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MCA681: Industry Project
AMS Custom Reporting

by

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A Project report submitted in partial fulfillment of the requirements for the award of the degree of Master of Computer Applications of CHRIST (Deemed to be University)
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CERTIFICATE

This is to certify that the report titled ***AMS Custom Reporting*** *is a bonafide record of work done by* ***Avatansh Awasthi (1947208)*** *of CHRIST (Deemed to be University), Bangalore, in partial fulfillment of the requirements of VIth Semester MCA during the year 2021-2022.*

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ABSTRACT

The project titled “AMS Custom Reporting” is an operations project used for providing, managing and maintaining responsiveness through the technical solutions to various clients of the company. This project will be used in the Healthcare sector to provide operational services to various clients.

The clients are using the solutions provided by the company, these clients are served and being given the services form the company side to help and manage these personalized solutions. But these clients might end up in such a place where they need to have some kind of enhancement or correction or a new feature to be added to the solution altogether. At this point the client registers and requests the company to make the required operational changes to their solutions. These requests are called Service Requests(SR’s). There are many types of service requests that can be made by the clients, and according to their requirements these SR’s are categorized and then assigned to different and respective teams. There is some codes called Change codes, these are used to determine which bucket/queue the request would fall into so the appropriate team would be handling it. The number in the Change code determines what type of change it is and what solution it might belong to. It will help us to decide which tickets will fall into which buckets and which teams are working on those buckets. When these SR’s are thoroughly classified by the triage teams, the SR’s go the respective backlog of those teams and then taken upon one by one or as a set of related SR’s by the software engineers to be provided solution for in limited time.

This system will be an enhancement addition to the organization as currently there is was existing system to keep a track of the tickets and provide operational solutions for the same but as the technology has evolved so as these systems. This system will not only keep a track of tickets that are being assigned to various teams, but it will also keep track of those tickets which do not have a change code. We will be using various technologies like - SQL, CCL, etc. The expected result would be to provide the operational support to each and every client in time.

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1. INTRODUCTION

Healthcare IT domain is a fast and upcoming industry with the rise is healthcare infrastructure, the need for IT solutions to manage them is also increasing. There are over 10,000 applications related to healthcare of which around 40% are designed for healthcare professionals, which includes remote monitoring and healthcare management applications.

Companies in this industry design and publish software for use by health care providers, including hospitals, pharmacy and medical practices. There are many vast areas in healthcare where the new technologies are leading. The adoption of health IT software will allow for more effective cost control and better medication management.

Cerner Healthcare Solutions Pvt. Ltd. is the leading U.S. supplier of healthcare information technology solutions that optimize clinical and financial outcomes. Cerner Healthcare Solutions Pvt. Ltd solutions are currently licensed by approximately 9,300 facilities around the world, including more than 2,650 hospitals, 3,750 physician practices, 40,000 physicians, 500 ambulatory facilities, 800 home health facilities, 40 employer sites, and 1,600 retail pharmacies with such many solutions being present in the market.

The healthcare IT market is growing at a tremendous rate. The adoption of health IT software will allow for more effective cost control and better patient care, as well as improvements in employee productivity. Cerner Healthcare Solutions Pvt. Ltd is the leading U.S. supplier of healthcare information technology solutions that optimize clinical and financial outcomes.

Population health is one of the primary factor that decides nations development and wealth, so need of electronic health information management at hospital level is very crucial since paper based healthcare information management always leads to one or more medical errors in turn patient critical situations. Cerner has managed to maintain world largest Electronic Health Record System(EHRS), this system contain all the information that is required for the management of successful Health IT sector.

Cerner provides many IT solutions to various clients according to their specific needs. These solutions need to be managed and operated vigorously. The project titled "AMS Custom Reporting" is carried out at Cerner Healthcare Solutions Pvt. Limited" Bengaluru, and is aimed to do the same, i.e. provide the operational services and help to all the IT solutions provided by the company.

1.1. PROJECT DESCRIPTION

Improving the quality of life is one of the main benefits of integrating innovations into medicine. Health Information technology (HIT) is the application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of healthcare information, data, and knowledge for communication and decision making. HIT, technology represents computers and communications attributes that can be networked to build systems for moving health information.

Let's have a brief glimpse of the background of information technology in medicine. Worldwide use of computer technology in medicine began in the early 1950s with the rise of computers. Health informatics also called Health Information Systems is a discipline at the intersection of information science, computer science, and health care. It concerns the resources, devices, and methods required for optimizing the acquisition, storage, retrieval, and use of information in health and biomedicine.

