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A Comprehensive WebCT Integration System

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Abstract

Murdoch University, in collaboration with industry partners, has developed a sophisticated middleware application (WebCTMan) between WebCT and other corporate systems, such as the Callista student records system, the Concept 1 human resources system and Murdoch's own authentication system. This presentation will describe the architecture and functionality of this system.

The impetus for WebCTMan was to enable Murdoch to change its student records database with minimal impact on our WebCT installation. However, WebCTMan now gives us great flexibility in managing our WebCT installation, enabling us to manage courses across teaching periods, and upgrade easily. This paper describes the context in which this system was built and gives an overview of its architecture.

Courses in WebCTMan can have a status of active (where student details are updated nightly), inactive (where all students are orphans), and static (where student accounts are valid but not updated). Tools are available to change this status, and easily activate and deactivate courses. Different versions of courses are maintained for each teaching period, resolving the problem of overlap between semesters, when some students still have deferred examinations after the start of a new semester.

In addition to managing students, WebCTMan provides functionality to manage staff and courses. Staff can request courses to be created or cloned from other courses. They can also create their own guest accounts and allocate tutors and markers to courses, and download class lists. Operators can create or *rename* courses on demand, as well as changing the roles of staff, including primary and secondary designers. A subset of functions is available to helpdesk operators, who can lookup details of both students and staff within the system.

Introduction

In late 1998, Murdoch University adopted WebCT as its centrally-supported learning management system. A comprehensive plan (the Murdoch Online Mainstreaming Project) was developed to establish WebCT as a mission-critical software application within the university. A crucial part of this plan was to integrate WebCT with other University systems.

The Murdoch Online Mainstreaming Project met its objectives: Over 9,500 of Murdoch's approximately 12,000 students now use WebCT as a tool of study, and WebCT is integrated with other corporate systems, such as the Callista student records system, the Concept 1 human resources system and Murdoch's own MAIS authentication and identification system.

The integration of systems was facilitated by a middleware WebCT management application called WebCTMan. WebCTMan is an intermediate system, comprising a database and a suite of operator tools and data transfer scripts, that collates student and staff information from multiple sources and enables the flow of students in and out of WebCT to be controlled in a flexible manner.

The integration of systems was facilitated by the adoption of the student number as the common login ID across systems, university-wide.

The common login ID and password removed the need for students to remember multiple passwords. Furthermore, taking the burden of managing student accounts away from academic staff gave those staff a strong incentive to adopt WebCT. Finally, the flexible nature of Murdoch's study offerings leads to thousands of enrolment changes each semester, and these needed to be seamlessly reflected in WebCT.

The other driver behind the development of WebCTMan was that Murdoch was in the process of phasing out a legacy student enrolments system in favour of the newer Callista system.

In the rest of this paper, we first discuss some conceptual issues around Murdoch's implementation of WebCT, then outline the functionality of the system. An administrator level of knowledge of WebCT is assumed in the rest of this paper. While some of the issues discussed are specific to Murdoch's environment, many of them can be adapted to other environments.

Conceptual Issues

Murdoch University has four teaching 'divisions', and WebCT courses are divided into categories according to the teaching division which runs the unit of study associated with that WebCT course. When a course is in use by students, it is present in the appropriate WebCT category. It is available to students through either MyWebCT, or through the WebCT Course Listing screen.

When a course is not available for students, it is located in a hidden category, called "Under Development". Once WebCTMan has 'orphaned' the students (see below), the only access to the course is by the designer(s) through myWebCT.

Each of the categories has an associated globalID, known as a "parent ID", available only to the Murdoch WebCT administrators. As each course is created, the parent ID is assigned as the primary designer. The teaching staff associated with the course are allocated as shared access designers. The WebCT administrators therefore have easy access to all courses for quality assurance and user support.

Murdoch has a flexible range of teaching timetables. Most units are offered on a semester basis, but some are offered in trimesters, and some in summer school. Some units start and finish at different times. There is no time in the year when WebCT is not in use by some students.

