

PT Calculator

By

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PT Calculator Proposal Submitted to
the Faculty of the Information Engineering Technology Program
in Partial Fulfillment of the Requirements for
the Degree of Bachelor of Science
in Information Engineering Technology

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Anthony Carota

Date

Professor Russ McMahon, Faculty Advisor

Date

Patrick C. Kumpf, Ed.D. Interim Department Head

Date

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Abstract

The *PT Calculator* software allows for the saving of soldier information, calculating Army Physical Fitness Test (APFT), and storing the results and information to a remote database using a front-end client application coded in C#. The information is then available on-line and can be accessed via the internet. The database used is MySQL and the site is written in ASP.NET. The client application allows the squad leader to save their soldier's information and test results to the database. The Web Access site allows the squad leader to view, edit, and print any information contained in the remote database. The soldier has access to view only their own information as well as print it to an official Army form for personal recordkeeping. The *PT Calculator* application will replace the current tedious and inefficient system of saving the information via hardcopy. It will also eliminate the problem of records being misplaced or lost. This application will help the squad leader to manage their squad's administrative data while allowing them to focus on more important things, such as training their soldiers.

Army PT Calculator

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1. Description and Intended Use

This application is intended to aid first and second line supervisors calculate and track their subordinate soldiers' physical test results. Soldiers take physical fitness tests at least biannually to determine their overall physical fitness(3, pg. 13). The test includes three events to be graded, sit ups, push ups, and a 2-mile run(3, pg. 14). Calculations are made from the number of repetitions from each event and the soldier's individual time on the 2-mile run. The repetitions and the run time are translated into points giving the soldier a possible 300 points on the test, 100 for each event(3, pg. 17). Those calculations are varied according to the soldier's age and gender.

The *PT Calculator* is designed to make grading of the test accurate, fast and simple. Today, graders and evaluators use a chart to translate the repetitions and run time into points. This chart is often misplaced as well as the results which are written down on a form and filed away. The *PT Calculator* will make record keeping of the results efficient and easily accessible to both the supervisor and the soldier.

The calculator has three main elements, the user interface, the database that is linked to the interface, and the output reports that reside on a server.

1.1 The Problem

First line leaders or supervisors test their subordinates in each event. The leader annotates the number of repetitions the soldier did for each event and in the end, converts

them to points. Each event has a maximum of 100 points. The calculations for converting the repetitions and run time differ according to the soldier's age and gender.

Presently, leaders have to look up the point conversion off a score sheet. They record the repetitions for each event, the converted points, and the total on a DA-Form 705(2, pg 8). This form is then filed away in the soldier's files for record keeping.

Figure 1 illustrates a sample view of the current conversion sheet the Army uses. Figure 2 illustrates the DA-Form 705.

This current process of calculating test scores and record keeping is very tedious and can be unreliable because of human error. The conversion sheet can sometimes be hard to read and the test records are often misplaced.

AGE GROUP	17-21		22-26		27-31		32-36		37-41		AGE GROUP	42-46		47-51		52-56		57-61		62+		AGE GROUP
Repetitions	M	F	M	F	M	F	M	F	M	F	Repetitions	M	F	M	F	M	F	M	F	M	F	Repetitions
77					100						77											77
76					99						76											76
75			100		98		100				75											75
74			99		97		99				74											74
73			98		96		98		100		73											73
72			97		95		97		99		72											72
71	100		95		94		96		98		71											71
70	99		94		93		95		97		70											70
69	97		93		92		94		96		69											69
68	96		92		91		93		95		68											68
67	94		91		89		92		94		67											67
66	93		90		88		91		93		66	100										66
65	92		89		87		90		92		65	99										65
64	90		87		86		89		91		64	98										64
63	89		86		85		88		90		63	97										63
62	88		85		84		87		89		62	96										62
61	86		84		83		86		88		61	94										61
60	85		83		82		85		87		60	93										60
59	83		82		81		84		86		59	92		100								59
58	82		81		80		83		85		58	91		99								58
57	81		79		79		82		84		57	90		98								57
56	79		78		78		81		83		56	89		96		100						56
55	78		77		77		79		82		55	88		95		99						55
54	77		76		76		78		81		54	87		94		98						54
53	75		75		75		77		79		53	86		93		97		100				53
52	74		74		74		76		78		52	84		92		96		99				52