Health IT is one of the important fields which is responsible for the care of the patients held by the physicians. Effective and efficient workflows in health IT can be beneficial for both the physicians and patients, where these can save their time as well as make the physician's role easy. There are different companies following different approaches, Cerner is one of the companies which has made significant efforts to increase the quality of care, reduce waste, and lower costs by developing efficient, effective solutions which are either used in multistate health systems and other one-doc practices.

Cerner recommended solution is an electronic restorative record with elements that are meant to figure crosswise over numerous facilities and divisions. It streamlines the work method brace oneself for clinicians onto one desktop stage, with an in-depth type of clinical and authoritative capacities. This could be a family of system solutions for a good assortment of health care suppliers.

Cerner deals with various kinds of client requests known as Service Request (SR). AMS Custom Reporting deals with these SR's which are based on the reporting side of the requests and targets to accomplish the work that is desired by various clients in a timely manner. We use different tools and techniques to track down the status of the tickets and work so that there is no margin for error and confusion so that the solution and the changes can be delivered in the stipulated time.

1.2. EXISTING SYSTEM

In the past, there was no proper medium from which the engineers were able to track their work. The challenge encountered by the earlier systems was variation in the information retrieval and display format by the engineers and conflict happening to the assigned tickets. Some tried to keep a track of their work on excel and other mediums but the access will be restricted to them and a few other colleagues. Chances of being wrong are also there as no one else is there to validate the records.

Development of the desired system to overcome this drawback began nearly a few years ago. Yet no system can support the entire process. The existing systems have certain traits in common. First, they maintain the data related to tickets on their local device. Second, sometimes conflict may happen, multiple people will be working on the same ticket. Third, more prone to errors as there is no one to cross-verify all the records. Finally, lots of manual work is to be done to report or keep a track of everything.

An effective system was needed to be introduced so that they can surpass all the challenges mentioned above. In the current system, if a ticket is being assigned to an engineer or associate, then they will need to check their emails or any other collaborative software for the notification. During scrum meetings, it becomes very hard to keep a track of priority-based tickets or the tickets which are being pending for too long. The proposed system will not only save time and effort, but it will also help us to keep a track of everything in one place.

Some of the common issues encountered in the Existing System:

- Execution time: The time taken for the execution of a report is high apart from that it would require some supporting tools that involve load ahead times.

- Human errors: Manual errors made by humans while maintaining a record is always high. Also, errors can be caused by factors like negligence, untested modules, or no proper test case.

- Regression: Every engineer rolls out different versions of the report, each version will build some confusion.

- Repetitive tasks: When the code is updated or enhanced the testing team needs to run the workflows again.

- Conflict of work: Sometimes two or more engineers would be working on the same thing because of no central portal, which will lead to a conflict of work.

1.3. OBJECTIVES

- The main aim of the project is to streamline the ticket-related tasks and track the records or tickets assigned to engineers.
- Maintain the right information about the tickets available to all engineers and managers so that they can prioritize their work accordingly.
- Aims at increasing the efficiency, effectiveness, and reliability of the ticket's information.
- Deals with solving and providing a personalized solution to the client in timely manner.
- The process to be seamless and error/confusion free so that it doesn't affect the workflow.
- Moreover, informing the engineer's about the necessary step or information to be taken on a particular ticket.

1.4. PURPOSE, SCOPE, AND APPLICABILITY

1.4.1. PURPOSE

When we look at the existing system, it is completely dealt with manual power. Manual power is nothing, but a predefined set of plans generated to check the enhancements performed on the tickets or to run through the workflows. The main aim of the project is to improve the efficiency and obtain the expected result with a minimum number of steps and in required time.

Engineers and Managers should know which engineer is working on which ticket, its progress, and the necessary step to be taken to complete or close the ticket. Tickets without change codes should be updated when an automated mail will be sent to the engineer's and TSA's email.

All the above-mentioned things should be regulated via a portal that will be accessible by all the employees so that no conflict of work can take place. This will help everyone to remain focused, work efficiently, and be well informed.

Hence, the purpose of the project is to have easy approach to solve and provide operational services to the clients of the company while overcoming the lapses of existing system which took more efforts and time due to the tools and techniques followed.

1.4.2. SCOPE

- The project aims to ease the records related to ticket information.
- Enable every assignee or engineer to go through all the records related to the ticket they will be working on.
- Display all previous activities done on a ticket by a previous engineer.
- Aims at introducing automation in ticket-related operations to ease the engineer's workflow.
- Eliminates the time consumption in performing repetitive tasks.