In many cases, a unit is offered at the same time, but at different locations, or an External Online offering might be running in conjunction with an Internal on-campus offering. Often, unit coordinators will want the whole cohort to be added to the same WebCT course, but in other cases, several courses will be required because the offerings are sufficiently different. In these instances, a separate WebCT course needs to be created for each version (Unit Offering).

A common circumstance occurs during the changeover between first and second semesters, where there is only a few weeks between the end of examinations and the start of the next semester. Students who are offered supplementary of deferred examinations often need access to the course at the same time as new students. It is inappropriate have both cohorts populating the same course, and clumsy to remove old students one by one.

To resolve this, a policy has been adopted where a WebCT course exists for each offering of a unit in a distinct teaching period. A naming convention is used, such that a unit called A123 offered in semester 1 has the WebCT course name A123s1. Similarly the unit offered in trimester 3 would have the suffix t3.

Callista Integration

The Callista student records system uses the concept of a Unit Offering, which is a subset of a unit. Students are associated in Callista with their Unit Offering, which is unique for each location (campus), teaching period (semester, etc.), unit type (internal, external, etc.) and academic year.

A simple view of the data relationships in WebCTMan is shown in Fig. 1. At its simplest level, the WebCTMan database consists of three major tables: a table of students downloaded from Callista; a table of all current Callista Unit Offerings; and a table of all courses existing in WebCT.

Two further tables *join* the data together in a relational database sense. Individual students can be enrolled in one or more Unit Offerings via an Enrolment table. Similarly, a Unit Offering can be mapped to a WebCT course through the Course Mapping table.

Experience has shown that the concept of course mapping can be difficult to understand. Fig. 2 shows an example of course mapping through a screen dump of the course mapping user interface. The right hand side of Fig. 2 shows a number of unit offerings associated with the unit C273. It can be seen that C273 is offered in semesters 1 & 2, and in another period coded as F3. It is offered in a number of locations: Murdoch, SNEF (Singapore National Employers Federation) and at a number of campuses of KDU University in Malaysia. It is offered in study mode D, in both 2001 and 2002.

