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# **Metrics Reporting System (MRS) Operational Specification**

**Written By**

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**With Contributions From  
Students in CS 480 Fall 2004**

**Revision: 1.2**

**19 November 2004**

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95

## Revision History

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<b>Revision</b>	<b>Date</b>	<b>Changed By</b>	<b>Description of Changes</b>
1.2	19 November 2004	Bill Junk	Clarification of data exporting feature, and a few other minor clarifications
1.1	15 November 2004	Bill Junk	Minor editorial changes, clarification of export operations, and addition of authentication to viewing individual data.
1.0	17 September 2004	Bill Junk	Initial release

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99

## 1.0 Introduction

100 This document is the Operational Specification for the Metrics Reporting System (MRS) tool being  
 101 developed to support the management of team software development projects undertaken in CS 481 at  
 102 the University of Idaho. MRS is a application existing in a web environment providing its users with the  
 103 ability to input project data and to retrieve project data for viewing in a way that enhances interpretation  
 104 and understanding of activities performed in support of projects.

105 The purpose of the operational specification is to document thoroughly the desired operational  
 106 characteristics of the system. The perspective from which the information contained in the operational  
 107 specification is presented is that of the system users. The operational specification should be considered  
 108 as documenting the abstract machine (model) that satisfies the users' requirements. The model  
 109 presented here should not be construed as presenting the system's architectural design or stipulating  
 110 details of the implementation that will not be apparent to the users.

111

### 112 1.1 References & Applicable Documents

113 1. CS 481 Capstone Design Project course web site,  
 114 <http://www.cs.uidaho.edu/~billjunk/courses/cs481/cs481.html>

115 2. Class discussion notes provided as e-mail:

Date	Submitted by
25 August 2004	Joel Gibler, David Nadler, Yang Shu, Vedran Skoro, Terry Triplett, Dimetri Wilker,
30 August 2004	Aaron Brown, Samuel Johnson, Kyle King, Laura Marshall, Neil Nguyen
9 September 2004	Bryan Barrett, Karen Marshall, Jeannine Schmidt, Doug Shikashio, Nick Webb
13 September 2004	James Elgee, Audra Johnson, Brad Faler, Sung-Ung Kim, Bryan Rossebo,
15 September 2004	Michael Apfelbeck, James Bianco, Ryan Blue, Shane Smith

116

117 3. Operational area definitions provided as e-mail:

Date	Operational Area	Submitted by
1 September 2004	Individual Weekly Activity Report – Data Viewing	Michael Apfelbeck, James Elgee, Karen Marshall, Jeannine Schmidt
1 September 2004	Individual Weekly Activity Report – Data Exporting	Brandon Barrett, Brad Faler, Laura Marshall, Doug Shikashio, Nicholas Webb
1 September 2004	Consolidated Weekly Team Activity Report – Data Viewing	James Bianco, Joel Gibler, Andrew McConaghy, Yan Shu, Dimetri Wilker
1 September 2004	Consolidated Weekly Team Activity Report – Data Exporting	Ryan Blue, Audra Johnson, David Nadler, Vedran Skoro

1 September 2004	System Administration – Semester Initialization & System Configuration	Aaron Brown, Sam Johnson, Neil Nguyen, Shane Smith
1 September 2004	System Administration – Modification of System Configuration	Sung-Ung Kim, Kyle King, Bryan Rossebo, Terry Triplet

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## 119 **1.2 Definitions & Terms**

120 **Authenticate:** To determine that a user is valid (approved) for the context in which he/she is requesting  
121 use of the system and its data.

122 **CSV:** Comma Separated Value

123 **MRS:** Metrics Reporting System

124

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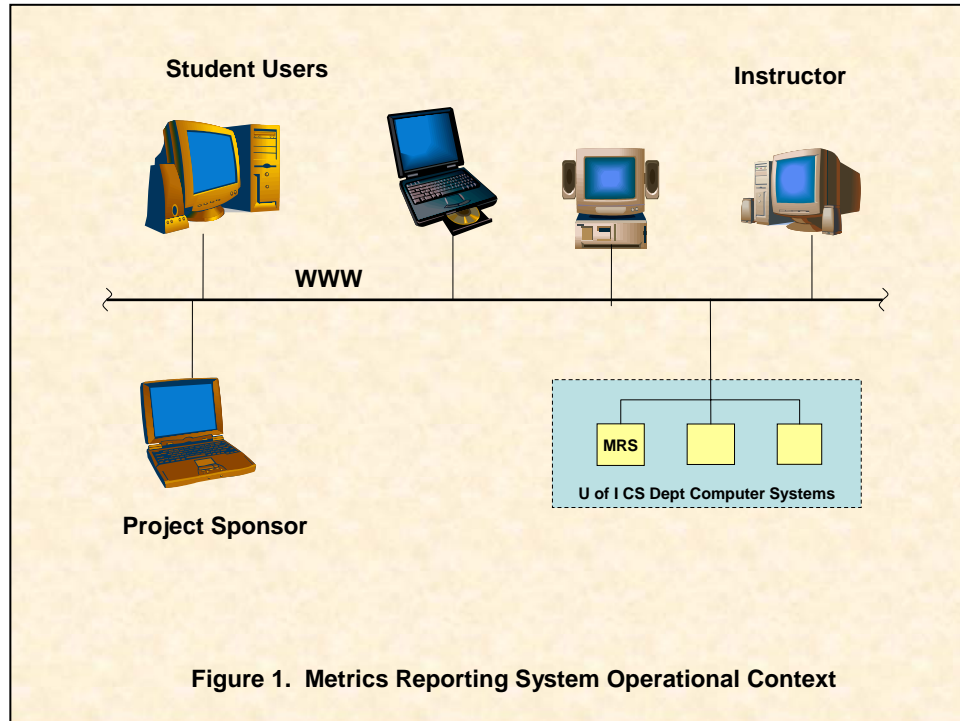
## 2.0 Operational Overview

126 When completed, the Metrics Reporting System (MRS) will be a suite of collaborating tools designed to  
127 support the management of team-based software development projects in the CS 481 Senior Capstone  
128 Design course offered by the University of Idaho Computer Science Department. Users are the students  
129 enrolled in the course, the course instructor, and potentially, the project sponsors (customers).

130 MRS will be a web-based or web-accessible application that allows users easy access to the most  
131 commonly required features. From the descriptive material presented in this section and in subsequent  
132 section, conceptually one could think of MRS as a classic case of a client-server application. However,  
133 there is no intention for this specification to force the system design into a client-server architecture.

134 In the Senior Capstone Design course students are placed in teams and assigned a project to work on for  
135 the semester. Team size is normally 4 or 5 members but could be more or less under unusual  
136 circumstances. Projects are sponsored by individuals from on and off campus with real needs requiring  
137 development of custom computer application programs. Each team is responsible for developing a  
138 solution that fulfills their customer's need. In a typical semester there will be from 3 to 6 teams actively  
139 working on different projects.

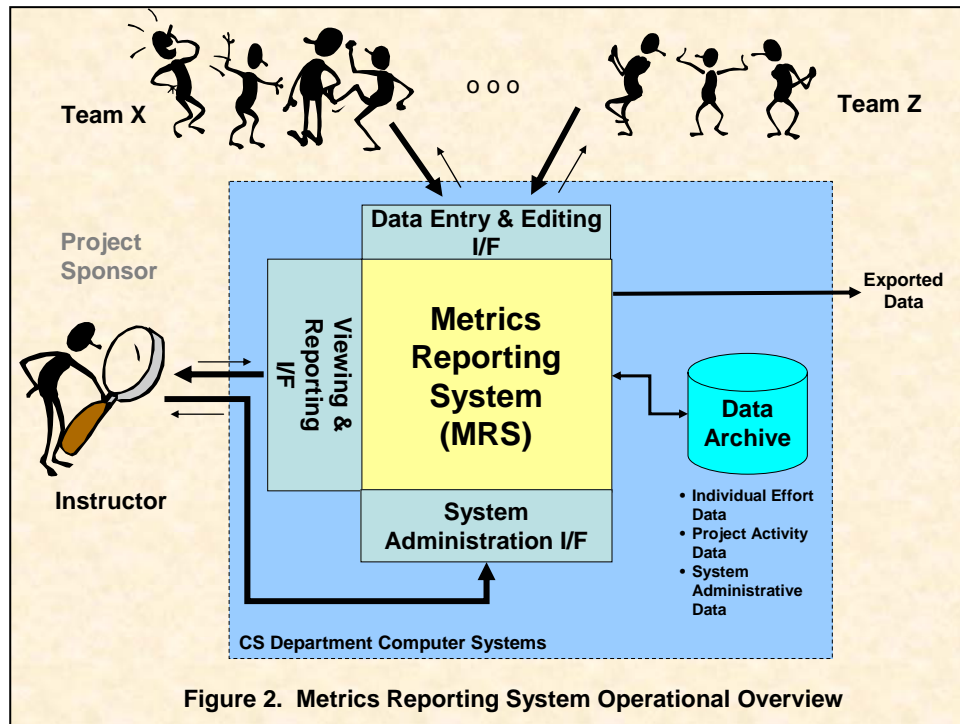
140 The MRS is needed to replace a manual, paper-based system that is currently in use to collect individual  
141 and team/project data. Automation of the process will save time and improve data accuracy by  
142 eliminating the need to take data collected manually using paper forms and entering it into Excel  
143 spreadsheets. Automation of the collection process will also allow for more timely review of the data and  
144 discussion of important data trends with individuals and teams as a whole. Figure 1 provides a simplified  
145 representation of the operational context of MRS. Since this figure only is intended to illustrate how MRS  
146 is used, it should not be interpreted as dictating, prescribing, or describing the actual system architecture  
147 or design.