1.4.3. APPLICABILITY

- Focus on what really matters: The main advantage of improvising the operational process is to help engineers/managers to focus on what really matters, that is while is observing the tickets progress and providing the right process and code at the right time.

- Client Support: Automating the workflows could be beneficial for the end-users who can understand the flow and use it accordingly based on their requirements.

- Smart Hospitals: The backbone of these facilities will improve the hospital’s way of dealing with its patients. Better and smart tracking facilities could lead to smart hospitals.

- Overall IT Solution Satisfaction: If we are able to achieve all that is mentioned we are indirectly satisfying the client base with the IT solutions that are provided by the company.

1.5. OVERVIEW OF THE REPORT

The report provides an idea about the impact of patient information analysis in health care followed by applying them to the solution-oriented software. The flow includes the requirements to set up the software for easing all the processes related to hospital-like registration, discharge-related, pharmacy-related, specimen-related, insurance, or billing-related processes carried out by the medical staff. Storing, retrieval, and visualization of the patient record, focusing on the right information and tracking necessary details of the patient to provide better healthcare. This helps in maintaining all the tickets which further helps the clients to run their organization smoothly.

2. SYSTEM ANALYSIS AND REQUIREMENT

The section explains the characteristics of the users who use the software followed by the basic requirements to run the software. The purpose of the system requirements analysis is to structure the system independently of any implementation environment. This phase can determine system behavior and limitations. The system requirements analysis activity represents the second major development phase of the overall process.

2.1. PROBLEM DEFINITION

To develop the system which enables engineers to adapt and work in an environment which facilitates the problem solving aspect of the operational services for the requests sent by various clients by taking a easy, sustainable and streamlined approach towards this work flow. Clients are also associated with the ticket. In case of any doubt like the requirement is not clear or engineers need a few more examples related to the ticket, an engineer can reach out to clients for the same. All the information will be saved and tracked through this system related to that particular ticket. An engineer may work on 1 or more tickets simultaneously by prioritizing the work.

The solution must pass all the test cases which are carried out in a real-life scenario when performing the its functionality. Necessary validations must be performed while storing the data in the database. Test cases should cover all the valid situations as well as the negative scenarios.

2.2. REQUIREMENT SPECIFICATION

2.2.1. FUNCTIONAL REQUIREMENTS

Functions available in the system are grouped under -

(i) Authentication

a. Credentials: Users can access this dashboard using their organization credentials using Lightweight Directory Access Protocol (LDAP).

b. Rule check: Employees have certain permissions and rules to follow.

(ii) Ticket Details

a. Ticket Information: Information related to ticket like - ticket number, requirement, client details, ticket priority, description of activity/operation done on the ticket, and so on.

b. Kanban Status: Ticket is in which phase - Scoping, Coding, Revision, Non-prod validation, and so on.

c. Activity: Which user is performing which activity on the ticket. All operations on the ticket will be stored here.

d. Setting the Closing Date: An engineer must set the closing date, which means till which date he or she would be able to complete the assigned task.

e. Workflows: The engineer should submit the workflow of the work he/she has done, so the client won't be facing any problems when trying out the required code.

(iii) Change Code Tracker

Tickets without change code: Engineers must update the tickets assigned to them according to the change required. After doing this, he/she must update the change code of the ticket which will let others know that some change has been done on a particular ticket. Change on a ticket can be an addition or a manipulation.

(iv) Search Existing Records

Existing Record: If an engineer wants to look at a particular ticket for help or maybe for consulting, he/she can do it by entering the ticket number on the search bar. All the necessary information related to that ticket will be displayed on the screen.

2.2.2. NON-FUNCTIONAL REQUIREMENTS

- Validation: All the processes must be validated strictly against the permissible authority.

- Security: Dashboard will be only available within an intranet that is within an organization.

- The flexible architecture will be highly desirable for future modifications of the software.

- Ease of maintenance and adaptability due to the use of the referenceable module

- The modules should be well documented with a proper description for ease of maintenance and upgrading of the system in the future.

2.3. SYSTEM REQUIREMENTS

2.3.1. USER CHARACTERISTICS

There are mainly three types of users participating in the network at any given point in time. The users who are responsible for creating a new ticket for the assignee. The manager will assign that ticket to an engineer. An engineer who will code according to the requirement for the tickets. Clients are also associated with the ticket. In case of any doubt like the requirement is not clear or engineers need a few more examples related to the ticket, an engineer can reach out to clients for the same.