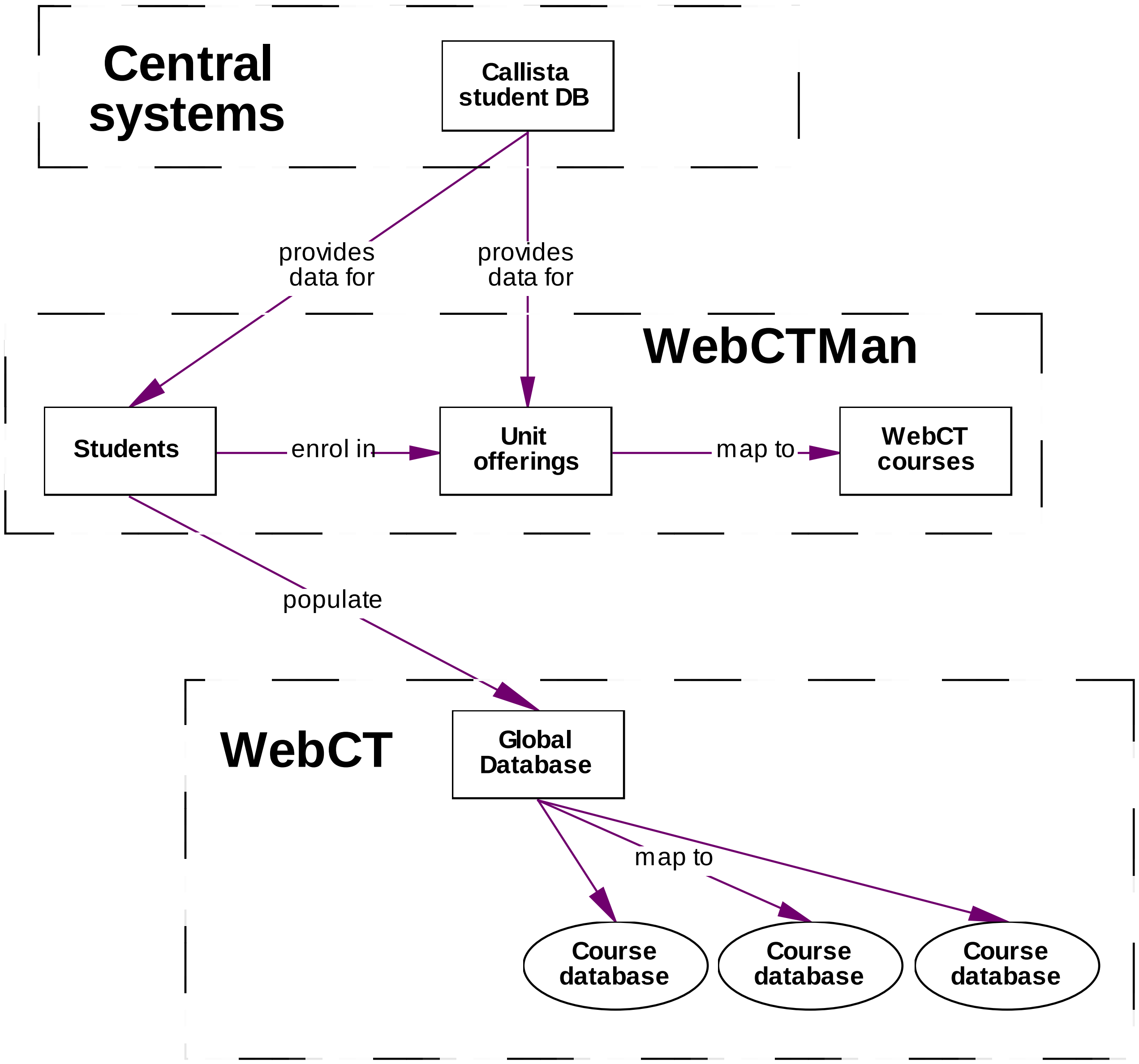


Figure 1. Simple conceptual structure of WebCTMan

The left-hand side of Fig. 2 shows that the three KDU offerings in 2001 are mapped to the WebCT course C273s2. That is, only students enrolled in those unit offerings will be propagated into WebCT, and students in other unit offerings are associated with no course, and no action will be taken with them.

If required by the unit coordinator, students in the 2001 “F3” unit offering could be mapped to a separate WebCT course called C273f3.

The use of the course mapping interface allows students to be allocated to WebCT courses in any way that the course designer requires. Perl scripts automatically load appropriate data into WebCTMan on a daily basis.

Some courses at Murdoch are offered to students who are not present in Callista, for example, first-year students at Murdoch’s partner institution in Malaysia. The use of WebCTMan enables student details from multiple sources to be combined in one place and then populated

Figure 2. Illustration of the Course Mapping concept from the WebCTMan user interface.

into WebCT in a coordinated manner. WebCTMan is potentially applicable in a situation where multiple WebCT installations are hosted on a single server.

WebCT Integration

The lower-left section of Fig. 1 illustrates the way in which WebCTMan data is transferred into WebCT. Student enrolments are entered into WebCT through calls to the WebCT standard API.

A perl script connects to WebCTMan and collects a list of all students who need to be populated into WebCT. A course list is generated for each student and passed to the WebCT API. If this student does not exist in WebCT, the API is called with the 'add' parameter; otherwise the API call uses the 'update' parameter. E.g.

```
webctdb update global xxxx "Global ID=12345678, Courses=C262:C227.
```

In most cases, the API call makes all appropriate modifications to the WebCT internal databases. Another paper presented at this conference details what to do when inconsistencies occasionally occur in the WebCT global and course databases.

Active, Static and Inactive Courses

The discussion so far has described how data can be sourced from Callista and transferred into WebCT courses. The question remains as to *which* WebCT courses should be populated with students.

For example, students may be entered into Callista several months before semester starts, but the unit lecturer may not want students to access the WebCT course until the semester starts. Similarly, after semester 1 has finished, it is wasteful of computer resources to continually update student details in semester 1 WebCT courses.