Figure 1. Sample View of Current Conversion Sheet

Army Physical Fitness Test Scorecard						NAME (LAST, FIRST MIDDLE)					
For use of this form, see FM 21-20; the proponent agency is TRADOC						SSN			GENDER		
UNIT											
TEST ONE			TEST TWO			TEST THREE			TEST FOUR		
DATE	GRADE	AGE	DATE	GRADE	AGE	DATE	GRADE	AGE	DATE	GRADE	AGE
HEIGHT (IN INCHES)	BODY COMPOSITION		HEIGHT (IN INCHES)	BODY COMPOSITION		HEIGHT (IN INCHES)	BODY COMPOSITION		HEIGHT (IN INCHES)	BODY COMPOSITION	
	WEIGHT:	BODY FAT:		WEIGHT:	BODY FAT:		WEIGHT:	BODY FAT:		WEIGHT:	BODY FAT:
	lbs GO / NO-GO ☐ / ☐	% GO / NO-GO ☐ / ☐		lbs GO / NO-GO ☐ / ☐	% GO / NO-GO ☐ / ☐		lbs GO / NO-GO ☐ / ☐	% GO / NO-GO ☐ / ☐		lbs GO / NO-GO ☐ / ☐	% GO / NO-GO ☐ / ☐
PURAW SCORE	INITIALS	POINTS	PURAW SCORE	INITIALS	POINTS	PURAW SCORE	INITIALS	POINTS	PURAW SCORE	INITIALS	POINTS
SURAW SCORE	INITIALS	POINTS	SURAW SCORE	INITIALS	POINTS	SURAW SCORE	INITIALS	POINTS	SURAW SCORE	INITIALS	POINTS
2MRRAW SCORE	INITIALS	POINTS	2MRRAW SCORE	INITIALS	POINTS	2MRRAW SCORE	INITIALS	POINTS	2MRRAW SCORE	INITIALS	POINTS
ALTERNATE AEROBIC EVENT		TOTAL POINTS	ALTERNATE AEROBIC EVENT		TOTAL POINTS	ALTERNATE AEROBIC EVENT		TOTAL POINTS	ALTERNATE AEROBIC EVENT		TOTAL POINTS
EVENT _____			EVENT _____			EVENT _____			EVENT _____		
TIME _____			TIME _____			TIME _____			TIME _____		
GO ☐ NO-GO ☐			GO ☐ NO-GO ☐			GO ☐ NO-GO ☐			GO ☐ NO-GO ☐		
NCOIC/OIC SIGNATURE			NCOIC/OIC SIGNATURE			NCOIC/OIC SIGNATURE			NCOIC/OIC SIGNATURE		
COMMENTS			COMMENTS			COMMENTS			COMMENTS		
SPECIAL INSTRUCTION: USE INK LEGEND: PU - PUSHUPS 2MR - 2 MILE RUN SU - SIT UPS APFT - ARMY PHYSICAL FITNESS TEST						Data Required by the Privacy Act of 1974 Title DA form 705 Authority 5 USC Section 301 Disclosure of requested information is mandatory. Individuals not providing information cannot be rated/scored. The principal purpose and routine use of this information are to maintain a record of individual scores on physical fitness events.					

DA FORM 705, JUNE 1999

DA FORM 705, JUN 1998, MAY BE USED

USAPA V1.00

Figure 2. Army DA-Form 705

1.2 The Solution

The *PT Calculator* is designed to alleviate the problems of converting test results from a score sheet and misplaced test results and soldier information. This software converts and calculates the fitness test scores using C#. The test results and soldier information are saved in a database that resides on a server. This software is accurate, consistent, and user-friendly. It is connected to a database to enable users to save the test results and also be able to generate reports. The database can be accessed by three different user profiles. In the Web Access, those profiles can then view, edit, save, or print the different information stored in the database.

1.2.1 Interface-Soldier Information

The interface is composed of two parts. The first part is the Soldier Information. This area is where the user inputs all necessary information for record keeping. It includes the soldier's name, social security number, date of birth, unit, grade, and gender. This area and all fields in this part are required in order to store information in the database. This area of the interface is linked to the soldier information and PT history tables.

1.2.2 Interface-Calculations

The calculations area of the interface is where all the test results are entered in order to translate them into points and output a total. It also displays the point conversion for each event of the test and will notify the user if that soldier passed or failed each event. The soldier has to attain at least 60 points in each event in order to pass the test.

This area of the interface is linked to the event tables in the database. In order for the application to return the results, the age and gender fields in the Soldier Information area have to be filled.

1.2.3 The Database

The database is created in MySQL for its simplicity in purpose and for easy maintenance. There are two types of tables stored in the database. The first type is comprised of lookup tables to be able to calculate the point totals. The Soldier Information and PT History tables comprise the second type of tables in the database. These tables contain soldier data, results, and history of the results.

1.2.4 Web Access

The third aspect of the *PT Calculator* is the Web Access. The Soldier Information tables in the database reside on a server accessible on the Internet. This is displayed on a site in ASP.Net integrates the results into an official Army form. This form can be viewed or printed out.

It uses authentication for security reasons and will have three types of users, the administrator, supervisor and the soldier.

1.3 User Profiles

The *PT Calculator* has a total of three different user profiles. The interface is only accessible by the supervisor or first line leader. The Web Access portion which enables users to view and manipulate the data is accessible by the supervisor, the soldier, and also the administrator.

