System and Software Architecture Description (SSAD)

CRCD Management System

Team 11

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Version History

Date	Author	Version	Changes made	Rationale
10/11/11	Muzzammil, Fan & Erik	1.0	• Section 1, 2.1.1 – 2.1.3 were completed	• Initial draft of SSAD Document
10/12/11	Erik	1.1	• Spellcheck, header/footer adjustments	• Polish
10/19/11	Muzzammil & Fan	2.0	• Diagrams update, removed problems	• Took care of TA comments
10/24/11	Muzzammil & Fan	3.0	• Diagrams updated, use cases updated	• Changes made according to TA comments during ARB
11/21/11	Muzzammil & Fan	4.0	• Diagrams updated and new section added	• New Sections added
12/4/11	Muzzammil & Fan	5.0	• Updates and fixes	• Feedback form DCR
12/10/11	Muzzammil	5.1	• Changes according to feedback	• Feedback from Daniela
02/06/12	Muzzammil	6.0	• Change Impacts due to changed requirements	• Requirements changed during Re-baselining
02/15/12	Muzzammil	6.1	• Changes in Evaluation summary	• Suggestions in ARB
03/25/12	Muzzammil	7.0	• All the minor problems fixed	• Changes made according to TA
04/27/12	Muzzammil	8.0	• Use cases revised	• Changes mad according to code review.

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1. Introduction

1.1 Purpose of the SSAD

This document captures the principal design decisions made for the CRCD Management System (CMS) during all the phases of the development lifecycle. It will be a reference document for the developers of the system so they can implement all the structural elements found in the architecture. This way the system will remain faithful to the architecture, making it easier for the stakeholders to understand the system and know how it functions. Also, it will help the maintainers manage the system easily and consistently.

1.2 Status of the SSAD

The current version of the SSAD is version 6.1 and is part of the Rebaselined Development Commitment Package (RDC). The document provides an overview of the CRCD Management System (CMS), describes its context, describes artifacts and information created by the CMS, and describes the behavior of this system.

2. System Analysis

2.1 System Analysis Overview

The primary purpose of the CRCD Management System is to submit employee time cards electronically and allow managers to approve them before they are sent to the payroll administrator. Additionally, there will be a web-based Resource Tracking System within this system, so employees can check in/out inventory items and mangers can track the inventory. The system generates reports based on the needs of managers in a format that will be easy use. This will replace paper time cards and paper sign-out sheets. By automating and tracking this process, there will be fewer errors and by capturing this data, managers will be able to reduce waste and plan more efficiently.

