP=127.0.0.1:2414 (IP=0.0.0.0:34049) accepted.
Jul 20 22:12:53 dev slapd[18954]: conn=316 op=0 BIND dn="OU=PEOPLE,DC=LERNEFFEKT,DC=DE" method=128
Jul 20 22:12:53 dev slapd[18954]: conn=316 op=0 RESULT tag=97 err=0 text=
Jul 20 22:12:53 dev slapd[26280]: conn=316 op=1 SRCH base="ou=People.dc=lerneffekt.dc=de" scope=2 filter="(uid=next)"
Jul 20 22:12:53 dev slapd[26280]: conn=316 op=1 SEARCH RESULT tag=101 err=0 text=
Jul 20 22:12:53 dev slapd[21882]: conn=316 op=2 BIND dn="UID=NEXT,OU=PEOPLE,DC=LERNEFFEKT,DC=DE" method=128
Jul 20 22:12:53 dev slapd[21882]: conn=316 op=2 RESULT tag=97 err=0 text=
Jul 20 22:12:53 dev slapd[18956]: conn=316 op=3 UNBIND
Jul 20 22:12:53 dev slapd[18956]: conn=-1 fd=13 closed
```

1

2

3

Integration

# Intro into Windows authentication

---

- Authentication in Windows domains:
  - Kerberos Version 5. The default for network authentication on computers with Windows 2000.
  - Windows NT LAN Manager (NTLM). The default protocol in Windows NT 4.0 operating system. Supported for backward compatibility.

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# Integration

# Kerberos :: Configuring WebCT

- WebCT server must be a configured Kerberos client (krb5.conf),
- KDC parameters:
  - Realm/Domain name (for ex. ou/admin@uni),
  - Instance box:
    - admin for K5 Kerberos server,
    - empty for W2K Kerberos authentication.

The screenshot shows the 'WebCT Administrator' interface in Microsoft Internet Explorer. The address bar shows 'http://dev.lerneffekt.de:8800/webct/admin/admin.pl'. The main content area contains several radio button options for authentication:

- Do **not** allow WebCT authentication across a domain.
- Internal WebCT password database.
- LDAP server.
  - LDAP Server Name: localhost
  - LDAP Port: 389
  - Base DN: ou=People,dc=lerneffekt,d
  - WebCT ID Attribute: uid
- MIT Kerberos V5 KDC or Windows 2000 Domain Controller.
  - Note:** Kerberos requires a properly configured krb5.conf file in the /etc directory.
  - Realm/Domain Name: [ ]
  - Note:** Each entry in the KDC is called a principal. Each principal looks like the following: Username/Instance@Kerberos Realm.
  - Instance: [ ]
- Custom authentication scheme.

At the bottom of the form are 'Update' and 'Cancel' buttons. A pink oval highlights the MIT Kerberos V5 KDC section.

At the bottom of the page, there is a navigation bar with 'Admin' and 'Server Mgmt:' buttons, and a footer with 'Utrecht Copyright© Giedrius Balb'.

Connectivity

# Large scale & integration solutions

---

- ✓ Security,
- ✓ Load balancing,
- ✓ Centralized databases,
- Building extensions.

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# Extending WebCT

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Integration

# Extending WebCT :: Technologies

---

## ■ Client side:

- Referencing internal/external URL,
- Accessing WebCT JavaScript functions,

## ■ Server side:

- Apache,
- WebCT API,
- IMS Enterprise API,
- IMS Content Migration Utility,
- Perl WebCT native functions.