1.3.1 Supervisor

The supervisor is the first or second-line leader who grades the soldiers during the test. He is responsible for inputting the test results for each event and also for inputting the soldier information in the interface. The supervisor is accountable for making sure that each data is valid and recording the overall results for each soldier who took the test. The supervisor will have far more rights and privileges than the soldier profile on the Web Access. The supervisor will have access to all the information in the database including changing, deleting, and updating any records. They will have the ability to omit any errors, delete soldier records, and update any type of changes that they have

made on any of the tables. They will also have the ability to write the results into the Army form, save the form, and print it.

1.3.2 Soldier

The soldier profile has limited rights on the Web Access. They have the ability to view only their own information. They do not have the ability to make any changes to the information or the results. If they need any changes made to their own information or results, they will have to discuss it with their supervisor and the supervisor will determine what changes need to be made. The soldier also has the ability to write the results into the Army form, save the form, and print it. The soldier does not have access to the interface.

1.3.3 Administrator

The administrator profile has the overall rights and permissions to maintain the Web Access site. The administrator also has the responsibility of managing the user groups and the group rights for all the information contained in the database.

1.4 Project Design

This is an application development, primarily focusing on programming. It also has an emphasis on database design and development, as well as Web programming. The interface was developed using C# because of my familiarity with it as well as its

functionality. When I developed the interface for the software, I did the following steps in order for the interface to be user-friendly as well as easy to navigate:

- Conducted a survey of the users to find out what type of interface suits them the best.
- Conducted a survey at each milestone to determine whether the current interface still meets users' requirements.
- Conducted user testing at different stages of development.

For the backend database, I used MySQL. It is not a very large or complex database, and served my purpose of being able to store the test results using a button on the interface. The database contains mostly lookup tables for the point calculations. It also contains tables for a soldier's personal information. I did the following to develop the database:

- Conducted a survey to determine which information the users need stored in the database.
- Made sure that all information in the lookup tables was accurate in order to calculate and output the right results.
- Conducted user testing at different stages of development.
- Determined appropriate security permissions for each user on the database.
- The database resides on a server requiring user authentication.
- Implemented the security permissions for each user on the database.

The test results and the soldier information is available on the internet by accessing the Web Access site. The page was developed in ASP.Net. The leaders or supervisors have permissions to change, edit, save, and print every soldier's information and results. The subordinates have permission to access and view only their results and information.

I did the following steps when I developed the Web Access site:

- Made sure that the information is accessible only to those who have the rights.
- Gave the supervisor/leader profiles access to the database information, at the same time ensuring that the database is secure.
- View, Edit, Save, Print options of the test results and soldier information.

The following diagram illustrates design protocol I used for this project.