2.1.1 System Context

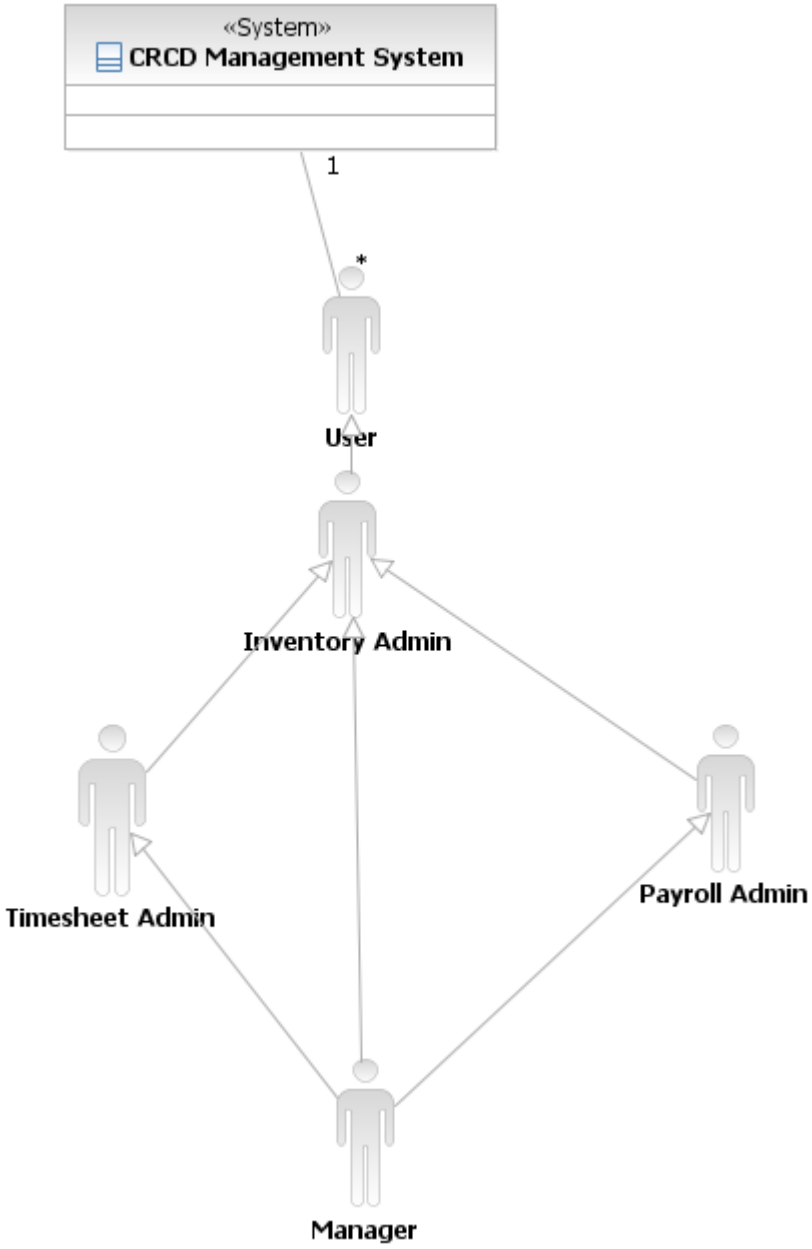

Figure 1: System Context Diagram

Table 1: Actors Summary

Actor	Description	Responsibilities
User	Every person which has access to the system and can login and logout of the system	• Login • Logout
Manager	A member of the managerial/executive staff of CRCD. (Primary user of the system)	• Reviews employee's performance • Approves employee timesheets • Keeps track of employee's growth • Generates reports as needed. • Modifies reports • Checks-in and checks-out inventory
Timesheet admin	A member of the staff who is assigned this role to maintain the timesheet system.	• Adds employee • Delete Employee if needed • Update Employee information
Inventory admin	A member of the staff who is assigned this role to maintain the inventory system.	• Adds products • Delete products if needed • Update product quantity
Payroll admin	HR employee who reviews timesheets for final submission and then submits it to the ADP system.	• Enters timesheets • Updates timesheets • Reviews timesheets • Sends it to ADP Payroll system • Accesses ADP Payroll system
ADP Payroll System	Interface that connects the Timesheet system with the ADP Payroll system	• Allows the Timesheet system to submit

2.1.2 Artifacts & Information

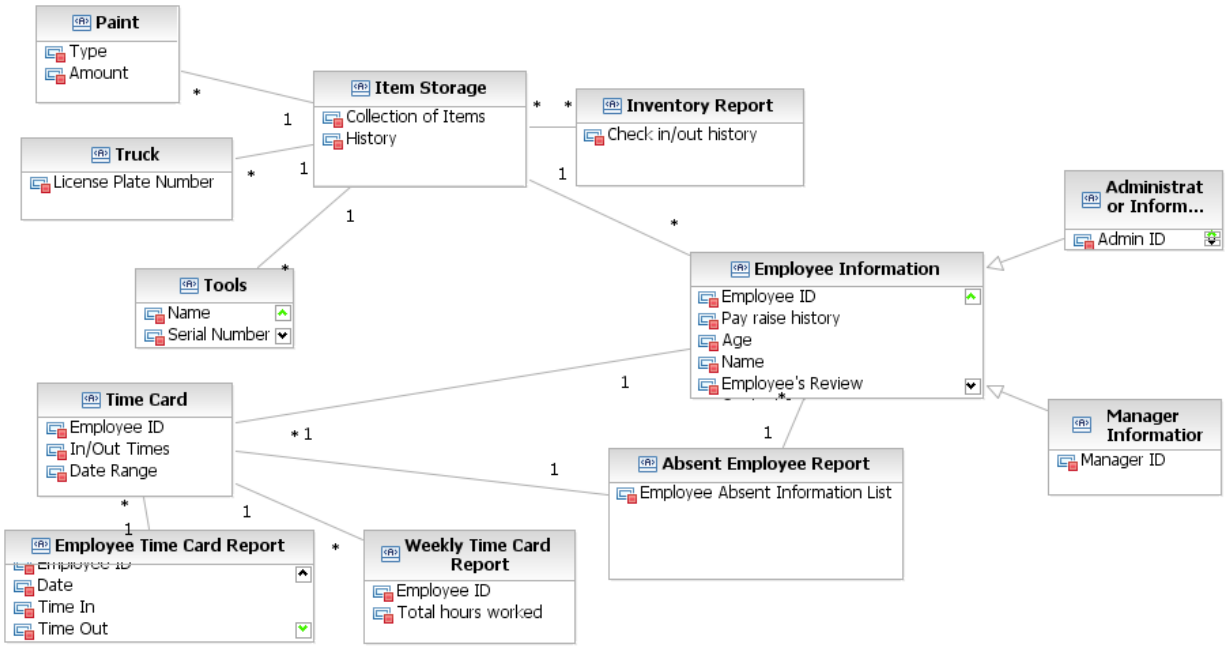

Figure 2: Artifacts and Information Diagram

Table 2: Artifacts and Information Summary

Artifact	Purpose
Tools	An artifact that contains tools information.
Trucks	An artifact that contains truck information.
Paint	An artifact that contains paint information.
Item Storage Information	An artifact that contains items storage information.
Inventory Report	A report contains inventory checking history generated by managers.
Time card	Contains a series of time In/Out information over a time