To handle these issues, the concept of *course status* was developed. The three major types of course status are active, static and inactive. These are described below, and the distinction between them is illustrated in Fig. 3.

Active Courses

Unit coordinators decide which units are to be made active, and inform the WebCT administrator through an online form. The administrator can then choose to approve a unit for activation. Activation consists of changing the WebCTMan Course Status flag to active, and moving the unit into an appropriate WebCT category.

Once a course is marked as Active, data is automatically uploaded into WebCTMan and WebCT by perl scripts. This uploading continues daily until the course status changes, as shown in Fig. 3.

Inactive Courses

Once all students in a WebCT course have completed their enrolment, the course can be made *inactive*. As shown in Fig. 3, once a course is inactive, students' enrolments records are deleted for that course in WebCTMan. When this happens, the API call to WebCT for that student will not contain that course, and the student will be "orphaned". That is, the link between the WebCT global database and the course database is broken[1]. The student database within the course, and all student work, remains, but students cannot access it.

According to Murdoch policy, it is the course designer's responsibility to manage and reset

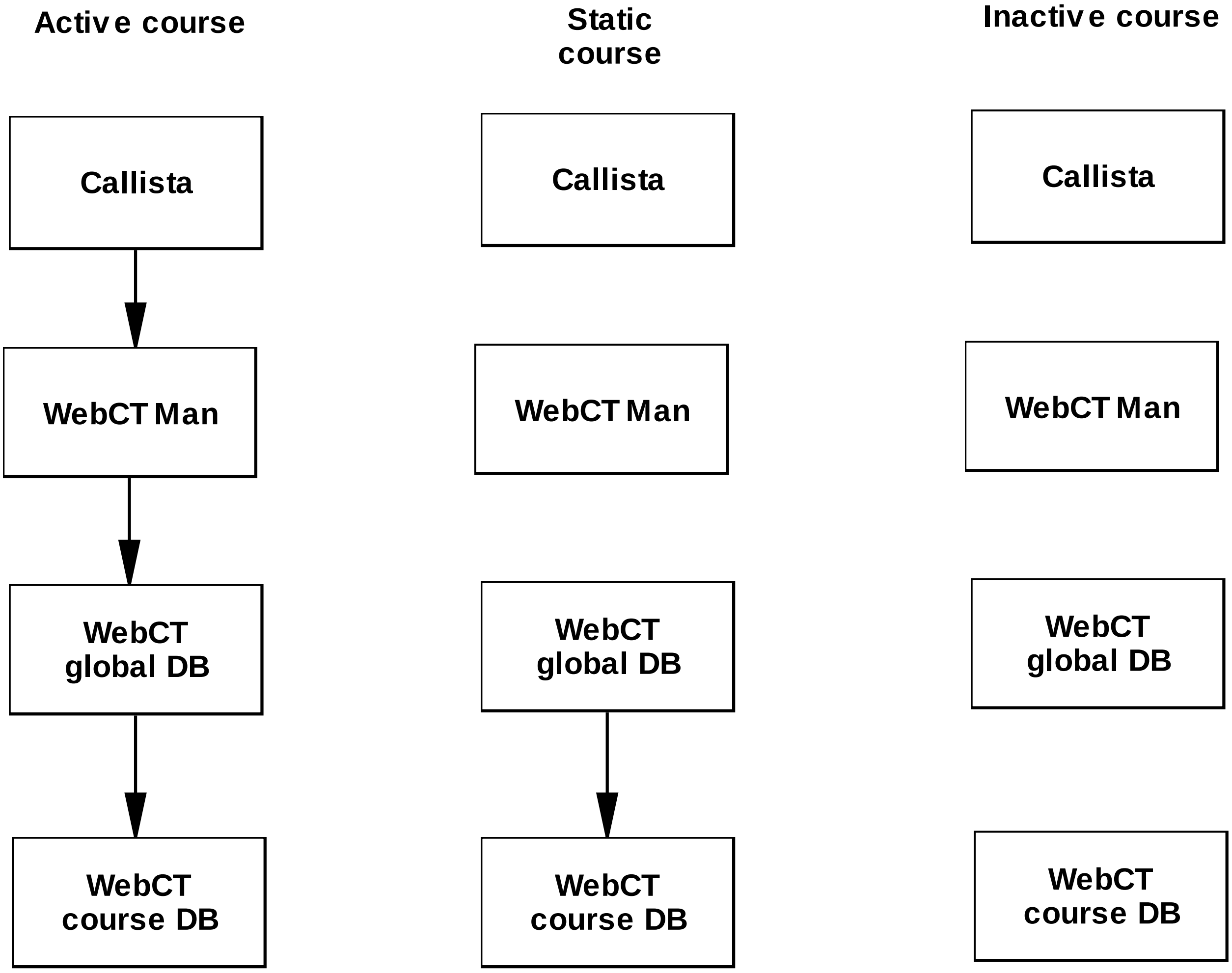


Figure 3. The effect of the Course Status on the interrelationships between Callista, WebCTMan and WebCT.

individual courses, so WebCTMan does not perform any course level functions.

Static Courses