2.3.2. SOFTWARE AND HARDWARE REQUIREMENTS

I. Software Requirements

- Programming Language – CCL, SQL
- Database – MySQL
- IDE – Visual Studio, Discern Visual Devloper
- Operating System – Windows 10
- Version Controlling System – Git, SVN.
- Code documentation – Jiraa

II. Hardware Requirements

- Desktop - Cloud Machine
- Processor - Intel®Xeon®ProcessorE5540 (8M Cache, 2.53 GHz, 5.86 GT/s Intel® QPI)
- Main Memory - 4.0 GB

2.3.3. CONSTRAINTS

To use the system, adequate application knowledge and organizational personnel are required who should be familiar with integrating different aspects of various clinical processes and the workflow of those processes. Knowledge of these processes and working Employees should be authorized to perform the necessary actions.

- The web browser is required. Chrome version 48 or higher, Firefox 34 or higher, or IE9 or higher.
- Active internet connection.
- Requirements from the client-side.
- Knowing the basic operations of US Healthcare
- A code should satisfy all the criteria as per the client requirement and coding standards.

Some of the constraints are as follows:

- Design Constraints
    - Standard Compliance
    - The system is designed to handle invalid inputs to ensure reliability
    - Ensuring network portability
- Hardware Limitations
    - Pentium Processor
    - Memory should not be less than 2 GB of memory.

2.4. CONCEPTUAL MODELS

2.4.1. DATA FLOW

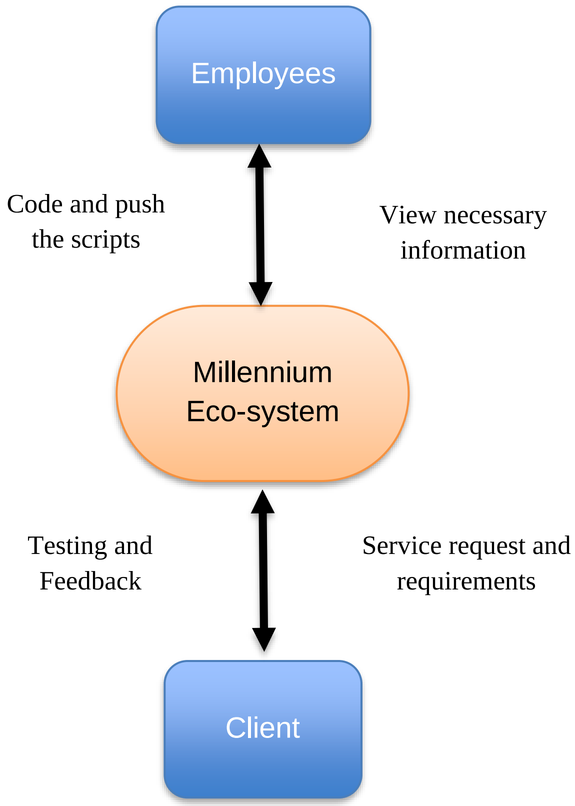

Employees
Code and push the scripts
View necessary information
Millennium Eco-system
Testing and Feedback
Service request and requirements
Client

Fig. 2.1. DFD for AMS Custom Reporting

The above diagram shows the flow of the overall process for all the solutions. The data flow diagram depicts how the data is flowing in the system, that is how the data is retrieved and how it is passed on to the other parts of the system, the different parts of the system are responsible for the generation, storage and manipulation of some data and this data is then transferred to other units according to the needs and is processed there and further passed on till the cycle is complete.

Here as we can see in the above diagram that, this is an overall general view of how the data is present in the system and how it flows form one unit to another.

The data here originally exists in the Millennium Eco-space which the combination of EHRS and the supporting software system used to manage, view and update the data residing. From here the data flows is both the directions of the client as well as the engineer. The client needs this data for the production of reports and to maintain, compare and view the records of different patients through the IT solutions provided to them. Whereas the engineer needs the data like the scripts and the domains to work upon and provide the solutions. The client needs to provide data regarding the specific requirements and changes they want to see, these requirements are noted on a ticket and sent to the central system, from there the engineer can access and view these same requirements. Also, as the engineer understands the exact requirements they code the logic in the scripts and then these scripts are again pushed to the central system for to be validated by the client, this is cycle is followed till the client is not satisfied with the work done and changes made, and this is the same way the data flows in the system.