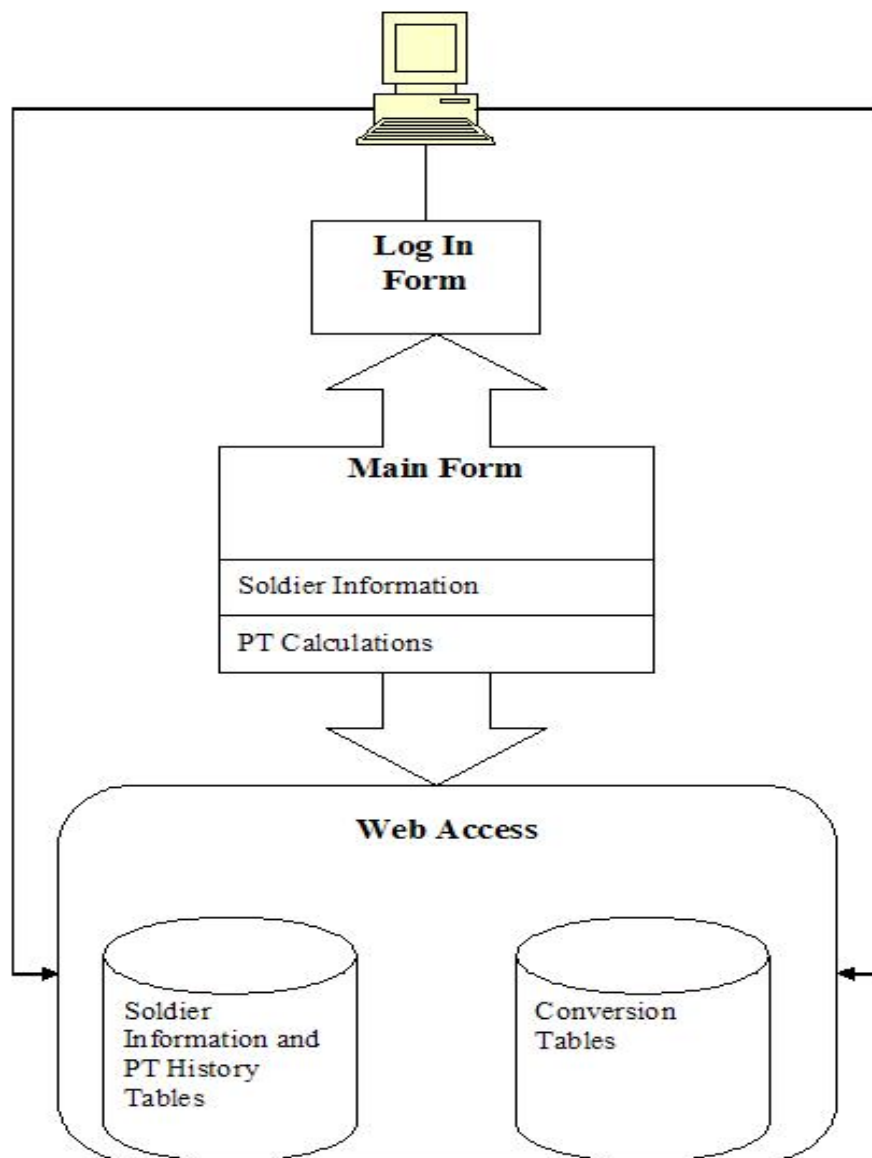


Figure 3. Design Protocol Flowchart

2. Interface Design

The Interface is comprised of two Windows forms. The first one is the Log In Screen. The second is the main screen in which the user inputs the soldier information and test results.

2.1 Log In Screen

The Log In screen is the first form the user sees once they open the application. It requires the user to input their username and their password. The username and password is provided in the installation disk but will require to be changed at the first login. Figure 4 illustrates what this screen looks like.

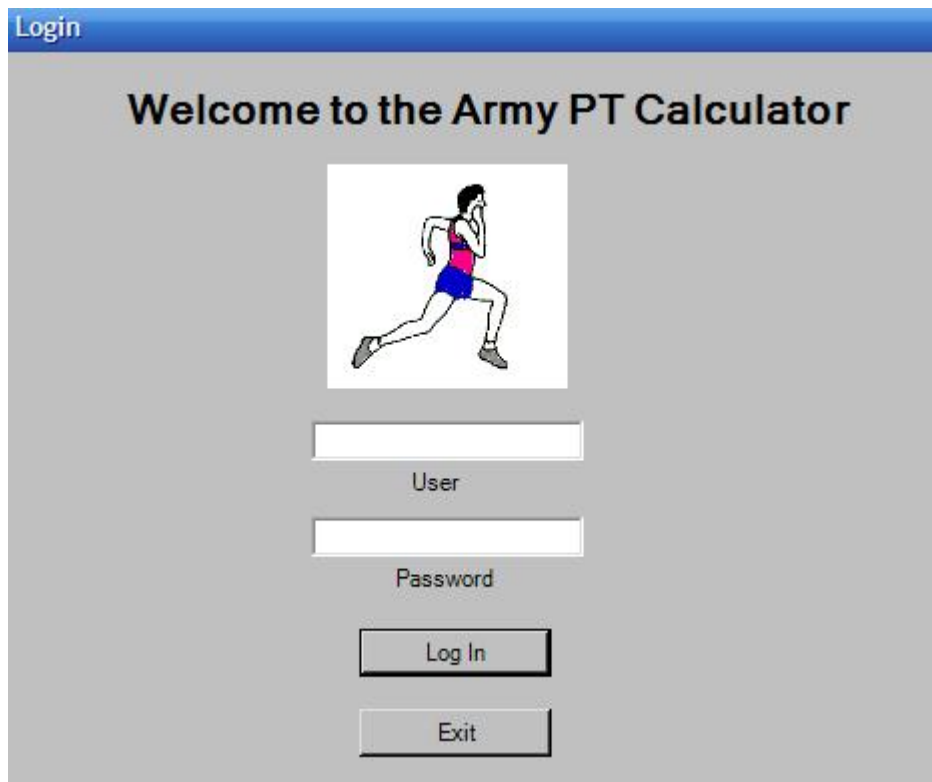


Figure 4. Log In Screen

2.2 PT Info and Calculations Screen

The PT Info and Calculations is the heart of the user interface. This form is divided into two sections. The first section is the Soldier Information area. The only mandatory field in this area is the Gender radio buttons. It is needed to calculate the results because points are tabulated according to age and gender. All the fields in the Soldier Information area are required only if they are saving the test results. Figure 5 illustrates what this screen looks like.

The screenshot shows a Windows-style application window titled "PT Calculator". Inside the window, the title "ARMY PT CALCULATOR" is displayed in large, bold, orange letters. To the right of the title is the official seal of the United States Army. Below the title, there is a "Soldier Info" section with a light blue background. This section contains several input fields: "SSN" (with a note "No hyphens/dashes"), "First Name", "Last Name", "Date of Birth" (with a note "MM/DD/YYYY"), "Unit", and "Grade" (with a note "E1,O5,CW3"). A "Retrieve Soldier Info" button is located next to the SSN field. To the right of the "Soldier Info" section are three buttons: "Save", "Clear", and "Exit". Below the "Soldier Info" section, there is an "Age" input field. To the right of the "Age" field is a "Calculate" button. At the bottom of the window, there are two sections: "Raw Scores" and "Total Scores". The "Raw Scores" section has three input fields for "Push Ups", "Sit Ups", and "2 Mile Run". The "Total Scores" section has three corresponding input fields for "Push Ups", "Sit Ups", and "2 Mile Run". At the very bottom, there is a "Total" label followed by a large yellow input field.