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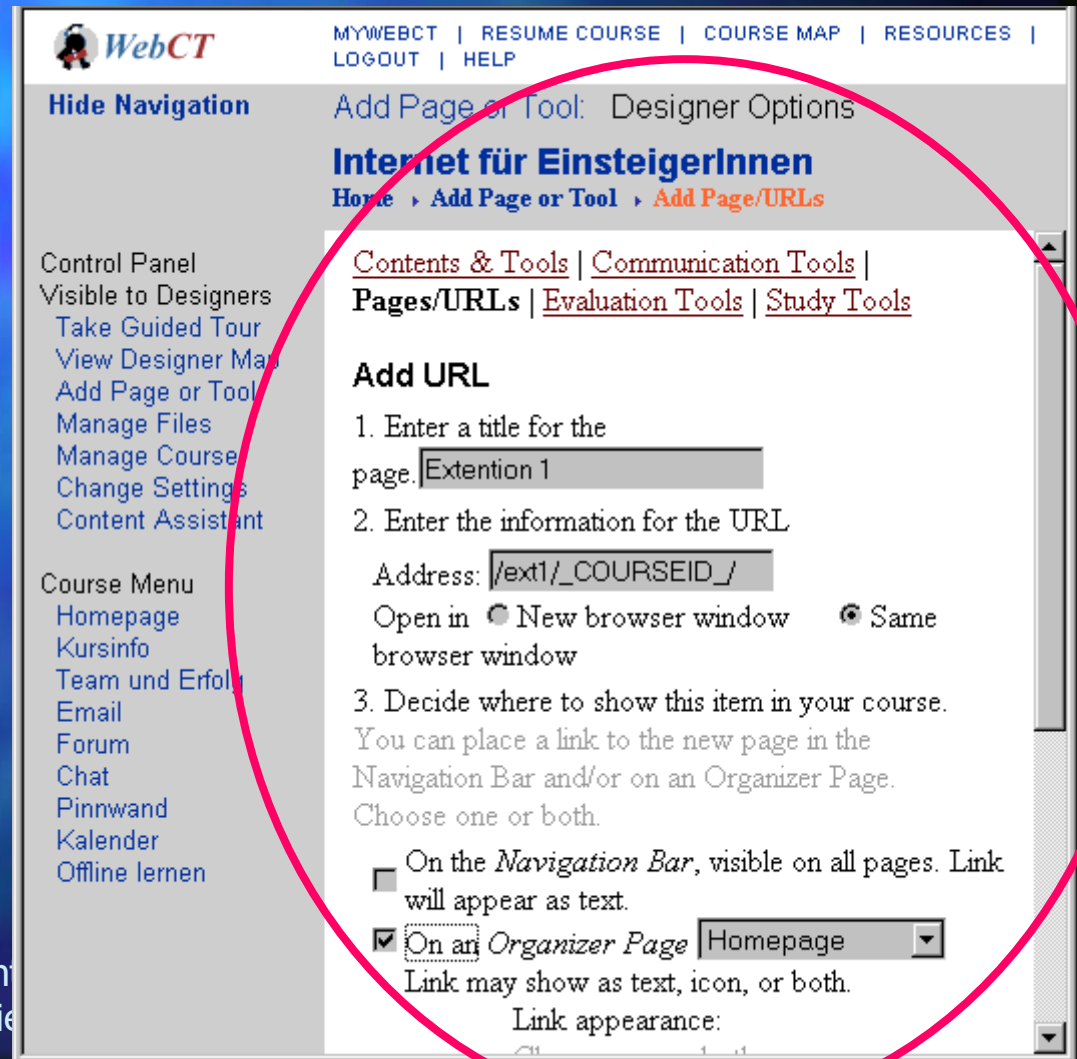
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# Integration :: Extending WebCT

## Client side :: Referencing extention

- WebCT Designer option:
  - Designer options -> Add Page or Tool -> URL.
- WebCT built in JavaScript functions
  - `update_loc_to_new_tool(tool_name, page_name, tool_view_loc, tool_edit_loc, mode, refresh_flag)`,
  - etc.



The screenshot shows the WebCT Designer interface. The top navigation bar includes links for MYWEBCT, RESUME COURSE, COURSE MAP, RESOURCES, LOGOUT, and HELP. The main content area is titled 'Add Page or Tool: Designer Options' and 'Internet für EinsteigerInnen'. A red circle highlights the 'Add URL' form, which includes the following steps and fields:

- 1. Enter a title for the page.
- 2. Enter the information for the URL.
  - Address:
  - Open in  New browser window  Same browser window
- 3. Decide where to show this item in your course. You can place a link to the new page in the Navigation Bar and/or on an Organizer Page. Choose one or both.