2.4.2. ACTIVITY DIAGRAM

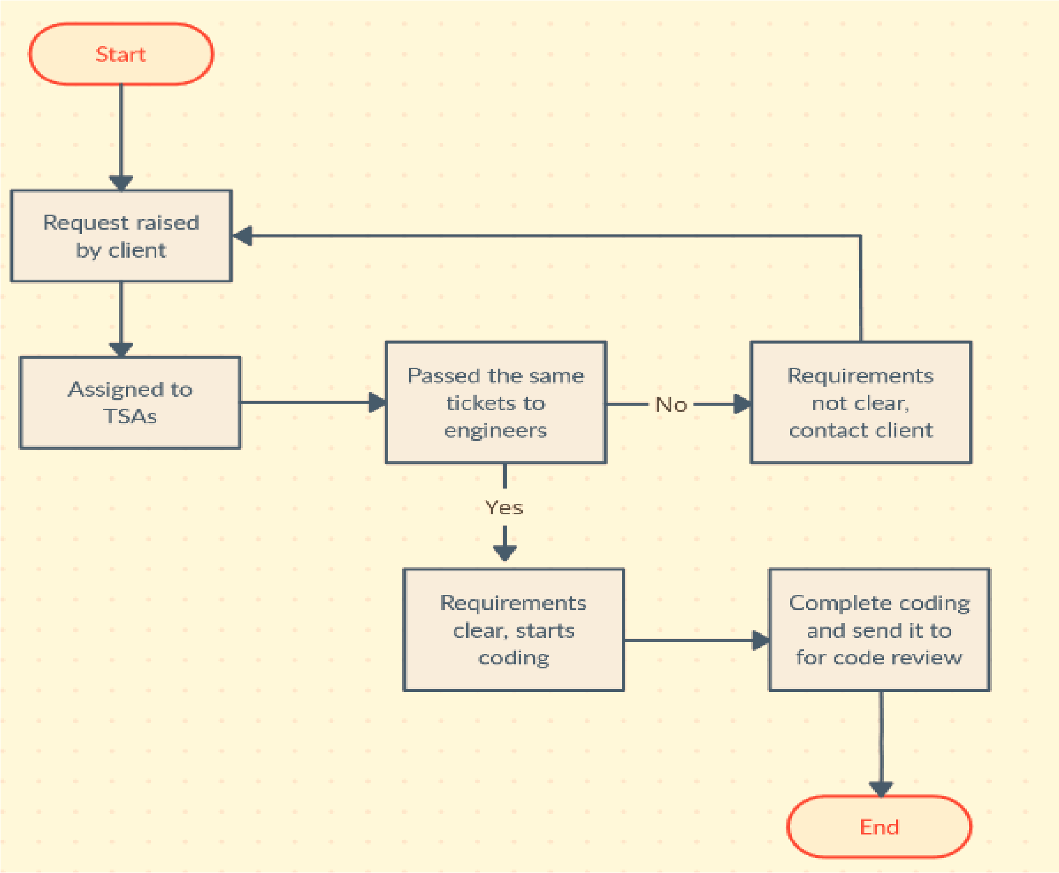

Start
Request raised by client
Assigned to TSAs
Passed the same tickets to engineers
No
Requirements not clear, contact client
Yes
Requirements clear, starts coding
Complete coding and send it to for code review
End

Figure 2.2. Activity Diagram

In the above Fig 2.2., depicts the behavior of a system. An activity diagram portrays the control flow from a start point to a finish point showing the various decision paths that exist while the activity is being executed. We can depict both sequential processing and concurrent processing of activities using an activity diagram. They are used in business and process modeling where their primary use is to depict the dynamic aspects of a system.

Here as you can see the first activity is that the ticket is raised by an client then, these tickets are assigned to the TSA(Technical solution analysts), these tickets are then assigned to any available engineers, they take the ticket and start to understand the requirements mentioned by the client to be executed, if the requirements are clear they code the same and sent it for the code review and validations otherwise if the requirements are not clear the TSA needs to be contacted for the same and the client can be asked to raise a new ticket with clear and specific requirements.