148

149 MRS is an application supporting multiple users who may be simultaneously using its capabilities. The  
 150 user's interaction with MRS is platform independent. MRS is accessed by "clicking" on a link located on  
 151 the CS 481 course web page which is stored on one of the CS Department's UNIX systems.

152 Figure 2 provides a slightly more detailed view of MRS without showing the broader context of its  
 153 environment. Note that there are three primary interfaces to MRS. Here interfaces signify access to a  
 154 collection of related operations. The Data Entry Interface is used by students to report their weekly



155 individual activity and team activity data. The Viewing and Reporting Interface is used primarily by the  
 156 course instructor, however, viewing and reporting capability may be used by anyone who has access to  
 157 MRS. This interface allows the user to see individual student data and data that has been consolidated  
 158 to the project team level. The System Administration Interface is used by the course instructor to configure  
 159 the system for each semester's use. This includes identifying individual students and their team  
 160 associations.

161 MRS must maintain two basic categories or types of project-related data. The first category of data  
 162 captures the effort contributed by individual team members while working on their team's project. This  
 163 data is referred to as "Individual Activity Data." The second category of data captures information about  
 164 the amount of documentation produced, code produced, defects discovered and fixed, and other project  
 165 management information that pertains to the project as a whole. This latter data is collectively referred to  
 166 as "Project Activity Data."

167 In the current manual process data entry occurs on a weekly cycle that coincides with the team's weekly  
 168 meeting with the course instructor. Normally each student will complete his or her individual "time sheet"  
 169 shortly before the weekly team meeting. When MRS is operational individual team members will use  
 170 MRS to fill out an electronic time sheet thus documenting the amount of time they spent on the project  
 171 during the seven day reporting period that ends on the day preceding the weekly meeting. With MRS the  
 172 time sheet will be a "form" accessible from a designated location on one of the Computer Science  
 173 Department's computer systems.

174 In addition to providing a day-by-day accounting of time spent, time is also distributed into a number of  
 175 different activity categories. In effect, each student must fill in a matrix that captures the important  
 176 elements of work performed over the reporting period. Examples of activity categories include: project

177 planning, system design, coding, and unit testing. Activity categories are determined by the course  
178 instructor at the beginning of each semester.

179 During the weekly meeting the instructor may review (look at) the effort data submitted by individual team  
180 members. The instructor may also be interested in viewing a team member's weekly time sheet for a  
181 previous week. If anomalous values are detected they need to be corrected. Individual team members  
182 may edit or correct their time sheets at any time.

183 MRS must also consolidate (aggregate) the data provided by individual team members into a project level  
184 report. A consolidated report is generated by adding the weekly totals for each team member in each  
185 activity category and generating a tabular representation of the data covering the entire semester. Thus  
186 consolidated reports provide visibility with weekly granularity covering the entire semester. Consolidated  
187 reports will be generated at the time they are requested, using the latest data available in the project's  
188 data archive. Consolidated data are not saved by MRS.

189 With the level of accessibility provided by a web-based application it is possible for more than one student  
190 to be entering and submitting data to MRS at roughly the same time. It is also possible that the course  
191 instructor could be viewing individual or team data concurrently with students who are updating data.

192 MRS must provide sufficient protection of the projects data so that the data of an individual team member  
193 can only be submitted, and modified by the "owning" individual. Restrictions must also be provided to  
194 limit viewing of individual data to the "owning" individual and the course instructor. No restrictions will be  
195 placed on who can view team-level (aggregate) data.

196 MRS must be easily configurable for use at the beginning of a new semester. Configuration entails  
197 establishing a new data repository, entering student names, assigning passwords for use in  
198 authenticating users, entering team names, and assigning students to teams. Additional configuration  
199 actions define the activity categories and the ending date of the first reporting period for each team. No  
200 code modification (in the traditional sense) and no recompilation of programs will be required to complete  
201 system configuration.

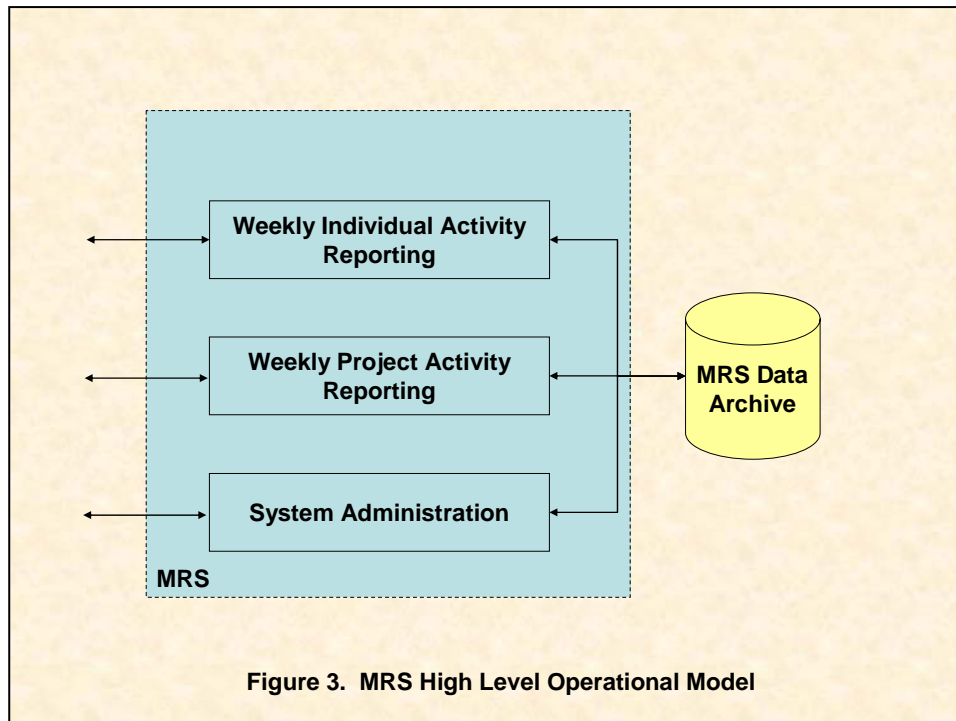
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## 3.0 Operational Model

220 This section provides an operational description for the Metrics Reporting System and provides a detailed  
 221 description of the capabilities supported by MRS. The operational description is based upon a set of  
 222 operations that have been identified. If the concept of an operation is not quite clear, you can think of an  
 223 operation as being roughly equivalent to a feature the system must support or a requirement the system  
 224 must meet. Operations are stated from the perspective of the system's users. Each operation describes  
 225 a collection of actions and responses related to the accomplishment of a focused, largely independent,  
 226 activity. Some explanatory information is provided in the discussion of the operational model. From an  
 227 operational model perspective MRS is viewed as providing access to three principle groupings of  
 228 capabilities as shown in Figure 3.

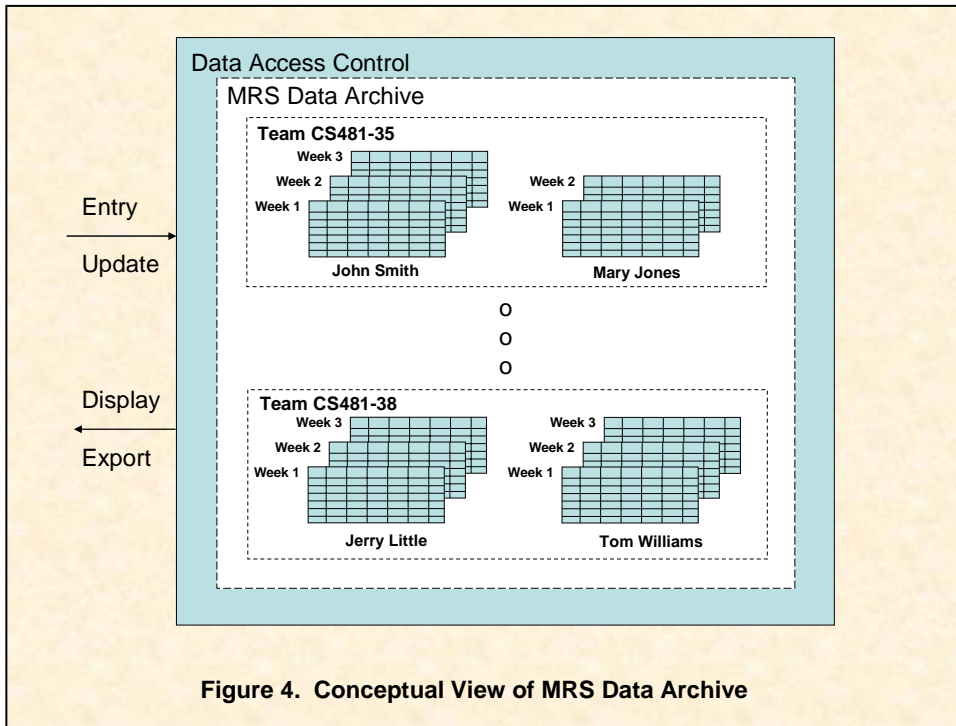


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### 230 3.1 Weekly Activity Reporting Operational Description

231 As was described in the previous section, MRS allows users to enter and retrieve project management  
 232 information for projects being worked on in CS 481. The diagram below provides a slightly more detailed  
 233 operational representation of the MRS data archive, showing its conceptual contents related to the  
 234 operations described in this section.

