

BROWN UNIVERSITY
Department of Computer Science
Master's Project
CS-97-M17

“DCE-Web GradeServer”

by

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DCE-Web GradeServer

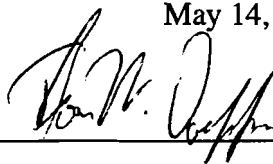
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May 14, 1997

A handwritten signature in black ink, appearing to read "Tom Doepner", is written over a horizontal line.

Tom Doepner

Advisor

DCE-Web Grade Server

Randy M. Fayan

May, 1997

I. Overview

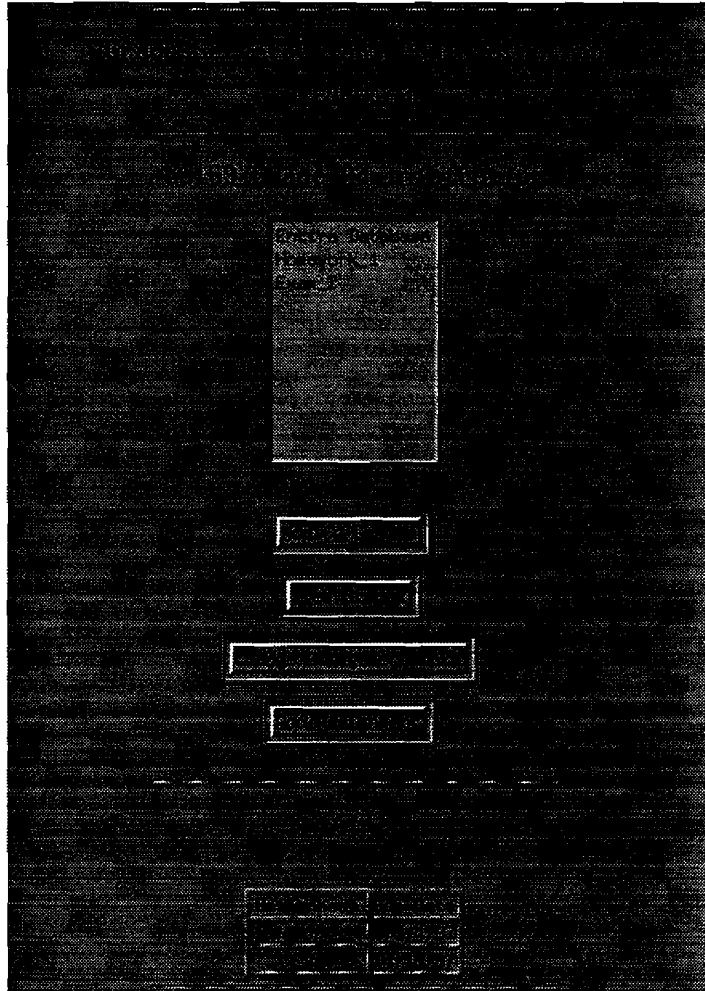
Accessing and manipulating a database of students' grades in a networked environment has many potential security perils. Issues pertaining to authorization, authentication, data privacy and integrity must be addressed:

1. The students who access the grade server must be able to obtain only their grades.
2. Users and servers must prove their identity.
3. An encryption scheme has to be used to prevent malicious, unauthorized users from deciphering the server transactions.
4. The security also has to prevent tampering from malicious users.

The goal of this project is to create a grade server securely implemented in a convenient, easy to manipulate hypertext Web environment. The GradeServer is implemented using DCE-Web, a secure hypertext-based approach to sharing documents. DCE-Web addresses each of the security issues above, as well as providing many convenient tools to make manipulating the security information easy. The GradeServer itself is a cgi program interfacing the DCE-Web server and a separate database server. The DCE-Web cgi approach provides an intuitive and secure means of manipulating and accessing sensitive information over a network.