  - On the Navigation Bar, visible on all pages. Link will appear as text.
  - On an Organizer Page

Link may show as text, icon, or both.  
Link appearance:

Integration

# Apache :: The Web Server

---

- A number of extension modules starting from authentication to efficient `mod_perl`, `mod_php`, `mod_rewrite` etc.
- Built-in core features like SSI and a number of standart directives like `Options`.
- WebCT Apache built in modules:  
`http_core`, `mod_env`, `mod_log_config`, `mod_mime`, `mod_negotiation`, `mod_status`, `mod_include`, `mod_autoindex`, `mod_dir`, `mod_cgi`, `mod_asis`, `mod_imap`, `mod_actions`, `mod_userdir`, `mod_alias`, `mod_access`, `mod_auth`, `mod_auth_dbm`, `mod_so`, `mod_setenvif`.

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Integration

# Extending WebCT :: Using API's

---

- Integrated user management (WebCT/IMS APIs, for ex.: LDAP and WebCT DB synchronization tool),
- Learning portal with e-commerce features (WebCT/IMS APIs),
- Content update utility (IMS API),
- Test system converter (IMS API),
- Learning experience analyzer (IMS API).

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Integration :: Extending WebCT

# Perl WebCT-native functions

---

- Plenty-of self-contained WebCT-native Perl functions for administrator/designer/user/etc. functionality.
- A core approach implementing different way of certain component or adding new component to standart learning feature set.

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Integration :: Extending WebCT

# Extensions - combined solutions

---

- Samples:

- Community Content Manager,
- Formulars,
- Booking system.

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Integration

# Extending WebCT :: Summary

---

- WebCT - a standart LMS provides 99% of needed features, but not all,
- There are all means to go for state-of-the-art solutions supported by the most up-to-date standarts (IMS, LTSC, SCORM etc.),
- Unlimited possibilities & limited costs,
- Standarts are in place. Users start with WebCT CE.

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Connectivity

# Large scale & integration solutions

---

- ✓ Security,
- ✓ Load balancing,
- ✓ Centralized databases,
- ✓ Building extensions.

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Large scale solutions

## Features that require WebCT CE

---

- Load balancing,
- External password database authentication using LDAP, Kerberos, Windows 2000 Domain Controller, or a custom implementation,
- Logout,
- Server lockdown,
- Automatic signon,
- Session timeout,
- Customizable logon page.

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# Connectivity Contents

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- ✓ 1<sup>st</sup> part: e-learning standards and WebCT,
- ✓ 2<sup>nd</sup> part: WebCT API's,
- ✓ 3<sup>rd</sup> part: WebCT large scale & integration solutions.
- 4<sup>th</sup> part: discussion.

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Part 4<sup>th</sup>:

# Discussion

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Connectivity

## Discussion, Questions & Answers

---

How these new technologies enrich, enhance learner experience?

What is the future of e-learning? To where it is developing?

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# Connectivity Contents

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Renaissance of e-learning is here.  
It comes via standarts and new technologies.

---

Welcome to the workshop on:

# Connectivity

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Connectivity

## e-learning standarts - your vision

---

- Think and create your vision of e-learning.
- Answer those questions:
  - What are the major areas/goals of your vision?
  - How does your vision connect to standarts?
  - What value does e-learning standarts create?
  - What standarts in more detail you see as very important to achieve your vision?

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Connectivity

## Exploring :: User portability

---

- User portability means
  - standartized minimum content components, granularity and features,
  - different interfaces,
  - standartized minimum learning experience tracking and inspection,
  - minimized startup and usability costs.

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Connectivity

# Exploring :: System integration

---

- Cohesive learning experience is the aim of LMS.
- It involves invisible technologies:
  - Seamless external Campus/Intranet user space access,
  - Registration and payment interactions,
  - Extending LMS technologies,
  - Learner experience export and external analysis tools,
  - Security of private information transfers.

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