235 The data archive contains the data collected during an entire semester. Each person in the CS 481 class  
 236 is assigned to a team (project). In the example below, team CS481-35 has team members John Smith  
 237 and Mary Jones. Teams are normally composed of 4 or 5 members although fewer or more members are  
 238 possible. For each person there are individual sets of data representing each reporting week of the  
 239 semester. Data are collected every 7 days for an 18 contiguous week period. Typical semesters contain  
 240 data for three to five teams, although as few as one team and as many as 10 teams are possible.



241 Contents of the MRS Data Archive are protected from inappropriate and unauthorized modification by a  
 242 Data Access Control capability. Some examples of what Data Access Control must accomplish include:  
 243 (1) preventing one student from entering or modifying the data of another student, and (2) preventing  
 244 hackers/attackers from modifying or corrupting the data. From an operational perspective (a view the  
 245 user has of the system) the processing performed by MRS to support weekly activity reporting can be  
 246 subdivided to produce a collection of operations (capabilities) that interact in various ways with the Data  
 247 Archive. A block diagram showing these basic operations is presented in Figure 5. The figure includes a  
 248 data store labeled "Configuration Data" that is the repository for information identifying student names and  
 249 passwords, team names, student-team associations, etc. The configuration data are used as needed by  
 250 MRS operations.

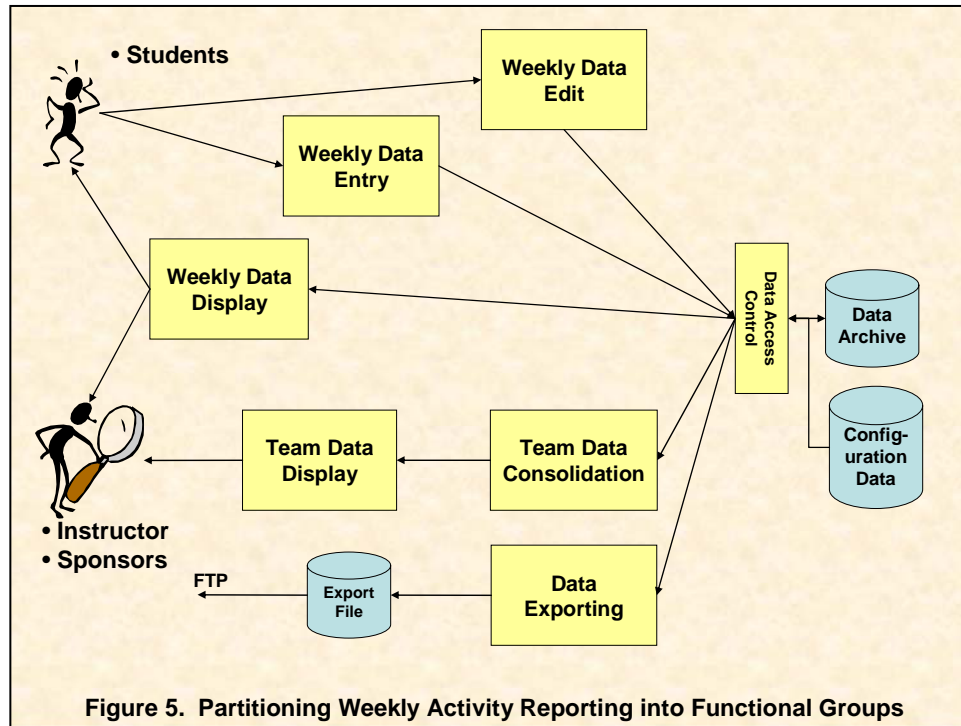


Figure 5. Partitioning Weekly Activity Reporting into Functional Groups

251 The following paragraphs provide a usage-based description of MRS capabilities supporting weekly  
 252 activity reporting.

### 253 3.1.1 Individual Weekly Activity Report – Data Entry

254 Figure 6 shows a sample Weekly Individual Project Activity Report form as it might appear in the paper-  
 255 based system currently in use. This example shows a report for Jim Caron of team CS 481-35 for the  
 256 week ending October 17, 2005. Rows of the form identify twelve different activity categories for which he  
 257 has reported daily activity. Data entry to the nearest ½ hour is expected. On the manual form the student  
 258 is expected to insert row and column totals. Row and/or column totals are frequently in error.

259 With MRS a student needing to input his or her data for the week goes to a known URL (most likely  
 260 available as a link from the main CS 481 web page) from which the desired capabilities can be accessed.  
 261 Students actually have a choice about how they use the MRS data collection feature. Data may be  
 262 submitted incrementally, that is, at the end of a particular day's activity, the student may access MRS,  
 263 retrieve his or her form for the current week, then enter the day's data. This is repeated several times  
 264 during the week as they spend time working on the project. Another alternative is for the student to  
 265 maintain independent records of the time spent working on the project, entering the data all at once just  
 266 prior to the weekly meeting with the instructor.

267 The ability to correct and modify the data while in the data entry mode is provided. Row and column  
 268 totals will be automatically generated by MRS. Hours are the units of measure for this data. Resolution  
 269 to 0.1 hours is supported. When data entry is completed, the user will submit the data for incorporation  
 270 into their project's section of the data archive. MRS has the ability to determine which student is  
 271 submitting data and associate that data with the project to which he or she is assigned.

272 Only students enrolled in the course will be allowed to submit weekly activity data.

273

CS 481 Weekly Individual Project Activity Report								
Team: <u>CS481-35</u> Name: <u>Jim Carson</u> Week Ending: <u>10-17-05</u> Release: <u>2</u>								
Activity	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total
1. Project Management		2					1	3
2. Customer Meetings			1					1
3. Requirements				.5	.5			1
4. System & Software Design						1	4	5
5. Coding	3	1	2		2		1	9
6. Unit Testing	1		1		1			3
7. Integration & System Testing				3				3
8. Release								
9. Documentation	1							1
10. Beta Testing								
11. Defect Evaluation								
12. Other						1		1
Totals	5	3	4	3.5	3.5	2	6	27

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**Figure 6. Sample Weekly Individual Project Activity Report.**

### 276 3.1.2 Individual Weekly Activity Report – Data Viewing

277 Viewing of the Individual Weekly Activity Report data may be performed by the “owning” student and the  
 278 course instructor. Viewing an individual’s weekly data will produce a display similar in appearance to that  
 279 used to input the data (see Figure 6) but without the ability to modify the data. To view a report, the user  
 280 must select the individual whose data are to be viewed. The data displayed will be the data  
 281 corresponding to the current reporting period. The daily activity in each of the activity areas as well as  
 282 activity totals and daily totals will be computed and displayed.

283 While viewing the most recent data, the user will have the ability to look or move through the data for  
 284 previous reporting periods, week by week. Both backward and forward movement will be supported.

### 285 3.1.3 Individual Weekly Activity Report – Data Exporting

286 MRS shall be able to export the Individual Weekly Activity Report data to a comma separated value file  
 287 (CSV) arrange in a way that will allow the data to be imported by Microsoft Excel or other program  
 288 supporting CSV importing for further data manipulation and generation of graphical displays. For security  
 289 reasons, the file generated by data exporting shall be placed in a predetermined location within the  
 290 computer system running MRS.

### 291 3.1.4 Consolidated Weekly Team Activity Report – Data Viewing

292 Primarily for the instructor’s use, MRS will provide the ability to consolidate Individual Weekly Activity  
 293 Reports submitted by the members of a team and present the data showing total team activity for each  
 294 week of the semester. Hours worked on individual days are not preserved in this view. A weekly total for  
 295 the team is generated for each activity category. The data are displayed in a matrix form with rows  
 296 corresponding to the activity categories and the columns corresponding to individual weeks of the

297 semester. An entire semester's collection of team data is displayed at one time. The user has the ability  
 298 to select which team's data is to be consolidated and displayed. No restrictions are placed on who can  
 299 view this data.