	period.
Employee Time Card Report	Report contains time card information for an employee
Absent Employee Report	Time card report for absent employees
Weekly Time Card summary	Weekly time card summary submitted to ADP system
Employee Information	Contains employee data
Administrator Information	Contains administrator's data
Manager Information	Contains manager's data

2.1.3 Behavior

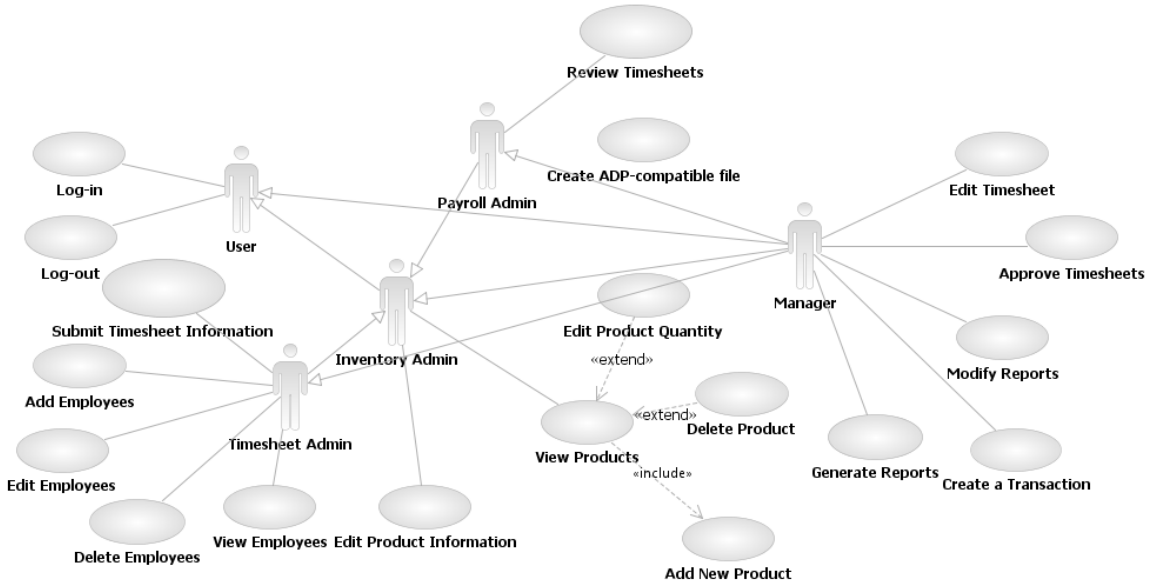

Figure 3: Process Diagram

2.1.3.1 Authentication

2.1.3.1.1 Login

Table 3: Process Description - Login

Identifier	UC-1: Login
Purpose	Authorize a user to log into the system and determine the users role(s) and access privileges.
Requirements	WC_321-- Only Managerial (Administrator) access to the data
Development Risks	None
Pre-conditions	System Database has been properly initialized.
Post-conditions	• If the user's log in information is authorized, the user is able to access system within the specifications of the user's role • If the user's log in information is not authorized, the system tells the user he has entered an invalid username and password

Table 4: Typical Course of Action Login : Successful

Seq#	Actor's Action	System's Response
1	Enter username and password andClick the "Login" button	
2		Validate username and password
3		Redirect the user to their home page.

Table 5: Alternate Course of Action Login : Failure

Seq#	Actor's Action	System's Response
1	Enter a username and password and Click the "Login" button	
2		Check username and password
3		Return the user to the log in page and notifies the user that he has entered an invalid username or password

2.1.3.1.2 Logout

Table 6: Process Description - Logout

Identifier	UC-2: Logout
Purpose	Log a user out of the system
Requirements	WC_321-- Only Managerial (Administrator) access to the data
Development Risks	None
Pre-conditions	• The user is logged into the system • The user's session exists
Post-conditions	• The user is logged out of the system and session is terminated

Table 7: Typical Course of Action Logout : Successful

Seq#	Actor's Action	System's Response
1	Click the "log out" link	
2		Log the user out of the system and terminate the session
3		Validate username and password
4		Notify the user that he has logged out of the system