2.4.3. SYSTEM FLOW DIAGRAM

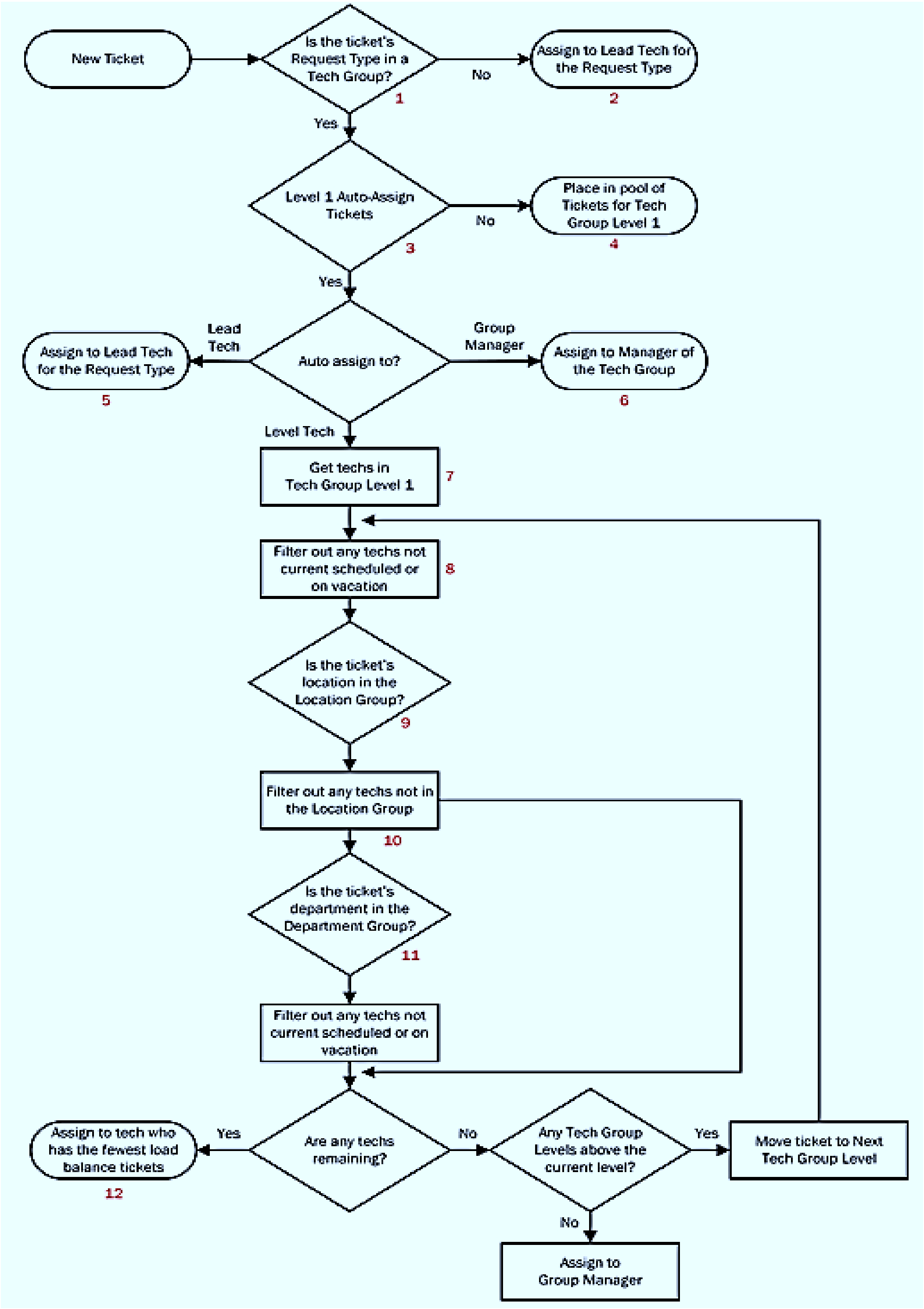

New Ticket
Is the ticket's Request Type in a Tech Group?
1
No
Assign to Lead Tech for the Request Type
2
Yes
Level 1 Auto-Assign Tickets
3
No
Place in pool of Tickets for Tech Group Level 1
4
Yes
Lead Tech
Assign to Lead Tech for the Request Type
5
Auto assign to?
Group Manager
Assign to Manager of the Tech Group
6
Level Tech
Get techs in Tech Group Level 1
7
Filter out any techs not current scheduled or on vacation
8
Is the ticket's location in the Location Group?
9
Filter out any techs not in the Location Group
10
Is the ticket's department in the Department Group?
11
Filter out any techs not current scheduled or on vacation
Assign to tech who has the fewest load balance tickets
12
Yes
Are any techs remaining?
No
Any Tech Group Levels above the current level?
Yes
Move ticket to Next Tech Group Level
No
Assign to Group Manager

Figure 2.3. System Flow Diagram

Fig 2.3. depicts a way of displaying how data flows in a system and how decisions are made to control events. The diagram consists of several steps that identify where the input is coming into the system and the output going out of the system. With the help of the diagram, it is possible to control the event decisions of the system and how data is flowing into the system. Therefore, the system flow diagram is basically a visual representation of data flow, excluding the minor parts and including the major parts of the system in a sequential manner. To illustrate this, symbols are used. They are connected together to show what happens to data and where it goes.