At a certain time after each teaching period, Callista determines that a unit is completed and no longer provides enrolment data for affected students to WebCTMan. This happens independently of any status changes within WebCTMan.

The consequence of this is that if a student is no longer considered to be enrolled in a course in WebCTMan, then the student will be orphaned. Initially, this seemed like desirable behaviour, until it was realised that Callista's idea of the end of a course depends on the date, not upon the students' successful completion. Unfortunately, some students awarded deferred or supplementary examinations were denied access to WebCT because Callista thought the unit was complete.

The resolution to this issue was by employing a *static* course status. Close to the end of each teaching period, WebCT courses are now manually given *static* status. As shown in Fig. 3, when a course is static, the link between Callista and WebCTMan is broken, and student enrolment details are not updated in the WebCT databases. Students, therefore, retain access to their WebCT course until the administrators remove it by making the course inactive.

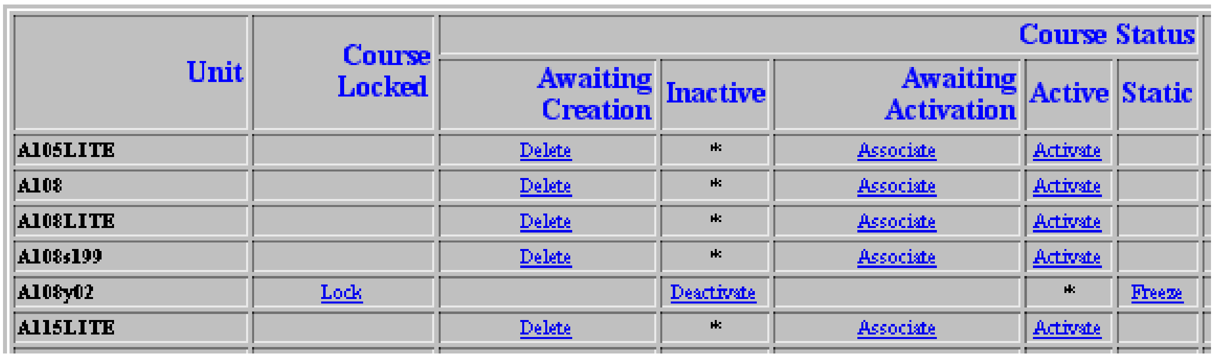
Course Status Interface

Figure 4 shows a sample of the web interface to change the course status in WebCTMan. The current status of every course is listed, and buttons allow appropriate changes of status. This interface allows courses to be managed very easily.

Integration with Other Systems

Once WebCTMan was functioning for students, it became feasible integrate it with other University systems, and expand it to manage all aspects WebCT. Fig. 5 shows the complete conceptual structure introduced in Fig. 1.