### 300 **3.1.5 Consolidated Weekly Team Activity Report – Data Exporting**

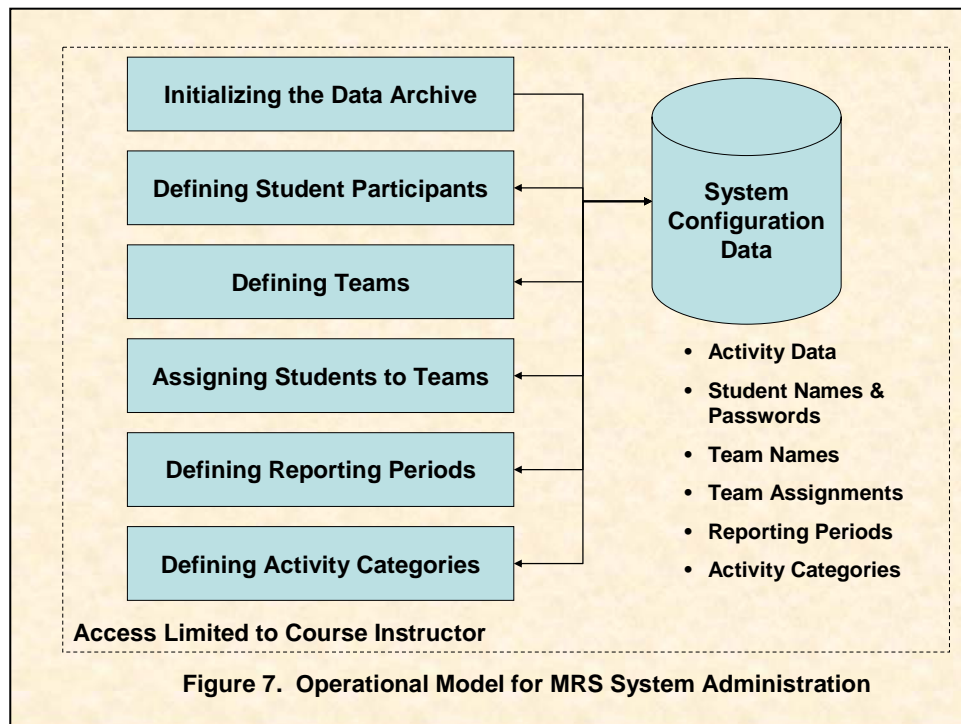
301 MRS shall be able to export the Consolidated Weekly Team Activity Report data for all teams to a comma  
 302 delimited file in a format that will allow the data to be imported by Microsoft Excel or other applications  
 303 supporting CSV importing for further data manipulation and generation of graphical displays. For security  
 304 reasons, the file generated by data exporting shall be placed within the computer system running MRS.

## 305 **3.2 Weekly Project Activity Reporting**

306 TBD

## 307 **3.3 System Administration**

308 MRS provides system administration features that enable the course instructor to configure the system for  
 309 each semester's use. Configuring MRS requires initializing the data archive to a "null" or "empty" state,  
 310 then identifying the teams that will be tracked, defining the names of students, providing authentication  
 311 information that will prevent unauthorized submission or modification of activity data, associating students  
 312 with team, defining activity categories to be used during the semester, and setting the reporting period  
 313 ending date for the first reporting period of each team. Only the course instructor or someone authorized  
 314 by the course instructor shall be able to initialize and configure the system. Figure 7 presents an  
 315 operational model for the system administration group.



316

317 The system administration capabilities are described in the following paragraphs.

**318 3.3.1 Initializing the Data Archive**

319 At the start of each semester the course instructor will remove data from MRS that was accumulated  
320 during the prior semester's use.

**321 3.3.2 Defining Teams**

322 MRS allows the course instructor to define the names of teams participating in the current semester.  
323 Subsequent operations will be used to identify and assign individual students to each available team. As  
324 a default condition there is always a team whose name is "UNASSIGNED".

**325 3.3.3 Defining Student Participants**

326 MRS allows the course instructor to enter the names of students participating in the team project course  
327 and assign each student a password to be used when submitting individual weekly activity data.

**328 3.3.4 Assigning Students to Teams**

329 MRS allows the course instructor to assign individual students to the available teams.

**330 3.3.5 Setting the Reporting Periods**

331 MRS allows the course instructor to specify dates on which individual weekly activity reports are to be  
332 submitted. These dates help ensure that data consolidation is performed for the correct time period.  
333 When configuring MRS at the beginning of the semester, the course instructor will define the ending date  
334 for the first reporting period for each team. Each team may have a different ending date and one or more  
335 teams may have the same ending date. MRS will use this initial date to determine the ending dates for  
336 subsequent reporting periods in the semester.

**337 3.3.6 Defining Activity Categories**

338 MRS allows the course instructor to specify a collection of text string that are to be used to identify the  
339 activity categories for which weekly data are collected and reported. Definition of activity categories will  
340 only occur at the beginning of a semester and will not happen once data collection has been initiated.

341

## 4.0 Operational Requirements

342 The information contained in this section of the MRS Operation Specification constitutes the definition of  
343 specific operational characteristics that must be fulfilled by MRS. In the event of conflict between various  
344 sections of this document, the specification of operational, behavioral, performance, non-functional, etc.  
345 characteristics in this section shall take precedence.

### 346 4.1 Operational System Platform & Environment

347 MRS must operate in the computer environment available in the Computer Science Department at the  
348 University of Idaho. Data will reside in a class account created on UNIX systems. Access to MRS will be  
349 provided from a web link accessible from the main CS 481 web page. Input and visualization of data will  
350 be possible from any computer using a standard web browser.

### 351 4.2 Operations

352 The following tables document operations the user may perform using MRS. In the Operations section  
353 the following information is defined for each operation:

354 **ID:** A unique identification assigned to the operation.

355 **Name:** A short descriptive name by which the operation is known.

356 **Priority:** The priority assigned to the operation. The priority reflects the value of the operation to  
357 the project sponsor and should be used as a guide in determining the sequence in which  
358 operations are implemented.

359 **Pre-conditions:** System conditions or state that are true before the operation is (or can be)  
360 executed. Pre-conditions apply to the normal sequence of operations. Pre-conditions may be  
361 violated by some error conditions.

362 **Stimulus:** The command, command sequence, or actions originating externally (from a user,  
363 external interface, or external system) that invoke the operation.

364 **Description of Nominal Operation:** An extended description of what happens during  
365 performance of the operation. This considers only the behavior expected from the "normal" case.  
366 Typically the nominal operation is defined as a set of steps that are performed. It is important to  
367 remember that this is an Operational Specification designed to capture a system definition as it  
368 is viewed by the system user. It is not the intent of this specification to define or prescribe a specific  
369 sequence of actions that must be performed in order by the system. This is not the system  
370 design. Rather the intent is limited to defining the capabilities that must be provided.

371 **Alternative actions or error conditions:** A description of the behavior exhibited by alternative  
372 actions or error conditions.

373 **Post-conditions:** System conditions or state after the operation has been completed. Different  
374 post-conditions for the nominal and alternative actions may be specified.

375 **Performance:** Specification of time allowed for the operation, accuracy of a computation,  
376 amount of a resource that may be used, etc.

377 **References:** Identification of where the information contained in the specification of this  
378 operation originated.

379 **Traceability:** (Code) Provide a list of code modules (objects, functions, or equivalent program-  
380 level entities) that participate in implementing this operation. This is information that will be  
381 added as the product is designed and implemented. (Tests) Provide a list of test cases available  
382 to exercise this operation. This is information that will be added as the product tests are designed  
383 and implemented.

384 The following paragraphs contain the definitions of operations to be supported by MRS. [In reading the](#)  
 385 [description of nominal operation for several of the operations you will see a requirement to authenticate](#)  
 386 [the user. In satisfying this requirement it is sufficient to require a single authentication action during a](#)  
 387 [user session, and once authenticated the user may perform all allowed operations without additional](#)  
 388 [authentication challenges.](#)

## 389 4.2.1 Individual Weekly Activity Reporting

### 390 4.2.1.1 Individual Weekly Activity Report – Data Entry

391 MRS provides students with the ability to fill out a web-accessible form to document their weekly project  
 392 activity.