2.4.4. WORK FLOW DIAGRAM

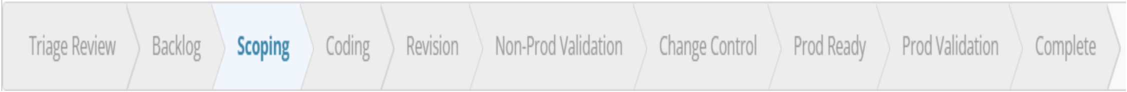


Figure 2.4. Work Flow Diagram

Fig 2.4 depicts the work flow diagram of the system, this diagram shows step by step how the work is completed from start to finish. It also shows who is responsible for work at what point in the process. Designing a workflow involves first conducting a thorough workflow analysis, which can expose potential weaknesses. A workflow analysis can help us define, standardize and identify critical areas of your process. Workflow diagrams are useful to help employees understand their roles and the order in which work is completed, and to create more unity within different departments.

Here we can see various stages in the workflow diagram, which are explained as follows :

- Triage Review – Whenever a SR is logged by the client, it is redirected to the Triage team whose work is to understand the basic requirement of the client and then assign the SR to the respective team which works on the corresponding issues related to the current SR.

- <u>Backlog</u> – The SR is then moved the backlog where the corresponding team to which the SR was assigned, here all the pending SR's are kept to be allocated to and to be worked upon.
- <u>Scoping</u>- this is where the SR gets assigned to the engineer and he works on to understand the problem and arranges necessary permissions, resources and examples form the client if required.
- Also, once the scoping is to be completed, the engineer sets the ECD (Estimated Completion Date), this indicates approximately the time taken by the SR to be moved to completion stage.

- <u>Coding</u> – Here is where the engineer works on the scripts, solutions, tools to bring out the required things as mentioned by the client.
- When the coding/scripting is done, the engineer's code goes through a rigorous process of code validation in various stages.

- <u>Revision</u> - if there is some issue with the code and it is not able to bring about the results as expected or anything is not up to the standards, the code is pushed here and the engineer needs to make changes accordingly, once done, the code again goes for code review, if passed the revision is skipped for now.

- <u>Non-Prod Validation</u>- This means the code, or the solution goes for testing by the customer in the non-production domain first, if satisfied goes to change control, else under revision and the process continues.

- <u>Change Control</u> – In this step we do the code review, the review of the code is done at this stage by different random associates inside the team/pillar on different parameters and if successful goes to next step otherwise to the review cycle.
- Also, the TSA (Technical Solution analyst) is required to take prod installation permission and date of installment.

- Prod Ready- if all is good after the change control, we say the solution is prod ready, i.e., the solution is ready to be tested on the actual production domain, basically it’s a heads up for the solution to be tested by the client.
- Prod Validation- here the solution is again tested by the client on the production domain, is the client is satisfied the SR is moved to next stage, otherwise it is again put on revision with feedback to be worked upon, and the cycle continues.

- Complete – Once, the customer gives thumbs up or approves the solution provided for the SR, the state of the SR to the completed status and the SR is closed.

Hence form this workflow diagram we can understand what is the overall workflow of the service request that is registered by any client, and how it is processed at each stage for the completion of the same in the set time frame.

3. SYSTEM DESIGN

This chapter discusses the arrangement of various modules that form the architecture of the platform. It is the process of defining the architecture, product design, modules, interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development.

3.1. SYSTEM ARCHITECTURE

System architecture is a conceptual model that describes the structure and behavior of multiple components and subsystems like multiple software applications, network devices, hardware, and even other machinery of a system.