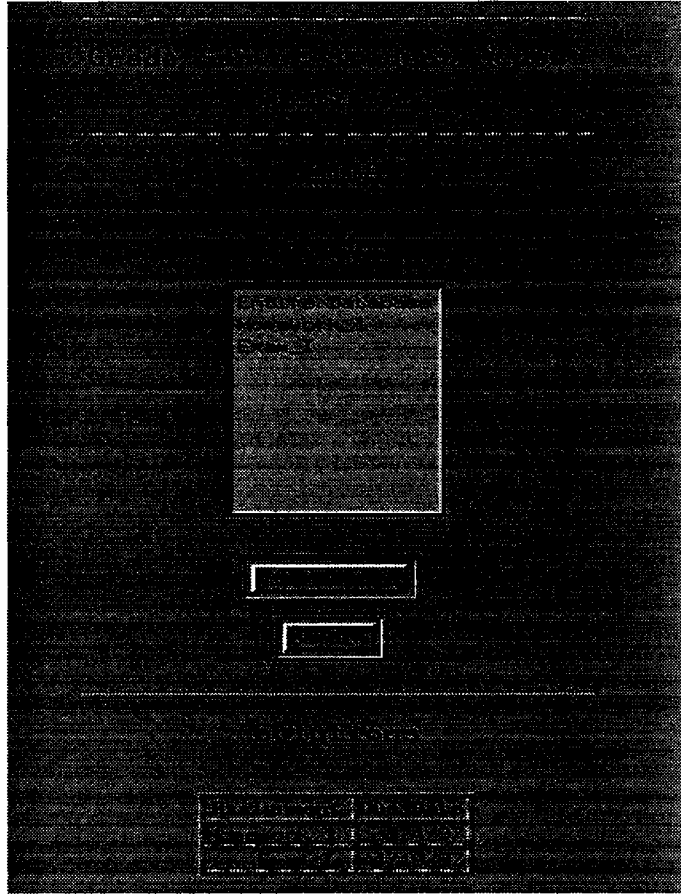
II. Functionality

The DCE-Web GradeServer allows administrators to create and manipulate various components of a course database through a standard HTTP web browser. The server allows assignments and students to be added to a course, the students' grades to be viewed and modified, as well as the ability to make homework solutions accessible to the students.



Example Administration Interface

The GradeServer allows the students of a course to access their grades for each assignment. It also integrates the ability to hand in assignments and to view assignment solutions posted by the administrators. Each student can access only his or her own grades, and not the grades of any other student.