Figure 5. PT Calculation Screen

The second section is the Calculations Area. This is where the repetitions are inputted for each event, and where the converted points are displayed. Each field is required in order to calculate the test results.

3. Database Design

The database is created in MySQL and contains lookup tables for the calculations part of this application. A table named SoldierInformation holds data saved from the Soldier Info section of the interface. Another table named PTHistory holds test results which have been saved for recordkeeping. Figure 6 depicts the tables in this database.

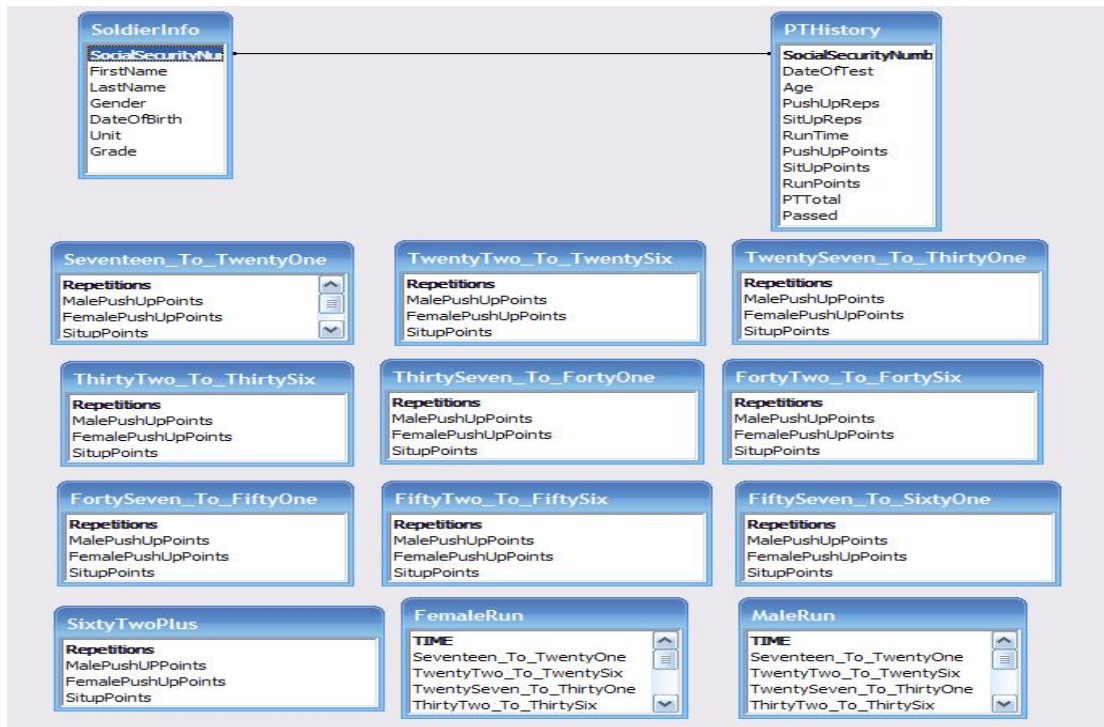
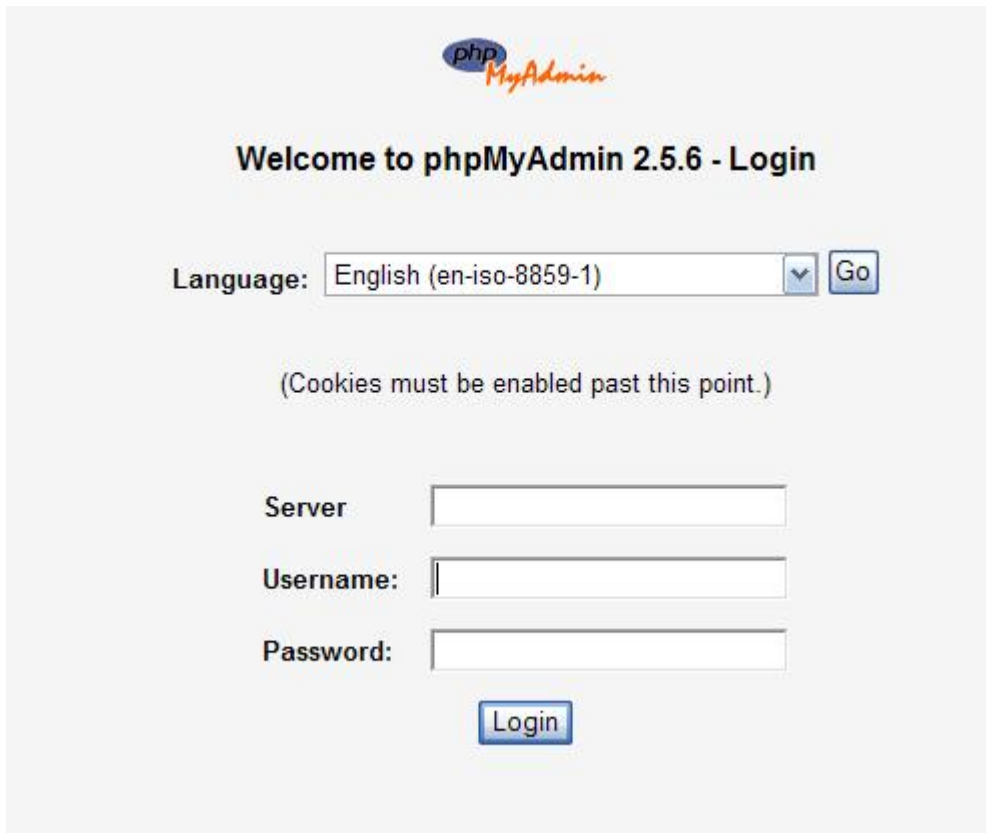