Table 8: Alternate Course of Action Logout : Session expires

Seq#	Actor's Action	System's Response
1	Log into the system for the amount of minutes before the session expires.	
2		Log the user out of the system and terminate the session.
3		Notify the user that the session has expired and that he has been logged out of the system

2.1.3.2 Reports

2.1.3.2.1 Generate Report

Table 9: Process Description – Generate Reports

Identifier	UC-3 Generate Reports
Purpose	Give managers the opportunity to generate reports for timesheets and inventory
Requirements	WC_299-- Track inventory as employees check them in and outeach day. Track who checked them out, and the amount of materials consumed.
Development Risks	None
Pre-conditions	User is a manager User is logged into the system Database is initialized
Post-conditions	The system is able to generate reports based on the criteria given on the format specified.

Table 10: Typical Course of Action: Generate reports

Seq#	Actor's Action	System's Response
1.	Select the category, Input the criteria, Click Generate Reports button	
2.		Validate criteria
3.		Check the database for matching records
4.		Display the generated report in the correct format to the user

Table 11: Alternate Course of Action Generate reports : Failure

Seq#	Actor's Action	System's Response
1.	Select the category, Input the criteria and Click Generate Reports button	
2.		Validate criteria
3.		Reload the page and indicate that required field were incomplete or invalid

2.1.3.2.2 Modify Report Format

Table 12: Process Description – Modify Report Format

Identifier	UC-4 Modify Reports
Purpose	Give managers the opportunity to modify report formats
Requirements	WC_299-- Track inventory as employees check them in and outeach day. Track who checked them out, and the amount of materials consumed.
Development Risks	None
Pre-conditions	User is a manager User is logged into the system Database is initialized
Post-conditions	The system is able to change the outlook of the report as specified by the user

Table 13: Typical Course of Action: Modify report format

Seq#	Actor's Action	System's Response
1.	Select the category, Change the format options like fonts and sizes, Click Modify Report button	
2.		Validate new format
3.		Check the database for matching records
4.		Display the modified format

Table 14: Alternate Course of Action Modify report format : Failure

Seq#	Actor's Action	System's Response
1.	Select the category, Change the format options like fonts and sizes and Click Modify Report button	
2.		Validate new format
3.		Reload the page and indicate the invalid input in the format fields causing failure.

2.1.3.3 Timesheet Management

2.1.3.3.1 Weekly Timesheet Approval

Table 15: Process Description – Timesheet Approval

Identifier	UC-5 Approve Timesheets
Purpose	Give managers the opportunity to approve weekly timesheets for their subordinates.
Requirements	WC_291--Interface: must pass the payroll data to ADP for payroll processing
Development Risks	None
Pre-conditions	User is a manager User is logged into the system Database is initialized
Post-conditions	The system is able to change the status of the report to approve and send a copy of it to the administrator through email.

Table 16: Typical Course of Action: Timesheet approval

Seq#	Actor's Action	System's Response
1.	Select the employee, Click "Approve"	
2.		Give approval confirmation on the screen
3.	Click "Send it to Payroll admin"	
4.		Update the database.
5.		Make the report visible to Payroll admin
6.		Give transfer confirmation on the screen

Table 17: Alternate Course of Action Timesheet change

Seq#	Actor's Action	System's Response
1.	Select the employee, Click "Change time", Change the time entries and Click "Approve"	
2.		Give approval confirmation on the

		payroll's admin screen
3.	Click "Send it to Payroll admin"	
4.		Update the database.
5.		Make the report visible to Payroll admin
6.		Give transfer confirmation on the screen

2.1.3.3.2 Timesheet review and Submission

Table 18: Process Description – Timesheet review and submission

Identifier	UC-6 Create ADP-compatible file
Purpose	Payroll admin can submit the timesheet to the current ADP system
Requirements	WC_291-- Interface: must pass the payroll data to ADP for payroll processing
Development Risks	ADP Payroll system interface compatibility with TimeTrex system unknown.
Pre-conditions	User is a payroll admin User is logged into the system Database is initialized Timesheet is approved and sent by the manager
Post-conditions	Timeheet system creates a file in ADP format

Table 19: Typical Course of Action: Timesheet review and submission

Seq#	Actor's Action	System's Response
1.	Select the timesheet, Make entries needed by the ADP system, Click save entries	
2.		Validate entries
3.		Give Saving confirmation on the screen
4.		Update the database.
5.	Click "Save as ADP format"	
6.		Create ADP formatted file in default directory

Table 20: Alternate Course of Action Timesheet submission: Failure

Seq#	Actor's Action	System's Response
1.	Select the timesheet, Make entries needed by the ADP system, Click save entries	
2.		Validate entries
3.		Give Saving confirmation on the screen
4.		Update the database.
5.	Click "Send it to ADP system"	
6.		ADP system doesn't respond
7.		Give failure and try again notification on the screen