Example Student Interface

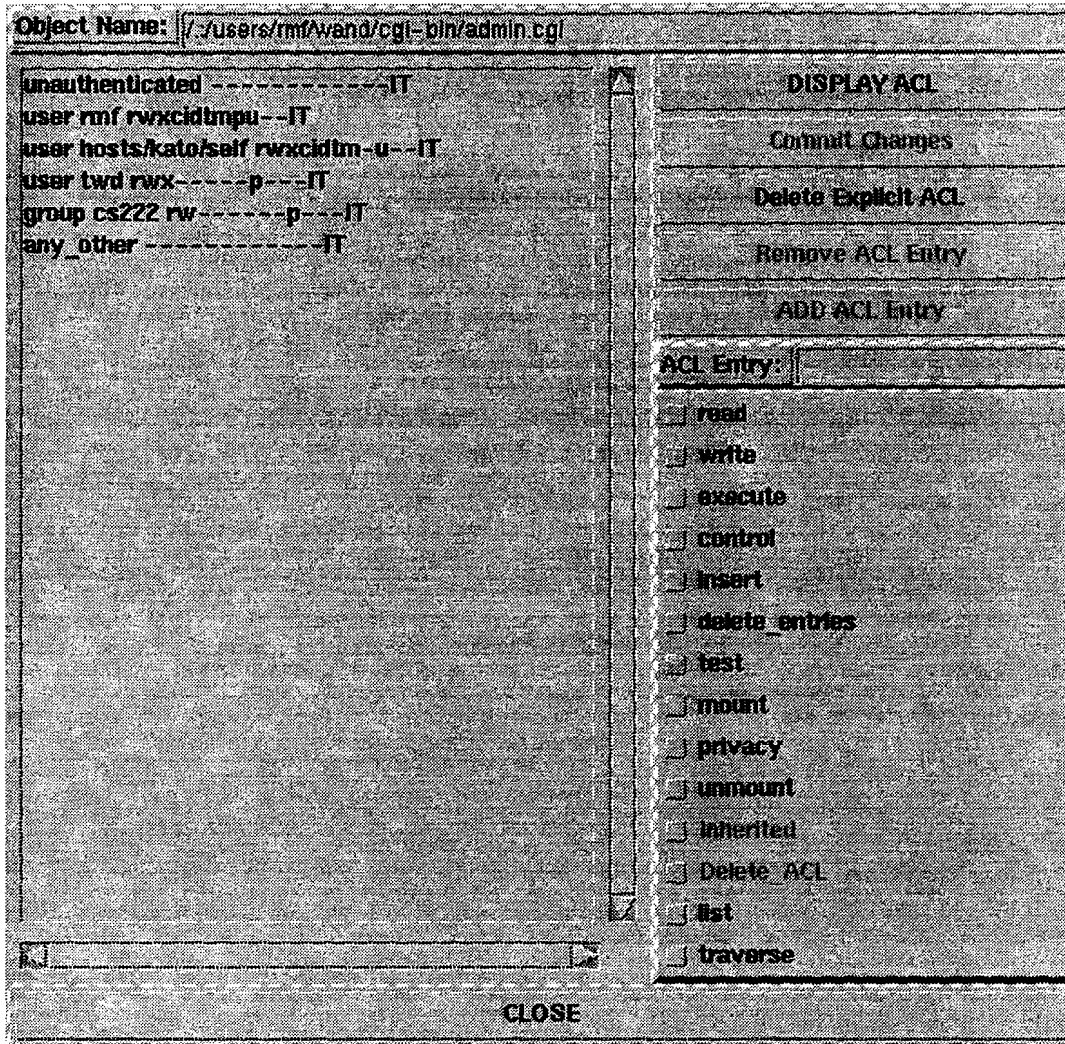
III. Implementation

A. *DCE-Web*

The GradeServer is implemented using DCE-Web. DCE-Web is built on top of DCE. DCE uses authenticated RPC and the DCE Security Services (Kerberos Ver. 5) to provide security requirements. Fine grain authorization control of documents is provided by Access Control Lists, or ACLs. Various tools are provided which support editing of the ACLs and the management of the DCE-Web server (called the Wand server).

DCE-Web requires a number of setup procedures on both the server and each client. The Wand server and the Msql server both must be started before clients can access the grade database. Each client is required to login to DCE in order to access the database. Also, each client has to run an HTTP Proxy called the Secure Local Proxy (SLP), and modify their web browser HTTP proxy entry. See Section IV, Running the DCE-Web GradeServer, for detailed information on running each of these programs.

Each client must have a DCE identity. Each class administrator must be assigned to a DCE group for the class (e.g., cs169admin group). An appropriate ACL, allowing only this group, should be set on the files and programs to be accessed by the administrators. Each student must have his or her own principal identity. The GradeServer program for the student will use the student's DCE identity to access only that student's grade information.



Example File ACL

In the example ACL shown above, all users and groups who have read, write and execute permission on the file have the ability to execute this program. The privacy entry ensures that data is encrypted before being sent on the network. For instance, the user rmf has execute ability on the file, so this user can run the cgi script. Users in the cs222 group do not have permission to execute this script, so they will be forbidden from running the administration GradeServer program.

B. Msql Database

The database used to implement the GradeServer is Msql, version 2. Msql provides a simple means of accessing and manipulating tables of information. The Msql database executes in a client/server fashion, with the client programs connecting to the server to execute the transactions. To insure security, the only user who should have access to the database should be the user identity of the DCE-Web Wand server.

Three tables are created in the database for each course. A table of students and their account names is created. Another table of grades, dates, and comments for each assignment is used to store the student grades. A third table is used to store the assignment information, such as the path to the on-line solutions and the due date.