ID: MRS-01	Name: Submit Individual Activity Data	Priority: Mandatory
<p><b>Pre-conditions:</b> CS Department Web services are functioning correctly. MRS has been correctly configured using system administration operations to define student participants and teams.</p>		
<p><b>Stimulus:</b> The user requests display of the data entry form.</p>		
<p><b>Description of Nominal Operation:</b></p> <ol style="list-style-type: none"> <li>1. The system successfully authenticates the user. For this operation users are students participating in the team project who have been authorized to submit data by the course instructor.</li> <li>2. The user selects the reporting period from a list of dates determined using the system configuration data set for the team to which this individual belongs. Note: The ending date of a reporting period must be the same for all students on a team so that data consolidation summarizes the data correctly.</li> <li>3. A data entry form is displayed. The data entry form contains rows representing the activity categories for which the student is to report. Activity categories may change from one semester to another, but will not be changed once semester data collection has been initiated. The data entry form contains columns representing days of the week. The data entry form covers a 7 day period. The data entry form contains row and column labels. If any data currently exists in the data archive for this student during this reporting period it is placed in the form. Zero values are shown as blanks.</li> <li>4. The user fills in hours worked on the form. Hours worked can be entered as whole numbers, e.g., 10, or decimal numbers, e.g., 3.5. Cells that have no value entered are considered to have a value of zero.</li> <li>5. When the user is satisfied that the form is filled out the user submits the form.</li> <li>6. The system successfully validates the submitted data. Data validation consists of checking the submitted form to ensure that it contains only numeric data. The data are also check to ensure that no negative values have been entered and that the total for each day does not exceed 24 hours.</li> <li>7. The system saves the data in the project archive.</li> </ol>		
<p><b>Alternative action or error conditions:</b></p> <ol style="list-style-type: none"> <li>1. If the system is unable to authenticate the user, the user is informed of an authentication failure, and no further processing is performed.</li> <li>2. If the system is unable to access the activity category definitions, an error message is sent to the user.</li> </ol>		

<p>3. The system checks the submitted data to ensure that values are numeric. If non-numeric data are found, the user is notified of an input error.</p> <p>4. The system checks the reasonableness of the data. If a negative value is found for any data, the user is notified of an input error. If the total of any day’s activity is greater than 24 hours, the user is notified of an input error.</p> <p>5. If the system is unable to save the user supplied data to the project archive, the user is notified.</p>
<p><b>Post-conditions:</b></p> <p>1. Normal: Submitted data is placed in the project archive.</p> <p>2. Error: No changes are made to system data.</p>
<p><b>Performance:</b> The form is displayed within 5 seconds of its request under conditions of average computer system load and average network traffic.</p>
<p><b>References:</b> Project sponsor</p>
<p><b>Traceability:</b></p> <p><b>Code:</b></p> <p><b>Tests:</b></p> <p><b>Release:</b></p>

393

394 **4.2.1.2 Individual Weekly Activity Report – Data Viewing**

395 This operation allows the MRS users to view previously submitted individual weekly activity data as well  
 396 as daily and activity category totals.

<b>ID: MRS-02</b>	<b>Name: View Individual Activity Data</b>	<b>Priority: Mandatory</b>
<p><b>Pre-conditions:</b> CS Department Web services are functioning correctly. MRS has been correctly configured using system administration operations to define student participants and teams.</p>		
<p><b>Stimulus:</b> The user submits a request to the system to view individual data.</p>		
<p><b>Description of Nominal Operation:</b></p> <ol style="list-style-type: none"> <li>1. The system authenticates the user.</li> <li>2. The system displays a list of students whose data are available for viewing</li> <li>3. The user selects from an alphabetized list of students which one to view. This selection is submitted to the system. The default selection will be the first student in the list.</li> <li>4. The system retrieves the data for the current reporting period for the selected student.</li> <li>5. The system assembles the data into a viewable format that corresponds closely with (organization and content are equivalent to) the data entry form used in operation 4.2.1.1. Zero values are displayed as blank. Non-zero values are displayed with an accuracy of one decimal <u>digit, that is, a value entered as 2 will be displayed as 2.0</u>. Row and column labels are included in</li> </ol>		

the assembled view. The row labels are taken from the current activity category definitions. The column labels correspond to the days of the week. The name of the student whose data are being displayed is inserted into the view. The ending date for the reporting period is included in the view. The system also generates a row total for each activity category, a column total for the each day of the week, and a grand total for the overall number of hours worked during the reporting period. Totals are displayed with an accuracy of one decimal digit. The layout of the display generated by MRS should allow the user to generate a printed copy from his/her browser that maintains the visual presentation displayed on the screen.

6. The generated display is presented to the user for viewing.

**Alternative action or error conditions:**

1. If the system is unable to authenticate the user, the user is informed of an authentication failure, and no further processing is performed.
2. After the initially requested data are displayed to the user, the user may indicate that he/she desires to see the data for the previous reporting period. A set of actions similar to those described for nominal operation will be performed but will result in the retrieval of the desired data if it exists.
3. If the user is viewing a set of data for a time period other than the most recent data supplied, the user may indicate to the system that he/she desires to see the data subsequent to (later than) the one being viewed currently. A set of actions similar to those described for nominal operation will be performed but will result in the retrieval of the desired data if it exists.
4. If the system cannot access the activity category definition data, an error message is generated and displayed to the user.
5. If the system cannot read the list of students participating in the class, an error message will be displayed to the user.
6. If the list of students participating in the class is empty, a message will be displayed to the user indicating that the list is empty. No further processing will be attempted.
7. If a request is made to view data that does not exist, [an empty table is displayed along with a message indicating that the data does not exist](#) ~~a message will be displayed to the user indicating that the data does not exist~~. Examples where this can occur are: (a) the user is currently viewing data for the first reporting period and requests to see the previous week's data, (b) the user is currently viewing data for the last reporting period in the system and requests to see the next week's data, and (c) a request is made to view data for a week in which no data entry was made.
8. If the system is unable to access the data requested, an error message will be displayed to the user.

**Post-conditions:** (Nominal and error) The data maintained by the system are unchanged.

**Performance:** Display of the data to the user shall be completed within 5 seconds of its request under conditions of average computer system load and average network traffic.

**References:** Project sponsor.

**Traceability:**

**Code:**

**Tests:**

**Release:**

397

#### 398 4.2.1.3 Individual Weekly Activity Report – Data Exporting

399 The data exporting operation allows the course instructor to generate a comma separated value (CSV)  
 400 file containing all of the individual weekly data currently residing in MRS. The data are arrange so that  
 401 they can be conveniently imported into a program such as Microsoft Excel for further analysis and  
 402 generation of visual data representations.

ID: MRS-03	Name: Export Individual Data	Priority: High
<p><b>Pre-conditions:</b> CS Department Web services are functioning correctly. MRS has been correctly configured using system administration operations to define student participants and teams. The data file containing individual student data exists and is readable.</p>		
<p><b>Stimulus:</b> The user submits a request to export the individual data.</p>		
<p><b>Description of Nominal Operation:</b></p> <ol style="list-style-type: none"> <li>1. The system authenticates the user. This operation is restricted to the course instructor.</li> <li>2. The system generates a comma separated value (CSV) file corresponding to the data currently being maintained by the system. All data values for all students are exported with one decimal digit of accuracy. The name of each student shall appear in the exported data file at a point immediately preceding that student's hour data. <u>In the exported data there shall be a row for each activity category. The label of the activity category shall be the first value in the row. Following the activity category label shall be the values corresponding to the total time worked by that individual in that category for each of the reporting weeks of the semester. No other header data and no row or column totals are to be included in the exported data. The file is saved into a known location in the file system of the account running MRS and shall be named in a way that allows the file to be uniquely identified.</u> The user is <u>not</u> prompted for a file or path name. File permissions are set to prevent anyone other than the account owner (instructor) from accessing the generated file. If an exported CSV file already existed when this operation was initiated, it is overwritten.</li> <li>3. Successful generation of the CSV file is indicated by the generation and display of an informational message to the user.</li> </ol> <p>Note: Through an independent action, such as FTP, the account owner will retrieve the results of the export operation.</p>		
<p><b>Alternative action or error conditions:</b></p> <ol style="list-style-type: none"> <li>1. If the system is unable to authenticate the user, the user is informed of an authentication failure, and no further processing is performed.</li> <li>2. If there are no data to export, an informational message is generated and displayed to the user.</li> <li>3. If the system is unable to read the data file, an error message is generated and displayed to the user.</li> <li>4. If the system is unable to write the CSV file, an error message is generated and displayed to the user.</li> </ol>		

<p><b>Post-conditions:</b> (Nominal and error) The data containing the accumulated record of project activity is unchanged.</p> <p>(Nominal only) A CSV file corresponding to the contents of the project activity data exists. Any previously existing CSV file is deleted.</p>
<p><b>Performance:</b> An informational message indicating completion of the requested operation shall be displayed to the user within 5 seconds of the operation request under conditions of average computer system load and average network traffic.</p>
<p><b>References:</b> Project sponsor.</p>
<p><b>Traceability:</b></p> <p><b>Code:</b></p> <p><b>Tests:</b></p> <p><b>Release:</b></p>

403

404 **4.2.2 Consolidated Weekly Project Activity Reporting**

405 **4.2.2.1 Consolidated Weekly Team Activity Report – Data Viewing**

406 This operation allows the MRS users to view previously submitted individual weekly activity data for an  
 407 individual team consolidated into weekly reporting periods. This provides a summary view of the  
 408 semester’s activity.