In mid 2001, a standard login and password was introduced for central systems at Murdoch. Currently, student password changes are sourced from the Murdoch-specific MAIS identification database and distributed to WebCT every 5 minutes. As Murdoch introduces a LDAP style authentication system, it will be integrated with WebCT, but this is not currently available.



Unit	Course Locked	Course Status				
		Awaiting Creation	Inactive	Awaiting Activation	Active	Static
A105LITE		Delete	*	Associate	Activate	
A108		Delete	*	Associate	Activate	
A108LITE		Delete	*	Associate	Activate	
A108s199		Delete	*	Associate	Activate	
A108y02	Lock		Deactivate		*	Freeze
A115LITE		Delete	*	Associate	Activate	

Figure 4. Screen capture of a selection of the Course Status screen in WebCTMan.

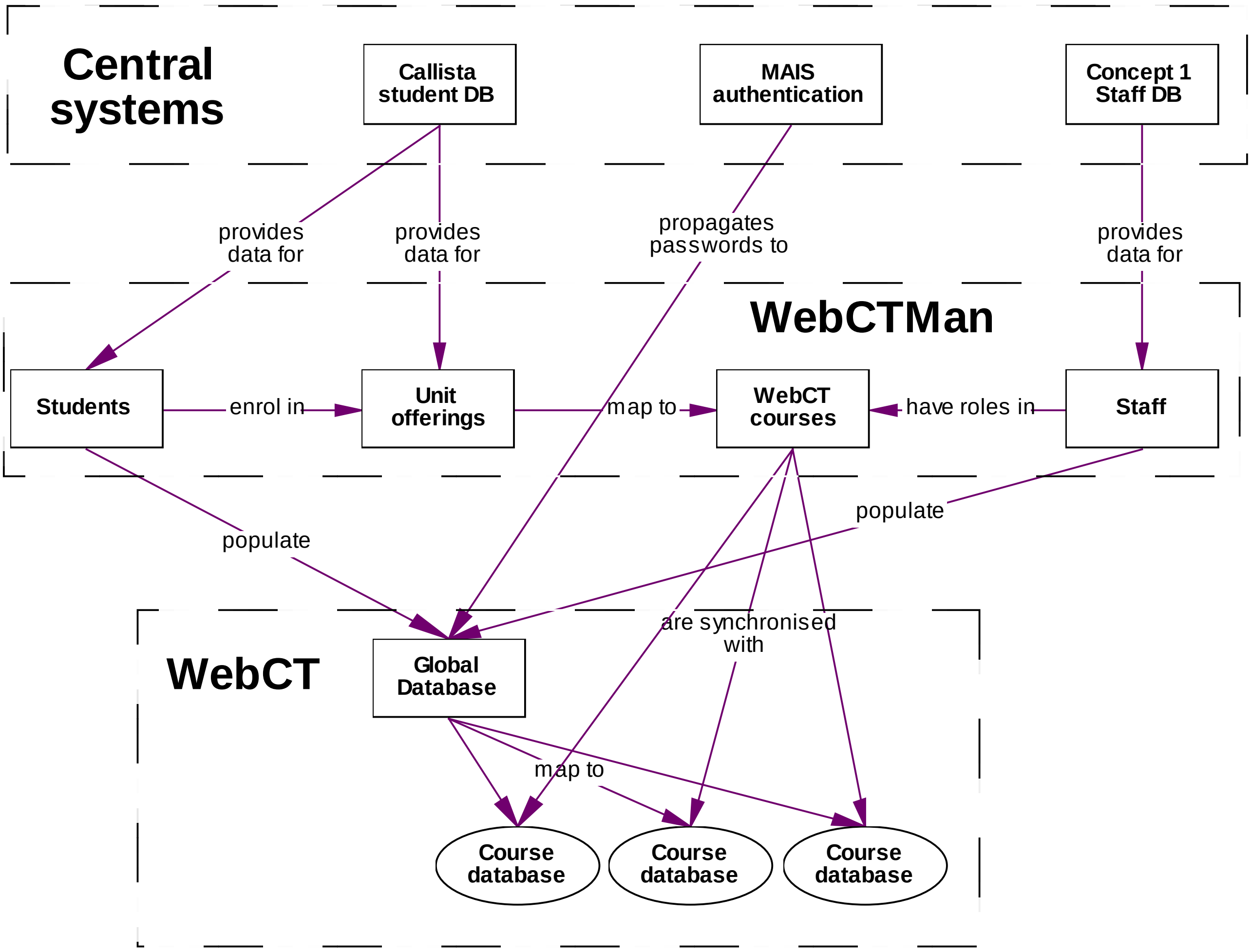


Figure 5. Overall conceptual structure of WebCTMan

WebCTMan has also been integrated with the Concept 1 Human Resource system. Staff details are updated nightly into a WebCTMan database table. Staff are associated with WebCT courses through their roles in a join table called Staff Roles. Available roles are Coordinator (equivalent to primary designer), Designer (equivalent to shared designer), Marker and Tutor (equivalent to student).

Comprehensive WebCT Integration System

With the addition of staff data, WebCTMan had the potential to fully manage WebCT, circumventing the Administrator Interface and adding more functionality. The student management functionality described so far in this paper occurs mostly behind the scenes in automated scripts. However, in addition to managing students, WebCTMan provides functionality to manage staff and courses. The full range of functionality is summarised in Table 1.

Teaching staff can request courses to be created or cloned from other courses. They can also create their own guest accounts and allocate tutors and markers to courses, and download class lists.

Table 1. Summary of the functionality available through the WebCTMan user interface.

Function	Description
Request a new or cloned course	The request is processed under Unit Activation
Unit Functions	The following functions are available for each course:
Unit Details	Change details of a course, including name, description and parent account
Add Staff Roles	Manage designers, tutors and markers
List Staff Roles	Show roles currently assigned to the course
Enrolment List	Display and/or download a current student list
Linking Additional Courses	Manage courses which students need access to in addition to their normal course
Upload Students	Upload non-standard students from a CSV file