Identifier	UC-16 Review Timesheets
Purpose	Payroll admin can review the timesheet
Requirements	WC_291--Interface: must pass the payroll data to ADP for payroll processing
Development Risks	None
Pre-conditions	User is a payroll admin User is logged into the system Database is initialized
Post-conditions	Timeheet status updated to reviewed in the database

Table 21: Typical Course of Action: Timesheet review and submission

Seq#	Actor's Action	System's Response
1.	Select the timesheet, Make entries needed by the ADP system, Click save entries	
2.		Validate entries
3.		Give Saving confirmation on the screen
4.		Update the database.

Table 22: Alternate Course of Action Timesheet submission: Failure

Seq#	Actor's Action	System's Response
1.	Select the timesheet and Make entries needed by the ADP system and Click save entries	
2.		Validate entries
3.		Give Failure information and reason on the screen

2.1.3.4 Inventory Management

2.1.3.4.1 Check-In and Check-Out Inventory

Table 23: Process Description – Create Transaction

Identifier	UC-27 Create Transaction
Purpose	Give managers the opportunity to check in or out inventory
Requirements	WC_299--Track inventory as employees check them in and out each day. Track who checked them out, and the amount of materials consumed.
Development Risks	None
Pre-conditions	User is a manager User is logged into the system Database is initialized
Post-conditions	The system is able to update information in the database

Table 24: Typical Course of Action: Create Transaction

Seq#	Actor's Action	System's Response
1	Select the category, Input the values and Click Create Transaction	
2		Validate values
3		Update the database

2.1.3.5 Administration

2.1.3.5.1 Employee Administration

Table 25: Process Description – Employee Admin

Identifier	UC-8 Add Employee
Purpose	Give timesheet admin control to admin employees data
Requirements	WC_998--Administrator is allowed to set user permission level and change passwords. Mangers allowed to access data.
Development Risks	None
Pre-conditions	User is a timesheet admin User is logged into the system
Post-conditions	The system is able to add Employee information in the database

Table 26: Typical Course of Action: Employee Admin

Seq#	Actor's Action	System's Response
1	Select add category from add, delete or edit employee and Input necessary field and press Add	
2		Validate values
3		Update the database
4		Display update confirmation

Table 27: Process Description – Employee Admin

Identifier	UC-9 Edit Employee
Purpose	Give timesheet admin control to admin employees data
Requirements	WC_998--Administrator is allowed to set user permission level and change passwords. Mangers allowed to access data.
Development Risks	None
Pre-conditions	User is a timesheet admin User is logged into the system
Post-conditions	The system is able to update Employee information in the

	database

Table 28: Typical Course of Action: Employee Admin

Seq#	Actor's Action	System's Response
1	Select edit category from add, delete or edit employee and Input necessary field and press OK	
2		Validate values
3		Update the database
4		Display update confirmation

Table 29: Process Description – Employee Admin

Identifier	UC-29 Delete Employees
Purpose	Give timesheet admin control to admin employees data
Requirements	WC_998--Administrator is allowed to set user permission level and change passwords. Mangers allowed to access data.
Development Risks	None
Pre-conditions	User is a timesheet admin User is logged into the system
Post-conditions	The system is able to delete Employee information in the database

Table 30: Typical Course of Action: Employee Admin

Seq#	Actor's Action	System's Response
1	Select delete category from add, delete or edit employee and Select the employee and press OK	
2		Validate values
3		Update the database
4		Display update confirmation

Table 31: Process Description – Employee Admin

Identifier	UC-19 View Employees
Purpose	Give timesheet admin control to admin employees data
Requirements	WC_998--Administrator is allowed to set user permission level and change passwords. Mangers allowed to access data.
Development Risks	None
Pre-conditions	User is a timesheet admin User is logged into the system
Post-conditions	The system is able to show Employee information from the database

Table 32: Typical Course of Action: Employee Admin

Seq#	Actor's Action	System's Response
1	Select View Employee	
2		Select Employee Data from database
3		Display Employees information

2.1.3.5.2 Inventory Administration

Table 33: Process Description - Payroll Admin

Identifier	UC-10 Edit Product Quantity
Purpose	Give inventory admin control to manage inventory data
Requirements	WC_299--Track inventory as employees check them in and out each day. Track who checked them out, and the amount of materials consumed.
Development Risks	None
Pre-conditions	User is an inventory admin User is logged into the system
Post-conditions	The system updates products quantity in the system