<b>ID: MRS-04</b>	<b>Name: View Team Activity Data</b>	<b>Priority: Mandatory</b>
<p><b>Pre-conditions:</b> CS Department Web services are functioning correctly. MRS has been correctly configured using system administration operations to define student participants and teams. The data file containing individual student data exists and is readable.</p>		
<p><b>Stimulus:</b> The user submits a request to the system to display the consolidated weekly activity data for a team.</p>		
<p><b>Description of Nominal Operation:</b></p> <ol style="list-style-type: none"> <li>1. The system displays a list of teams whose data are available for viewing.</li> <li>2. The user selects from the list of teams which one to view. This selection is submitted to the system. The default selection will be the first team in the list.</li> <li>3. The system retrieves the individual weekly activity data for all the students who are members of the selected team.</li> <li>4. The system generates a weekly total for the team for each activity category. Each weekly total is generated by taking the weekly total from each student on the team in the corresponding week. The weekly totals are generated for the entire semester, including periods for which no data has yet been reported. When displayed, zero values are shown as blanks, and non-zero values are displayed with one decimal digit of accuracy, <u>for example, a value input as 2 will be displayed as 2.0.</u></li> </ol>		

5. For each reporting period included in the consolidated data, a count is generated of how many students had data included in the reporting period. The count is displayed for each week in a row labeled "Number Reporting." Note: This is an indirect way to allow user to determine if data are missing.

6. The system assembles the composite data into a viewable format. Row and column labels are included in the assembled view. Rows represent activity categories and are defined at the beginning of the semester using system administration operations. Columns represent reporting periods and correspond directly with weeks of the semester. They are numbered sequentially beginning with 1. All reporting periods for the semester are included. In addition, each column is to be labeled with the reporting period ending date. Rows of the display shall correspond with and be labeled with the activity categories. The name of the team whose data are being displayed is inserted into the view.

The system also generates row totals for the activity categories, column totals for each reporting period, and a grand total for the overall number of hours worked. The layout of the display generated by MRS should allow the user to generate a printed copy from his/her browser that maintains the visual presentation displayed on the screen.

7. The generated display is presented to the user.

**Alternative action or error conditions:**

1. If the system cannot read the list of teams, an error message will be displayed to the user.
2. If the list of teams participating in the class is empty, a message will be displayed to the user indicating that the list is empty. No further processing will be attempted.
3. If the system cannot read the activity category definition data, an error message is displayed to the user. No further processing will be attempted.
4. If the system cannot read the list of students participating in the class, an error message is displayed to the user. No further processing will be attempted.
5. If the list of students participating in the class is empty, a message will be displayed to the user indicating that the list is empty. No further processing will be attempted.
6. If the system is unable to access any of the activity data required by this operation, an error message will be displayed to the user. No further processing will be attempted.
7. [If no data is available to display, display an empty table and output a message indicating that no data was found.](#)

**Post-conditions:** (Nominal and error) The data maintained by the system are unchanged.

**Performance:** Display of the data to the user shall be completed within 5 seconds of its request under conditions of average computer system load and average network traffic. Error messages shall be displayed to the user within 5 seconds of the detection of the error condition under conditions of average computer system load and average network traffic.

**References:** Project sponsor.

**Traceability:**

**Code:**

**Tests:**

**Release:**

409

#### 410 **4.2.2.2 Consolidated Weekly Team Activity Report – Data Exporting**

411 The data exporting operation allows the course instructor to generate a comma separated value (CSV)  
 412 file containing the consolidated weekly data on a team by team basis for all teams whose data currently  
 413 reside in MRS. The exported data must be arrange so that they can be conveniently imported into a  
 414 program such as Microsoft Excel for further analysis and generation of visual data representations.

<b>ID: MRS-05</b>	<b>Name: Export Consolidated Data</b>	<b>Priority: High</b>
<p><b>Pre-conditions:</b> CS Department Web services are functioning correctly. MRS has been correctly configured using system administration operations to define student participants and teams. The data representing individual student activity exists and is readable.</p>		
<p><b>Stimulus:</b> The user submits a request to the system to export the consolidated data.</p>		
<p><b>Description of Nominal Operation:</b></p> <ol style="list-style-type: none"> <li>1. The system authenticates the user. Note: Access to this operation is restricted to the course instructor.</li> <li>2. The system accesses the individual weekly activity data for each student on each team, generating the consolidated data for each team. Details of the consolidation operation are described in MRS-04.</li> <li>3. The system generates a comma separated value (CSV) file corresponding to the consolidated data generated in step 2. All data values are exported with one decimal digit of accuracy. The name of each team shall appear in the exported data file at a point immediately preceding that team's hour data. <u>Each subsequent row of output for the team corresponds to an activity category. The first value appearing in the row shall be the activity category label, followed by values representing the total number of hours worked by all team members for that activity category in each of the weeks of the semester.</u> No other header data and no row or column totals are to be included in the exported data. The file is saved to a known location in the file system of the account running MRS <u>and shall be named in a way that allows the file to be uniquely identified.</u> The user is not asked for a file or path name. File permissions are set to prevent anyone other than the account owner (instructor) from accessing the generated file. If an exported CSV file already exists when this operation is initiated, it is overwritten.</li> <li>4. Successful generation of the CSV file is indicated by the display of an informational message to the user. The name of the file generated is included in the message.</li> </ol> <p>Note: Through an independent action, such as FTP, the account owner will retrieve the results of the export operation.</p>		
<p><b>Alternative action or error conditions:</b></p> <ol style="list-style-type: none"> <li>1. If the system is unable to authenticate the user, the user is informed of an authentication failure, and no further processing is performed.</li> <li>2. If there are no data to export, an informational message is generated and displayed to the user.</li> <li>3. If the system is unable to read the data file, an error message is generated and displayed to the</li> </ol>		

<p>user.</p> <p>4. If the system is unable to write the CSV file, an error message is generated and displayed to the user.</p>
<p><b>Post-conditions:</b> (Nominal and error) The system’s data containing the accumulated record of individual student’s project activity is unchanged.</p> <p>(Nominal only) A CSV file corresponding to the contents of the project activity data exists. Any previously existing CSV file is deleted.</p>
<p><b>Performance:</b> An informational message indicating completion of the requested operation shall be displayed to the user within 5 seconds of the operation request under conditions of average computer system load and average network traffic.</p>
<p><b>References:</b> Project sponsor</p>
<p><b>Traceability:</b></p> <p><b>Code:</b></p> <p><b>Tests:</b></p> <p><b>Release:</b></p>

415

416 **4.2.3 System Administration**

417 System administration operations are provided for use by the course instructor or his designee in  
 418 configuring the system for use during the semester. These operations are normally performed once prior  
 419 to the start of the semester.

420 **4.2.3.1 Initially Configuring the System for Semester Startup**

421 At the beginning of a new semester the course instructor or his designee will prepare MRS for the new  
 422 semester by removing the data from the prior semester’s use of MRS.

<b>ID: MRS-06</b>	<b>Name: Initialize MRS</b>	<b>Priority: Low</b>
<p><b>Pre-conditions:</b> CS Department Web services are functioning correctly. MRS has been correctly installed and is functioning.</p>		
<p><b>Stimulus:</b> The user submits a request to initialize MRS.</p>		
<p><b>Description of Nominal Operation:</b></p> <ol style="list-style-type: none"> <li>1. The system authenticates the user. Note: This operation is available only to the course instructor or his designee.</li> <li>2. The system displays a confirmation message indicating that continuation of the operation will result in the loss of all MRS data.</li> <li>3. The user confirms the request to initialize MRS.</li> <li>4. The system removes all individual activity data, all team names, all student names and</li> </ol>		

passwords, and all reporting period date information. The activity category information is not removed.

5. The system displays a confirmation message indicating that MRS has been initialized.

**Alternative action or error conditions:**

1. If the system is unable to authenticate the user, an informational message is generated and displayed to the user. No further processing of this operation is performed.
2. If the user indicates that he/she does not want to continue with MRS initialization, no further action is taken and no existing data are deleted or modified.
3. If the system is unable to access any of the data that should be removed by this operation, an error message is displayed to the user.
4. If the system is unable to remove (delete or overwrite) any of the data present in the MRS data archive at the beginning of this operation, an error message is displayed to the user.

**Post-conditions:**

(nominal) All semester-specific data (team names, student names, team-student associations, and reporting period ending dates) are deleted from MRS. The activity category definitions remain as they were when the operation was initiated.

(abort) If the user elects to abort the initialization operation, all data present at the beginning of the operation remain in the system.

**Performance:**

1. An informational message indicating completion of the requested operation shall be displayed to the user within 5 seconds of the operation request under conditions of average computer system load and average network traffic.

**References:** Project sponsor.

**Traceability:**

**Code:**

**Tests:**

**Release:**

423

424 **4.2.3.2 Defining Team**

425 This operation allows the course instructor to enter team names and associate weekly reporting period.

<b>ID:</b> MRS-07	<b>Name:</b> Define Teams	<b>Priority:</b> Medium
<b>Pre-conditions:</b> CS Department Web services are functioning correctly. MRS has been correctly installed and is functioning.		
<b>Stimulus:</b> The user submits a request to define teams.		