Callista Download	Special execution of the Callista download process for the specified course.
Populate WebCT	Special execution of the WebCT populate process for the specified course.
Unit Activation	Manage the overall status of courses and course requests. See Fig. 4.
User Details	The following functions are available:
Lookup Student ID	Lookup students and staff details in all appropriate systems based on their login ID or name
Create Guest Account	Create an account which can be allocated a role in WebCTMan
Course Mapper	Mapping between Unit Offerings and courses. See Fig. 2.

Administrators can access all the functions available to teaching staff. They can change the course mapping (see Fig. 2) and the course status (see Fig. 4). They can also create or clone courses on demand. A useful enhancement not offered by WebCT is the ability to rename courses.

An ongoing problem at Murdoch was the management of unit coordinators, who change from semester to semester. WebCTMan distinguishes between “coordinators” and “designers”. The coordinator is the second designer, after the “parent” primary designer. “Designers” are any subsequent shared designers. WebCTMan enables us to add, delete and change the roles of staff.

A subset of functions is available to helpdesk operators, who can lookup details of both students and staff within the system.

This functionality was achieved by using PHP scripts to call WebCT perl functions and post requests to administration web pages.

Summary

WebCTMan provides a range of functionality which comprehensively integrates WebCT with other central systems at Murdoch University. Much of this functionality may be applicable to other WebCT installations.

The major features of WebCTMan are:

- Parent accounts, which are the primary designers of collections (categories) of WebCT courses. This facilitates the management of multiple client groups on the one WebCT server.
- The concept of Unit Offerings, which enable a many-to-many mapping between unit offerings and WebCT courses.
- The concept of Course Status, and the implications of “active”, “static” and “inactive” status on the availability of courses to students.
- A user interface which supersedes the WebCT administration interface, and allows for management of students, courses and staff roles.

WebCTMan has become the authoritative source of data which controls how WebCT behaves at Murdoch University. It enables us to change the WebCT API without affecting other functionality. Potentially, it enables us to migrate away from WebCT to other learning management systems, if the feature/cost nexus indicates that another system is preferable.

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