Figure 6. Database Tables

4. Web Access Design

The Web Access site is developed in ASP.Net. It consists of the three user profiles stated previously. The site is designed to enable squad leaders to view the database, edit any erroneous data entered, update the database, and print any test results to the official Army form. It also enables the soldiers to view only their information and results in the database and print test results. Administrators can also use the site and have the ability to fully manage and control the users and the data in the database. The administrator can log on to the database using phpMyAdmin located on the webserver. On the Administrator page, there will be a link that redirects the administrator to the phpMyAdmin login to gain access to the MySQL database. The following shows what this screen looks like.



phpMyAdmin

Welcome to phpMyAdmin 2.5.6 - Login

Language:

(Cookies must be enabled past this point.)

Server:

Username:

Password:

Figure 7. phpMyAdmin Log In

4.1 The Main Page

The Main Page for the Web Access site located at www.anthonyc.us. On the main page, the user can select which user level they would like to sign on as. They can either log on as an Administrator, Squad Leader, or soldier. Squad Leader users have special permissions and therefore have to log on using a username and password given assigned to them beforehand. The Administrator have is a special account and the log on information are set in the database itself. Soldiers can log on to the site by using their last name for the username and their social security number for their password. Figure 8 illustrates what the main page looks like.

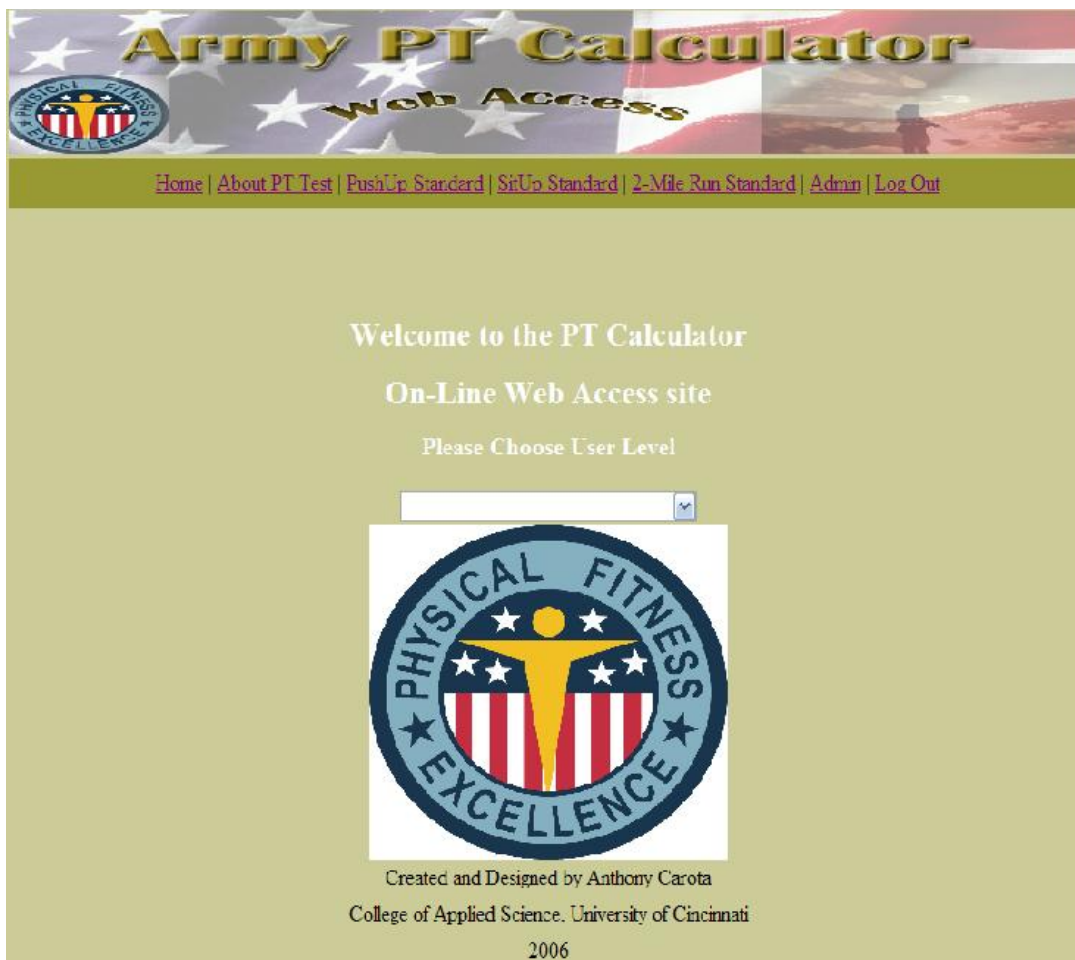


Figure 8. Web Access Main Page

4.2 Log In Screen

Once the user selects the user level they want to log on as, they will be redirected to the Log In Screen. This page uses VB scripting to validate user authentication and authorization. Figure 9 shows what the screen looks like.



The image shows a web-based login interface with a light olive-green background. At the top left, there is a small icon of a key with a globe inside. To its right, the text "Please Enter your Username and Password" is displayed in a bold, black, sans-serif font. Below this text are two input fields: "User Name:" followed by a white text box, and "Password:" followed by a white text box. Under the password field are two buttons: "Submit" and "Reset", both with blue gradients and white text. At the bottom of the page, the text "Welcome To the Squad Leader/Supervisor LogIn" is centered in a bold, black, sans-serif font. Below this, the text "[Back To Site Home](\"#\")" is centered in a purple, underlined, sans-serif font.