Information may be obtained and changed through the msql program. Adding additional columns to an existing table may be achieved with the msqladmin program. An entire database may be dumped in a format that could be read in by msql using msqldump. These three programs are used in the cgi scripts of the GradeServer to manipulate the course information.

C. GradeServer

Two main programs interface with the Msql database: one for the students, and another for the administrators. These programs, written in Perl, execute as cgi scripts. The student program is found in the file **stud.cgi**, while **admin.cgi** holds the administration program. Both programs include the libraries **msql_if.pl**, which is the executable which interfaces with the Msql database, and **cgi_lib.pl**, which formats the cgi input. Portions of the DCE-Web code were re-written to provide the GradeServer program with the identity of the client. Unauthorized access of these programs is prevented by DCE-Web, and is indicated with a security failure message in the web browser.

The student program allows the students to access their grades, hand in assignments, or view assignment solutions for each assignment in the class. The online solutions are selected as hypertext links. Handing in assignments requires the student to enter the path

to the homework solutions. The code is then copied by the server into a pre-determined location.

The administrator program is more complex. It allows student and assignment names to be added, and the grade and assignment information to be modified. Adding an assignment automatically creates three new columns in the grades database: grade, date, and comment. Default values of NULL are added for each student in these fields. The path to the assignment solution may also be entered, allowing the students to view the solution on-line.



Grade Server Client Administration

DCE_USER.rmf

View Grades Database: cs169, Entire Database

Name	Unix Id	DCE Id	Homework_1			Exam_1		
			Grade	Date	Comment	Grade	Date	Comment
Ann, Raggedy M.	ra	ra/dce	55	3/4	not too good	77	NULL	a bit better
Chonkite, Walter A.	wac	wcdce	78	3/4	ok	95	NULL	awesome
Fayan, Randy M.	rmf	rmf	78	3/4	ok	45	NULL	not good
Gregorian, Vartan D.	vg	vg/ww	78	3/5	ok	33	NULL	poor
Jones, Julie E.	jej	jj/dce	59	3/6	silly mistake	67	NULL	so so
Lennon, John P.	cs22242	cs22242	88	3/2	great	87	NULL	good answer on number 4
Smith, Sally R.	ss	ss/dce	83	3/2	good	54	NULL	not good
Whittle, Willy Q.	ww	dc/ww	84	3/4	good	69	NULL	ok

Example Administration View of Grades

IV. Running the DCE-Web GradeServer

A. Documentation

On-line documentation on running the DCE-Web GradeServer can be found from **/pro/dce-web/www/docs/index.html**. Notes on running, modifying, and installing DCE-Web can be found from this location.

The base directory for the DCE-Web GradeServer is found in **/pro/dce-web/***. The DCE-Web code is found in **/pro/dce-web/wand/dist-0.83/***. The installation of the server executables is found in **/pro/dce-web/www/bin/***, and the client executables in **/pro/dce-web/www/slp/***. The Msql database programs can be found in **/pro/dce-web/mssql/bin/***. The cgi scripts which implement the Grade Sever are found in **/pro/dce-web/www/docs/cgi-bin/***.

B. Running the Programs

1. Server Programs

To start the servers:

- Start the DCE-Web server: **/pro/dce-web/www/bin/gowand**
- Start the database server: **/pro/dce-web/mssql/bin/mssql2d&**

2. Client Programs

To run the client programs:

- Modify Web Browser Network Options
 - a. Cache Option: Verify document every time
 - b. Proxy Option: Manual HTTP Proxy: localhost port 8004
- dce_login to DCE
- Run the local proxy from the slp directory: **cd /pro/dce-web/www/slp; slp**

3. Administration Programs

To change or view the ACL permissions, run **/pro/dce-web/www/bin/acleditr**.

To Shutdown the Servers:

- Shutdown the DCE-Web server: **/pro/dce-web/www/bin/endwand**
- Shutdown the database server: **/pro/dce-web/msql/bin/msqladmin shutdown**

To access the GradeServer, begin with the **/pro/dce-web/www/docs/index.html** page.