Table 34: Typical Course of Action: Payroll Admin

Seq#	Actor's Action	System's Response

1	Select edit product quantity from add product, edit product quantity, edit product information or delete product and Input necessary fields and press OK	
2		Validate values
3		Update the database
4		Display update confirmation

Table 35: Process Description - Payroll Admin

Identifier	UC-11 Add New Product
Purpose	Give inventory admin control to manage inventory data
Requirements	WC_299--Track inventory as employees check them in and out each day. Track who checked them out, and the amount of materials consumed.
Development Risks	None
Pre-conditions	User is an inventory admin User is logged into the system
Post-conditions	The system is adds products information in the system

Table 36: Typical Course of Action: Payroll Admin

Seq#	Actor's Action	System's Response
1	Select add product category from add product, edit product quantity, edit product information or delete product and Input necessary fields and press OK	
2		Validate values
3		Update the database
4		Display update confirmation

Table 37: Process Description - Payroll Admin

Identifier	UC-12 Delete Product
Purpose	Give inventory admin control to manage inventory data

Requirements	WC_299--Track inventory as employees check them in and out each day. Track who checked them out, and the amount of materials consumed.
Development Risks	None
Pre-conditions	User is an inventory admin User is logged into the system
Post-conditions	The system deletes products information in the system

Table 38: Typical Course of Action: Payroll Admin

Seq#	Actor's Action	System's Response
1.	Select delete product category from add product, edit product quantity, edit product information or delete product and Input necessary fields	
2.		Validate values
3.		Update the database
4.		Display update confirmation

Table 39: Process Description - Payroll Admin

Identifier	UC-13 View Products
Purpose	Give inventory admin control to manage inventory data
Requirements	WC_299--Track inventory as employees check them in and out each day. Track who checked them out, and the amount of materials consumed.
Development Risks	None
Pre-conditions	User is an inventory admin User is logged into the system
Post-conditions	The system is able to show products information of the system

Table 40: Typical Course of Action: Payroll Admin

Seq#	Actor's Action	System's Response
1	Click View Products	
2		Select Product data from Database
3		Display Product Information

Table 41: Process Description - Payroll Admin

Identifier	UC-14 Edit Product Information
Purpose	Give inventory admin control to manage inventory data
Requirements	WC_299--Track inventory as employees check them in and out each day. Track who checked them out, and the amount of materials consumed.
Development Risks	None
Pre-conditions	User is an inventory admin User is logged into the system
Post-conditions	The system updates products information in the system

Table 42: Typical Course of Action: Payroll Admin

Seq#	Actor's Action	System's Response
1	Select edit product information category from add product, edit product quantity, edit product information or delete product and Input necessary fields	
2		Validate values
3		Update the database
4		Display update confirmation

3. NDI/NCS Interoperability Analysis

3.1 Introduction

We will try to cover interoperability analysis in this section. There are two Non-Developmental Items (NDI) that will be used for this project. We are using Inventory Management system which provides complete Inventory management system which is open source and has features that can easily handle the client's requirements and TimeTrex system which is also an open source system and can handle employees attendance in a way that it will also integrate with the existing systems. These both systems will use some common data that will be stored in Inventory management system.

3.1.1 COTS / GOTS / ROTS / Open Source / NCS

Table 43: NDI Products Listing

NDI/NCS Products	Purposes
Inventory management System	An open source system that can is made to handle inventory for small organizations.
TimeTrex System	An open source system that gets the sign-in and sign-out time for employees, gives all the basic payroll features and then gives the capability to push the data to ADP Payroll system which is already in use by the client.

3.1.2 Connectors

ADP Payroll Connector:-

This connector would be made by using PHP and it would connect the Timecard System and the existing ADP Payroll system. Its main job would be conversion of data in the right format for ADP and connection between the two systems.

3.1.3 Legacy System

ADP Payroll system is an existing system client uses for their payroll needs. Its online payroll system that enables accountants who process payroll for their small business clients to choose between performing tax filing and check printing themselves.

We would connect to this system so that the employee's attendance can be timely entered into the system automatically. We will be using a connector for that purpose which would convert the data in the ADP format and would push the data into the system so employees payroll can be processed.

This connector would be made by using PHP and it would connect the Timecard System and the existing ADP Payroll system. Its main job would be conversion of data in the right format for ADP and connection between the two systems. ADP Payroll system is the current system client is using for Payroll handling.

3.2 System Structure

These diagrams show the different aspect of deployment.