Figure 9. Log In Screen

4.3 SquadLeader Panel Screen

The SquadLeader Panel allows the squad leader to manipulate the data in the database. They can view all the soldier information contained in the database as well as edit, view the soldiers' test history, as well as print the information to the Army form. Figure 10 illustrates the SquadLeader screen.

Army PT Calculator
Web Access

HOME -- PT Calculator Web Access

[Home](#) | [About PT Test](#) | [PushUp Standard](#) | [SitUp Standard](#) | [2-Mile Run Standard](#) | [Admin](#) | [Log Out](#)

All Soldiers' Information

[SSN Search](#)

	Details	SocialSecurityNumber	FirstName	LastName	Gender	DateOfBirth	Unit	Grade
Delete Edit View Details		111111111	TORY	DANZIG	Female	1/1/1980	TEST	TEST
Delete Edit View Details		133333333	TONY	PATELI	Male	12/19/1976	TEST	E1
Delete Edit View Details		333333333	JOEY	BLOE	Male	1/1/1980	TEST	TEST
Delete Edit View Details		563112001	DANA	PACIS	Female	04/20/1966	TEST	TEST
Delete Edit View Details		656666666	DAVID	SANDER	Male	1/1/1976	TEST	E1
Delete Edit View Details		678555555	TIM	SMITH	Male	12/19/1974	TEST TROOP	E2
Delete Edit View Details		779999999	RACHEL	SIMON	Female	7/9/1980	TEST TROOP 2-107 CAV	E1
Delete Edit View Details		999999999	ANTHONY	CAROTA	Male	1/1/1980	A TROOP	E6

[Clear PTHistory View](#) **PT History For SSN# 33333333**

	ID	DateOfTest	Age	PushUpReps	SitUpReps	RunTime	PushUpPoints	SitUpPoints	RunPoints	PTTotal	Passed	Print
Delete Edit	57	2/8/2006	25	55	66	2222	77	81	0	158	Failed	Print
Delete Edit	58	2/8/2006	25	55	66	1111	77	81	100	258	Passed	Print

Figure 10. SquadLeader Panel Screen

4.4 SoldierPanel Screen

The SoldierPanel Screen is displayed when a soldier logs on to the site. They only have permission to view their own personal information and test results, as well as print their results to the Army form. Figure 11 displays the SoldierPanel Screen.

The screenshot shows the 'Army PT Calculator Web Access' interface. At the top is a banner with the title and a navigation bar with links: Home, About PT Test, PushUp Standard, SitUp Standard, 2-Mile Run Standard, Admin, and Log Out. Below the banner, the section 'Personal Information For:' is followed by the name 'DANZIG'. A table displays personal details: SocialSecurityNumber (111111111), FirstName (TORY), LastName (DANZIG), Gender (Female), DateOfBirth (1/1/1980), Unit (TEST), and Grade (TEST). The 'Your PT History' section contains a table with 12 columns: ID, DateOfTest, Age, PushUpReps, SitUpReps, RunTime, PushUpPoints, SitUpPoints, RunPoints, PTTotals, and Passed. There are 10 rows of test data, each with a 'Print' link to its left.