**Description of Nominal Operation:**

1. The system authenticates the user. Note: This operation is available only to the course instructor or his designee.
2. The system displays a data entry form to the user. The form contains a list of all the team names currently known to MRS and each team's reporting period ending date for the first period of the semester. The list will always contain the team name "UNASSIGNED" as the first name on the list. Other names, if they are present, will be displayed in alphabetical order following "UNASSIGNED".
3. The user enters the name of a single team which is to be added to MRS.
4. The user enters the ending date of the first reporting period in the semester for this team. The reporting dates are the seven consecutive days immediately preceding and not including the ending date. The period ending date generally will correspond to the date of the weekly team meeting. Reporting is performed for the seven full days preceding this meeting.
5. The user initiates transfer of the form contents to the system.
6. The system checks the submitted team name to ensure that it does not currently exist in the list of team names.
7. The system checks the date of the first reporting period to ensure that it is a legal date.
8. The system generates the remainder of the reporting dates for the semester. Reporting dates occur every 7 days following the initial ending date for the duration of the semester.
9. The new team name and reporting dates are added to the system configuration data.
10. The system sends an informational message to the user indicating that the team name was successfully added. The informational message identifies the team name added and the date corresponding to the end of the first reporting period.
11. Steps 2 through 10 above can be repeated until the user indicates that no additional team names are to be entered.

**Alternative action or error conditions:**

1. If the system is unable to authenticate the user, an informational message is generated and displayed to the user. No further processing of this operation is performed.
2. If the data representing the team names does not exist, it is created. The team names list always contains the team name "UNASSIGNED".
3. If the team name already exists in the configuration data, the supplied reporting period ending date will replace the previous ending date.
4. If the reporting period ending date does not represent a legal date, an error message is displayed to the user.
5. If the system is unable to access the current team name data, an error message is displayed to the user.
6. If the system cannot save new data to the team name data in the configuration portion of the system data, an error message is displayed.

**Post-conditions:**

(initial use) The list of team names is created and contains the team name "UNASSIGNED" and the team names and reporting period dates entered during the operation.

(non-initial use) The list of team names contains the names and reporting period ending dates

present at the start of the operation and the unique names and reporting period ending dates submitted during the operation.

**Performance:**

1. The data entry form shall be displayed to the user within 5 seconds of the operation request under conditions of average computer system load and average network traffic.
2. An informational message indicating completion of the requested operation shall be displayed to the user within 5 seconds of the operation request under conditions of average computer system load and average network traffic.

**References:** Project sponsor.

**Traceability:**

**Code:**

**Tests:**

**Release:**

426

427 **4.2.3.3 Defining Student**

428 This operation allows the course instructor to configure MRS with the names of students participating in  
 429 the course and to assign each student with a password to be used when entering individual weekly  
 430 activity data.

<b>ID: MRS-08</b>	<b>Name: Define Students</b>	<b>Priority: Medium</b>
<b>Pre-conditions:</b> CS Department Web services are functioning correctly. MRS has been correctly installed and is functioning.		
<b>Stimulus:</b> The user submits a request to define students.		
<b>Description of Nominal Operation:</b>		
<ol style="list-style-type: none"> <li>1. The system authenticates the user. Note: This operation is available only to the course instructor or his designee.</li> <li>2. The system checks that the Team Name data exists. (Note: This step may be necessary in order to assign the student to the team "UNASSIGNED")</li> <li>3. The system displays a data entry form to the user. The form contains a list of all students currently defined as participating in the course.</li> <li>4. The user enters the name of a single student participating in the course and a password to be used by the system in authenticating the student during entry of individual weekly activity data.</li> <li>5. The user initiates transfer of the form contents to the system.</li> <li>6. The system checks the submitted student name to ensure that it does not currently exist in the list of student names.</li> <li>7. The new student name is added to the list of student names. The submitted password is saved</li> </ol>		

associated with that student.

8. The student is automatically assigned to the team "UNASSIGNED".
9. The system sends an informational message to the user indicating that the student name was successfully added. The informational message identifies the student name that was added and that he/she was assigned to the team "UNASSIGNED".
10. Steps 3 through 9 above can be repeated until the user indicates that no additional student names are to be entered.

**Alternative action or error conditions:**

1. If the system is unable to authenticate the user, an informational message is generated and displayed to the user.
2. If the Team Name data does not exist, an informational message is sent to the user.
3. If the name supplied for an individual student already exists in the MRS student name data, the password for that student is updated to correspond to the new value. The team association is not change.
4. If the file containing the student names does not exist, it is created.

**Post-conditions:**

(initial use) The file of student names is created. All students entered are assigned to the team "UNASSIGNED".

(non-initial use)

1. The file of team names contains the names present at the start of the operation and the names added during the operation. All students added during the operation are assigned to the team "UNASSIGNED".
2. If the student name duplicates an name already present, the password is changed to the new value. The team association is not changed.

**Performance:**

1. The data entry form shall be displayed to the user within 5 seconds of the operation request under conditions of average computer system load and average network traffic.
2. An informational message indicating completion of the requested operation shall be displayed to the user within 5 seconds of the operation request under conditions of average computer system load and average network traffic.
3. If the system is unable to write the data containing the names of individual students, an error message is generated and displayed to the user.

**References:** Project sponsor.

**Traceability:**

**Code:**

**Tests:**

**Release:**

432 **4.2.3.4 Assigning Students to Teams**

433 MRS provides an operation that allows the course instructor to assign individual students to teams.

<b>ID: MRS-09</b>	<b>Name: Assign Students to Teams</b>	<b>Priority: Medium</b>
<p><b>Pre-conditions:</b> CS Department Web services are functioning correctly. MRS has been correctly installed and is functioning.</p>		
<p><b>Stimulus:</b> The user submits a request to assign students to teams.</p>		
<p><b>Description of Nominal Operation:</b></p> <ol style="list-style-type: none"> <li>1. The system authenticates the user. Note: This operation is available only to the course instructor or his designee.</li> <li>2. The system retrieves data defining team names and the names of students participating in the course.</li> <li>3. The system assembles the team names into an alphabetized list. The first entry on the list will be the team name "UNASSIGNED".</li> <li>4. The system assembles the individual student names into an alphabetized list.</li> <li>5. The system displays the team names and the individual names .</li> <li>6. The user selects an individual name and the team name to which the individual is assigned.</li> <li>7. When satisfied with the selection the user sends the individual name – team name pair to the system.</li> <li>8. The system stores the information in its internal data store.</li> <li>9. Steps 6 through 8 above will be repeated until the user indicates that no additional team assignments are to be entered.</li> </ol>		
<p><b>Alternative action or error conditions:</b></p> <ol style="list-style-type: none"> <li>1. If the system is unable to authenticate the user, an informational message is generated and displayed to the user.</li> <li>2. If the system is unable to access the team name data, an error message is displayed to the user.</li> <li>3. If the system is unable to access the student name data, an error message is displayed to the user.</li> <li>4. If the system is unable to access the data defining the current assignment of students to teams, an error message is displayed to the user.</li> <li>5. If the system is unable to write the data defining the student – team assignments, an error message is displayed to the user.</li> <li>6. If the user selects to assign a student to the team "UNASSIGNED", the effect is to remove the student from the data consolidation operations of the team to which he/she was previously assigned.</li> <li>7. If the user assigns a student to a team who is currently assigned to another team, the effect is to move that student's individual activity data in total to the new team and to completely remove it from the team to which he/she was previously assigned.</li> </ol>		

**Post-conditions:** The data representing the team names and the individual student names contain the same names as were present at the initiation of the operation. The association (assignment) between students and teams reflects the successful changes submitted during the operation.

**Performance:** 1. The data entry form shall be displayed to the user within 5 seconds of the operation request under conditions of average computer system load and average network traffic.

2. An informational message indicating completion of the requested operation shall be displayed to the user within 5 seconds of the submission of the operation request under conditions of average computer system load and average network traffic.

**References:** Project sponsor

**Traceability:**

**Code:**

**Tests:**

**Release:**

434

#### 435 4.2.3.5 Defining Reporting Period Ending Date

436 MRS allows the system administrator (course instructor) to specify the ending date for each reporting  
 437 period for each team. Project teams can have different reporting period ending dates although some  
 438 teams may have the same set of dates.

ID: MRS-10	Name: Defining Reporting Period Ending Date	Priority: Medium
<p><b>Pre-conditions:</b> CS Department Web services are functioning correctly. MRS has been correctly installed and is functioning.</p>		
<p><b>Stimulus:</b> The user submits a request to assign reporting period ending dates.</p>		
<p><b>Description of Nominal Operation:</b></p> <ol style="list-style-type: none"> <li>1. The system authenticates the user. Note: This operation is available only to the course instructor or his designee.</li> <li>2. The system provides the user with a form to fill out.</li> <li>3. The user specifies the team name (selected from a list of available team names) and the date corresponding to the end of the team's first reporting period.</li> <li>4. The system checks the date and verifies that the value submitted is a reasonable date. A reasonable date is one that conforms to an established date representation convention such as mm/dd/yy.</li> <li>5. The system automatically generates the remainder of the dates. The meeting dates occur every seven days throughout the semester. There will be a total of 18 dates.</li> </ol>		
<p><b>Alternative action or error conditions:</b></p> <ol style="list-style-type: none"> <li>1. If the system is unable to authenticate the user, the user is informed of an authentication failure,</li> </ol>		

<p>and no further processing is performed.</p> <ol style="list-style-type: none"> <li>If the initial reporting period ending date submitted by the user does not represent a reasonable value for an ending date, the user is notified with an informational message.</li> <li>If the system is unable to access the list of team names, an informational message is generated and displayed to the user.</li> </ol>
<p><b>Post-conditions:</b></p> <p>(normal) The data representing the reporting period ending dates for the specified team are present in the data archive.</p> <p>(error) No changes are made to the data archive.</p>
<p><b>Performance:</b></p> <ol style="list-style-type: none"> <li>The data entry form shall be displayed to the user within 5 seconds of the operation request under conditions of average computer system load and average network traffic.</li> <li>An informational message indicating completion of the requested operation shall be displayed to the user within 5 seconds of the submission of the operation request under conditions of average computer system load and average network traffic.</li> <li>Error messages shall be displayed to the user within 5 seconds of the detection under conditions of average computer system load and average network traffic.</li> </ol>
<p><b>References:</b> Project sponsor.</p>
<p><b>Traceability:</b></p> <p><b>Code:</b></p> <p><b>Tests:</b></p> <p><b>Release:</b></p>

439

440 **4.2.3.6 Defining Activity Categories**

441 MRS allows the system administrator (course instructor) to specify the activity categories used to label  
 442 rows in the individual data input form and for display of individual and consolidated data.