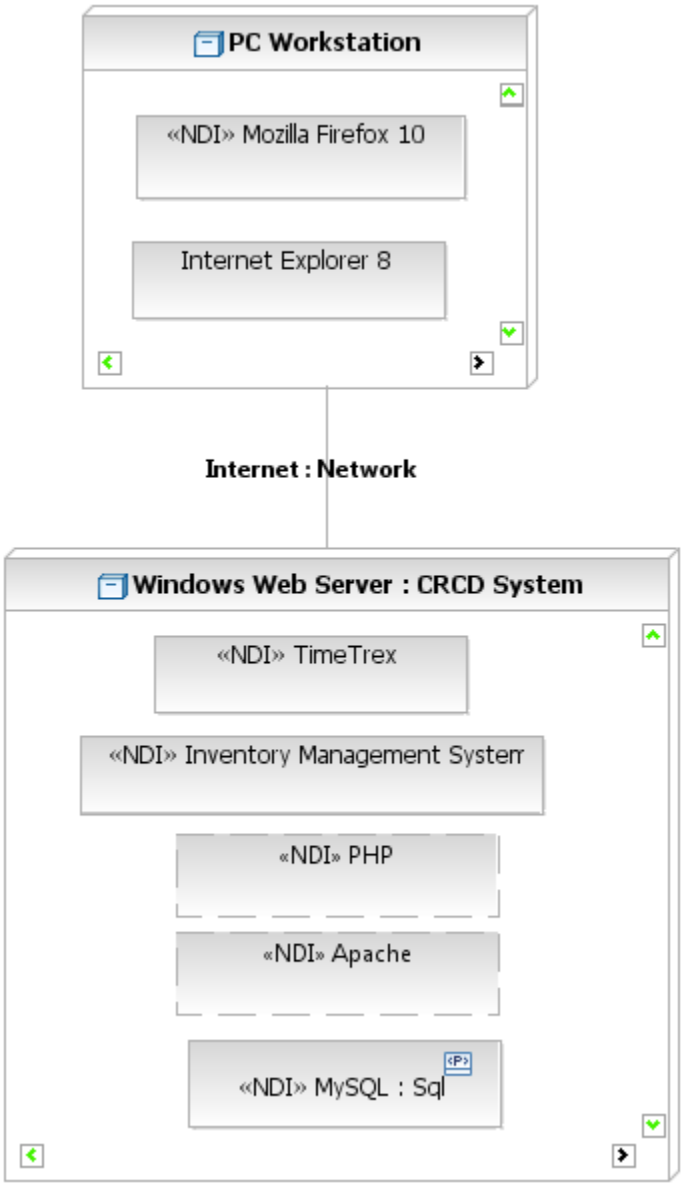

Figure 4: Deployment Diagram

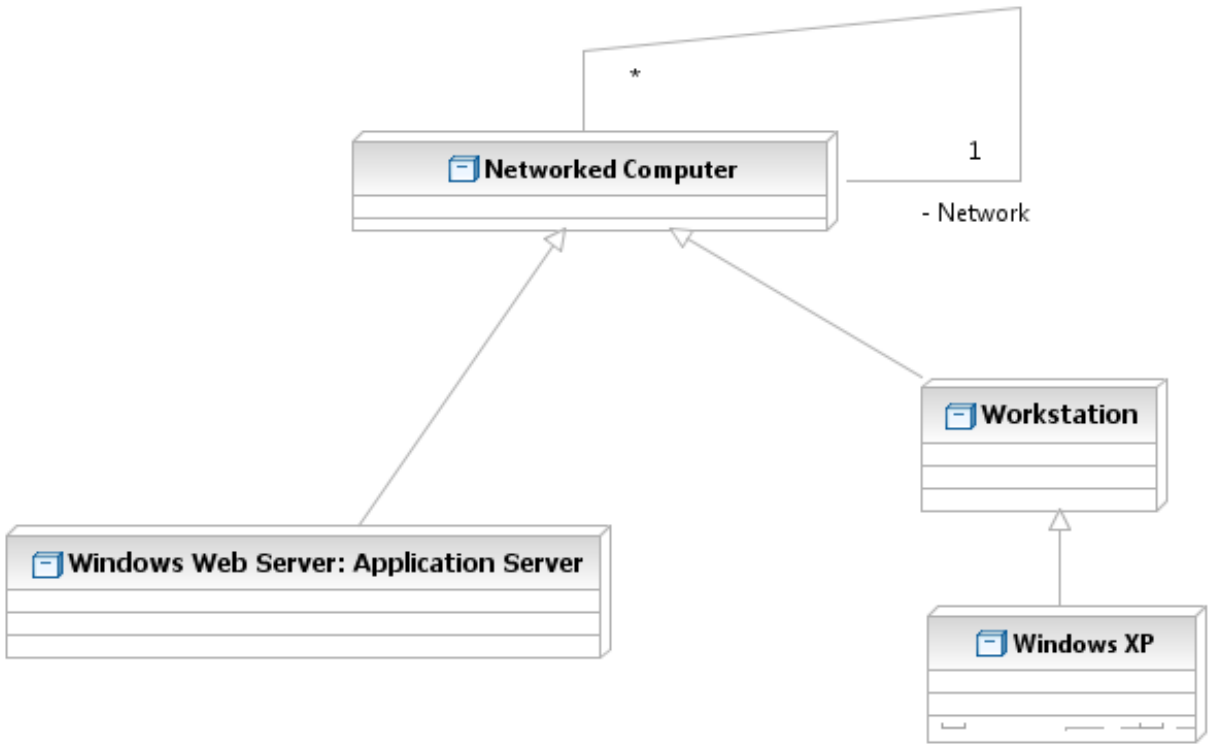

Figure 5: Hardware Components

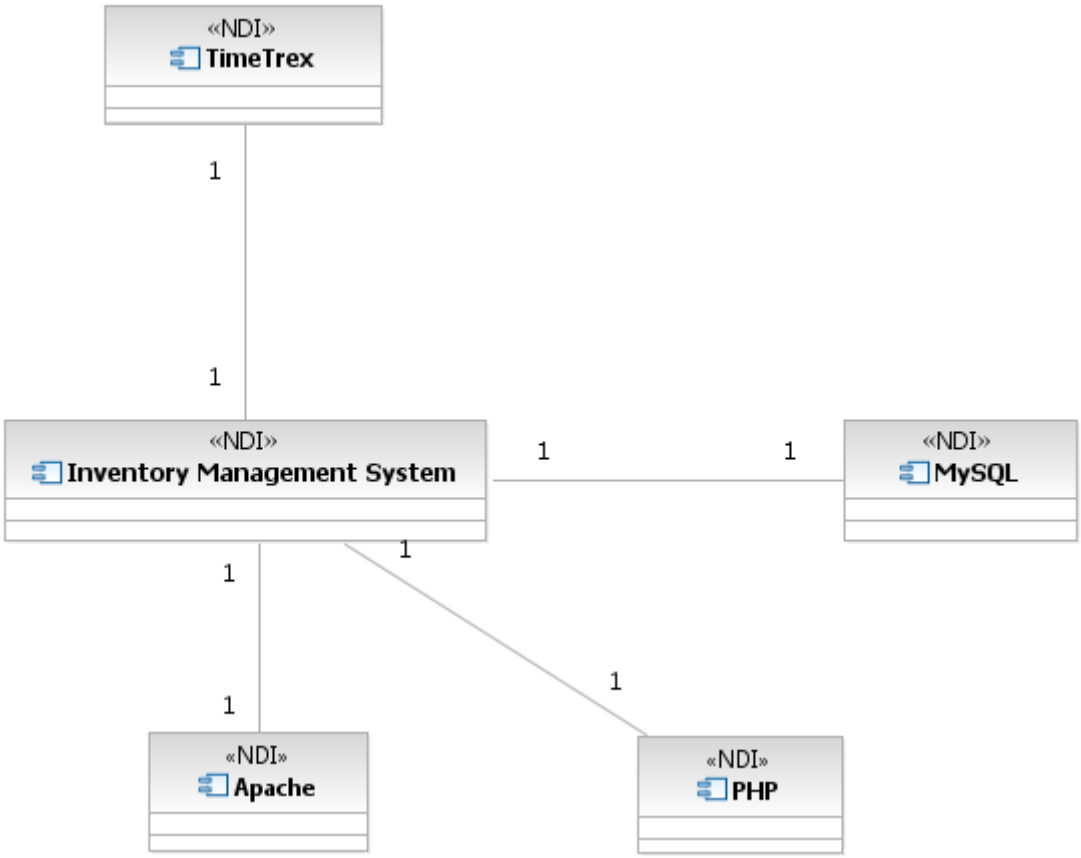

Figure 6: Software Components

3.3 Evaluation Summary

We have selected two NDI's to implement the functionality of CRCD Management system. The TimeTrex system provides basic payroll and attendance services. Timetrex system will be used as the primary system to store all employee information. The Inventory Management System (IMS) provide the inventory management services. IMS also needs employee information for assignment of tasks and inventory items to different employees. To synchronize the shared employee information and provide a single login credential for each employee, the employee information is being centrally stored in TimeTrex database.

IMS database is updated on any transaction that is related to employee or login information through inter-system function calls. So when the user logins to the main system he gets logged in to the IMS system as well. Also the latest employee information is showed in both systems.

This functionality has been tested and verified by the prototype. Since this is the only communication that is needed between the two NDI's as both NDI's cater to mutually exclusive requirements, we don't see any potential interoperability issues arising because of cross-system communication. Other than this both systems have their own exclusive databases and implementations.