	ID	DateOfTest	Age	PushUpReps	SitUpReps	RunTime	PushUpPoints	SitUpPoints	RunPoints	PTTotals	Passed
Print	30	1/25/2006	26	33	44	1222	52	52	100	204	Failed
Print	31	1/26/2006	26	55	55	1222	77	67	100	244	Passed
Print	46	1/26/2006	26	77	77	2222	100	96	0	196	Failed
Print	48	1/26/2006	26	44	77	1111	65	96	100	261	Passed
Print	49	1/26/2006	26	44	44	2222	97	52	32	181	Failed
Print	50	1/26/2006	26	44	55	2222	97	67	32	196	Failed
Print	64	2/13/2006	26	55	55	1111	100	67	100	267	Passed
Print	66	2/18/2006	26	66	66	3333	100	81	0	181	Failed
Print	63	2/19/2006	26	55	55	1111	100	67	100	267	Passed

Figure 11. SoldierPanel Screen

5. Timeline

5. 1 Senior Design I Fall 2003

- Analysis
- Gathered information
- Conceptual Design of Database
- Conceptual Design of Interface
- Document
- Wrote Proposal
- Presented Proposal

5. 2 Senior Design II Fall 2005

- User Interface Survey of End Users
- Logical and Physical Design of Database
- Developed User Interface
- Tested User Interface and Database
- Wrote Intended Use and Profiles
- Wrote Design Freeze
- Document
- Presented Prototype

5. 3 Senior Design III Winter 2005-2006

- Developed Web Access
- Completed User Profiles and Authentication of Web Access
- Tested and Troubleshoot Web Access
- Completed Application Functionality
- Final Testing of Completed Project
- Document
- Present Final Project and turn in all documentation

6. Budget

The following charts illustrate the approximate cost of the software and hardware required to complete this development.

SOFTWARE	DEVELOPER	COST	ACTUAL COST
Visual Studio.Net 2003 Pro *	Microsoft	\$410.00	FREE
MySQL Database	MySQL AB	FREE	FREE

Figure 12. Software Costs

HARDWARE	SPECIFICATIONS	COST	ACTUAL COST
Monitor **	17" CRT Display	\$149.00	\$149.00
Desktop **	Pentium 4 2.20Ghz with 48x CD-ROM and 80GB Hard Drive, 256 MB DDRAM at 333MHz	499.00	499.00
Printer **	Canon Desktop Printer 4800 X 1200 color dpi.	129.00	129.00
Dell Server SC1420 ***	Intel® Xeon™ Processor at 2.8GHz/2MB Cache, 800MHz FSB	699.00 (Already Acquired through donation by A-Troop 2-107 CAV)	FREE

Figure 13. Hardware Costs

Overall cost of project \$1,886.00.

Actual cost of project \$777.00.

*Prices found at www.amazon.com

** Prices found at www.topmicrousa.com

***Price found at www.us.dell.com

7. Deliverables

1. User Interface that calculates test results and saves soldier information.
2. User Interface that requires a login but is easy to navigate.
3. A normalized database that retains soldier information and test results. Contains tables with the correct conversion points for each event.
4. Web Access, which provides the supervisors and soldiers access to the database on-line.
5. Supervisors will be able to view, edit, save, and print the information contained in the database.
6. Soldiers will be able to view, print only their information contained in the database via Web Access.
7. An optional deliverable of developing the application to run on a PocketPC.

8. Testing

The project was tested throughout the whole development of the application as well as at each milestone. The User Interface has been tested by two soldiers from A-Troop 2-107 CAV(13)(14). A few bugs were reported concerning the input formatting on the main form. These bugs were corrected and the functionality was implemented. The Web Access is now available online at www.anthonyc.us and were tested by the same two personnel.

9. Recommendations

During the development of this application, I encountered a few bumps on the road. On the client application, I encountered some problems with trying to connect the software to the remote database. Since I began the project using Access for my database, I only had to implement the OleDb connector for the application and the database to communicate. Halfway through the project, I converted my database from Access to MySQL. I encountered some minor problems during the conversion such as the Yes/No value type not having an explicit equal value type in MySQL. I instead converted the

field into a varchar field. But the biggest problem I encountered during the conversion was my connection string. I used the ODBC connector to enable the application to communicate with the remote database. In order to use the ODBC connection, I had to go to MySQL's site and download the ODBC driver(10). The following link points to the download site: <http://dev.mysql.com/downloads/connector/odbc/3.51.html> .

On the Web Access development, I encountered some problems with my datagrids. My controls were not being bound to the datagrid each time I clicked on a command button. To solve this problem, I had to create session cookies and bind the data each time a command button was clicked(8).

I would recommend an intermediate level of knowledge to manipulate the code in both the client application as well as the Web Access. Without having the basic knowledge of C# and ASP.NET, manipulation of any of the code is not suggested.

10. Conclusion

The main point of this application was to alleviate problems with inaccurate conversion of the test results, saving soldier information as well as the test results, and making the process of calculating the PT test faster and more efficient. I believe that this application met its deliverables, enhanced the process, and met the objectives I set forth at the beginning of the development.

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