<b>ID:</b> MRS-11	<b>Name:</b> Define Activity Categories	<b>Priority:</b> Low
<p><b>Pre-conditions:</b> CS Department Web services are functioning correctly. MRS has been correctly installed and is functioning.</p>		
<p><b>Stimulus:</b> The user submits a request to define activity categories.</p>		
<p><b>Description of Nominal Operation:</b></p> <ol style="list-style-type: none"> <li>The system authenticates the user. Note: This operation is available only to the course instructor or his designee.</li> <li>The system provides the user with a form to fill out. The data entry fields of the form are initialized to the current values stored for the activity category labels. Note: Activity categories are</li> </ol>		

to appear in other input forms and in data displays in the order in which they are entered in this operation.

3. The user may alter any current activity label and may delete a current activity category definition by deleting the characters in the input field. The user may add a new activity category definition by entering the desired characters in an empty input field. A blank (null) category label may not be located prior to the first activity category definition or between any two non-empty activity category definitions.

Note: From a procedural perspective the use of this operation will not be permitted once MRS is being used for data collection. MRS itself will not be required to enforce this restriction.

**Alternative action or error conditions:**

1. If the system is unable to authenticate the user, an informational message is displayed to the user.
2. If the system cannot read the current activity category definitions, an error message is displayed to the user.
3. If the first activity category is blank (null) and the second is not, an error message is displayed to the user.
4. If a blank (null) category definition is found between two non-blank activity category definitions, an error message is displayed to the user.
5. If the system cannot save the activity category definitions, an error message is displayed.

**Post-conditions:**

(normal) The data representing the ~~reporting period ending dates for the specified team activity categories~~ are present in the data archive.

(error) No changes are made to the data archive.

- Performance:**
1. The data entry form shall be displayed to the user within 5 seconds of the operation request under conditions of average computer system load and average network traffic.
  2. An informational message indicating completion of the requested operation shall be displayed to the user within 5 seconds of the submission of the operation request under conditions of average computer system load and average network traffic.
  3. Error messages shall be displayed to the user within 5 seconds of the detection under conditions of average computer system load and average network traffic.

**References:** Project sponsor.

**Traceability:**

**Code:**

**Tests:**

**Release:**

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444

## 445 **4.3 External Interfaces, Files, Capacity, & Performance Requirements**

### 446 **4.3.1 External Interfaces & Files**

447 Any data files created by MRS that are used to store team names, student names, assignment of  
448 students to teams, and ending dates of reporting periods should be created as ASCII text files. The  
449 course instructor should be able to edit manually these files without causing failure of MRS. This ability is  
450 required so that the instructor can continue to use the system in the event that system administration  
451 operations are not delivered during the initial phase of MRS development or in the event of failure of  
452 system administration operations(s) that are delivered.

453 If the system design uses temporary files to store data during the performance of an operation, the  
454 temporary files must be deleted before the operation is completed.

### 455 **4.3.2 System Capacity & Size**

#### 456 **4.3.2.1 Teams**

457 MRS must be able to support the following:

- 458 • from 1 to 10 teams per semester
- 459 • from 1 to 10 students per project

#### 460 **4.3.2.2 Semester Duration**

461 A semester can contain up to 18 weeks of data.

#### 462 **4.3.2.3 Student Names**

463 Student names can be from 1 to 30 characters in length but cannot be null or consist of a string of all  
464 blank characters. Names must contain at least one alphabetic character and can contain spaces and  
465 special characters such as the hyphen, apostrophe, and comma. When initializing the system the  
466 instructor will determine the name format to use. For example, names may be entered as first name  
467 followed by a space and last name, or names may be entered as last name and first name separated by a  
468 comma and space.

#### 469 **4.3.2.4 Team Names**

470 Team names can be from 1 to 30 characters in length but cannot be null or consist of a string of all blank  
471 characters. The team name may include spaces and special characters such as the hyphen, apostrophe,  
472 and comma.

#### 473 **4.3.2.5 Activity Categories**

474 The system shall accommodate up to 15 activity category labels. Each activity category label can be from  
475 1 to 30 characters in length. Activity category labels can contain spaces and special characters such as  
476 the hyphen, apostrophe, and comma.

#### 477 **4.3.2.6 Passwords**

478 The system shall accommodate passwords of up to 10 characters in length. Passwords cannot be null  
479 nor consist of a string of all blank characters.

### 480 **4.3.2 Performance Requirements**

481 This paragraph provides a qualitative discussion of performance objectives for MRS. Detailed  
482 performance requirements were previously defined for individual operations.

483 MRS is a web-based interactive information system that must provide access to project information within  
484 a reasonable time. Reasonable time is determined by the context within which the user is performing the  
485 operation. For most operations, the operation is expected to complete in one or two seconds. That is,  
486 there should be no annoying lag between the issuing of a request (operation) and presentation of the  
487 desired results to the user. Under conditions of average processor load and average network traffic,  
488 performance of a specific operational request to the system shall not exceed 5 seconds.

489 The time allowed for an operation can be proportionate to the value of the information it provides. For  
490 example, requesting a display of an individual's hours worked should be completed in less than two  
491 seconds, while a request to consolidate a team's activity data may take five seconds.

## 492 **4.4 Non-Functional Characteristics**

493 MRS must achieve the following non-functional characteristics.

### 494 **4.4.1 Reliability**

495 MRS must perform accurately and consistently. Results must be as expected. MRS must not fail as the  
496 result of unanticipated user input. MRS must be designed and implemented to prevent failures caused by  
497 attempts to exceed specified system capacities or the limits of individual data items. In the event a  
498 condition is detected in which MRS could exceed its implemented capacity it shall notify the user, cease  
499 performance of any operation that could lead to system failure and ensure the integrity of the existing  
500 data.

501 On occasion it can be expected that a user will initiate an operation, such as entry of individual activity  
502 data, and never transmit the completed form back to MRS. A situation such as this must not cause failure  
503 of MRS or make MRS unavailable to this or any other user.

### 504 **4.4.2 Security**

505 Since MRS's primary mission is to provide access to and display the management data associated with a  
506 project, it is paramount that MRS protect the data from unauthorized access or modification. MRS  
507 explicitly defines an operation that assigns passwords for student use. During MRS installation in the  
508 final operational location, there must be a mechanism available to define the instructor password that will  
509 be used for authenticating access to "instructor only" operations.

### 510 **4.4.3 Availability**

511 MRS must be available at any time when the constituent computer systems are running.

### 512 **4.4.4 Maintainability**

513 To facilitate evolution of the MRS, source code shall be formatted to conform to requirements defined in  
514 the approved programming standards and practices. Supporting documentation shall be developed to  
515 record thoroughly the design at the operational, functional, and modular levels.

516 During the design of MRS consideration shall be give to minimizing the need for additional supporting  
517 software upon which MRS becomes dependent. However if supporting software is required to support  
518 MRS, MRS should remain operational if the supporting software is updated to a later version. Minimizing  
519 the demands on Computer Science Department computer system administrative staff must be given  
520 strong consideration.

### 521 **4.4.5 Survivability**

522 Should failure of a specific MRS operation occur, the system must give a clear indication to the user that  
523 the failure occurred and provide information that will allow the user to determine the nature of the failure  
524 and to initiate corrective action. To the maximum extent possible, other operations should remain  
525 unaffected. The integrity of the project data being managed by MRS must be maintained.

**526 4.4.6 Compatibility**

527 To facilitate portability it is highly desirable that MRS be designed to operate on a variety of Unix or Linux  
528 operating systems. The use of operating system version specific functions should be avoided. MRS  
529 must also interface with web browsers commonly found on departmental, university, and student-owned  
530 computers.

**531 4.4.7 Usability**

532 Design of the MRS user interface shall strive to achieve interaction with each class of user that is intuitive,  
533 requires a minimum of user actions to accomplish the desired operation, and results in few operational  
534 errors. No training or help system shall be required to achieve proficient use of MRS by the intended  
535 users.