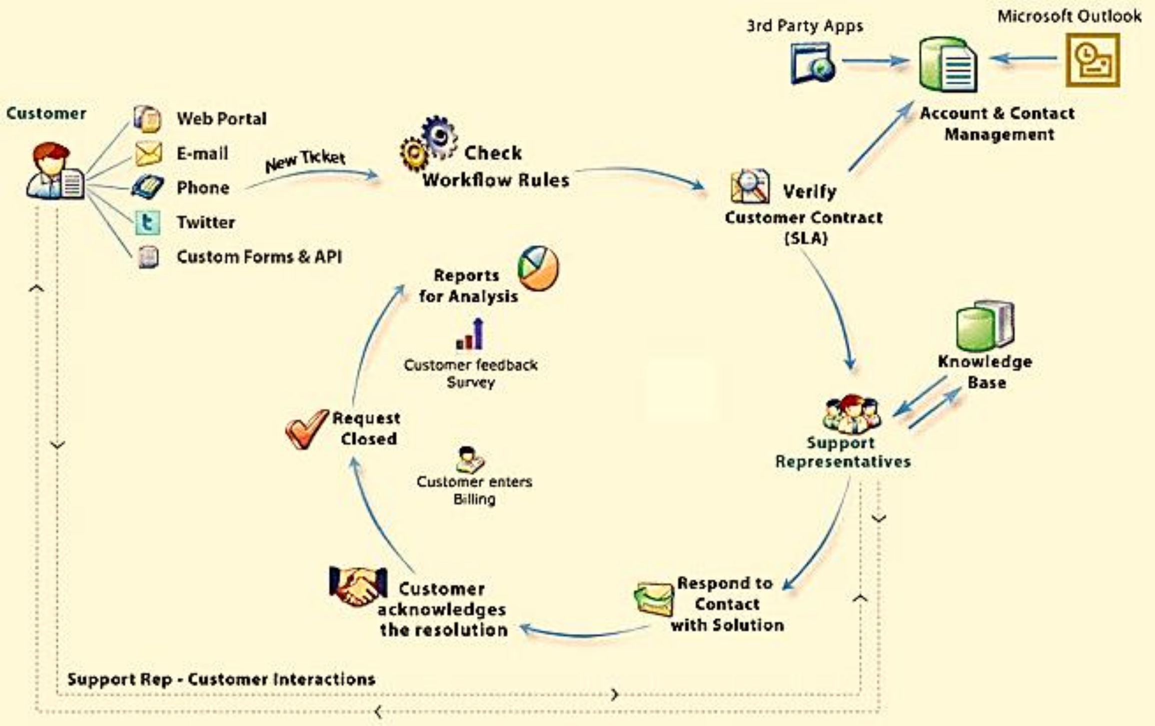


Figure 3.1. System Architecture Diagram

Here we can see the system architecture of the company where there are multiple software which are using the network devices also, there is hardware and other sub systems along with the database, Millennium EHRS. So here we can see that the customer or the client registers a new ticket which then goes through the cycle which defines the system architecture of the company in the following way.

The ticket is then check through the workflow rules and the clients contract is verified from SLA(Service level agreements) using third party application and contract management systems, then after verification the ticket is sent to the support representatives who look after the ticket and provide the solution using the knowledge base, the customer when acknowledges the solution provided and the request is closed and the reports are sent for analysis. Whereas is in the background the client undergoes billing and survey is taken for the customer feedback.

3.2. DATABASE DESIGN

3.2.1 TABLE DESIGN

Table 3.2.1.1: Clinical_event

The clinical event table stores the data related to all the patients clinical data:

Clinical_event_id	Encounter_id	Event_cd	Reference_nbr	Event_id	Updt_dt_tm

Clincal_event_id – is the primary key for the table and us unique and not null.

Encounter_id – is the foreign key from the encounter table, which stores the encounter id of a patient.

Event_cd – it is coded value for the events which are related to the patient particularly the clinical events.

Reference_nbr- it is a reference number to track events

Event_id- it is just like a coded value for event but it is unique id for each event.

Updt_dt_tm- it is the time when the event was last updated.

Table 3.2.1.2: Encounter

The encounter table stores the data related to all the patients and their encounters:

Encounter_id	Encounter_status_cd	Arrival_ct_tm	Loc_facility_cd	Person_id

Encounter_id – is the primary key for the table and us unique and not null.

Encounter_status_cd – is the status of that particular encounter, which stores the encounter status of a patient like closed, in progress or started.

Arrival_ct_tm – it is when the patient arrived in the facility.

Loc_facility_cd - it is the location of the facility where the patient registered.

Person_id - it is the foreign key from the person table.

Table 3.2.1.3: Orders

The orders table stores the data related to all the patients and orders:

Order_id	Catalog_cd	Order_status_cd	Order_dt_tm	Updt_dt_tm	Encounter_id

Order_id – is the primary key for the table and us unique and not null.

Catalog_cd – is the catalog coded value.

Order_status_cd– it is coded value for storing the current order status.

Order_dt_tm - it is the date and time when the order was placed.

Updt_dt_tm - it is the last update date and time on that particular order.

Table 3.2.1.4: Person

The person table stores the data related to all the patients and their personal details:

Person_id	Birth_dt_tm	Name_first_key	Name_last_key	Decease_dt_tm	Inst_id

Person_id – is the primary key for the table and us unique and not null.

Birth_dt_tm – is the date and time of birth of the person.

Name_first_key – it is the first name of the person in capitals.

Name_last_key – it is the last name of the person in capitals.

Decease_dt_tm - it is the date and time of that particular person when deceased.

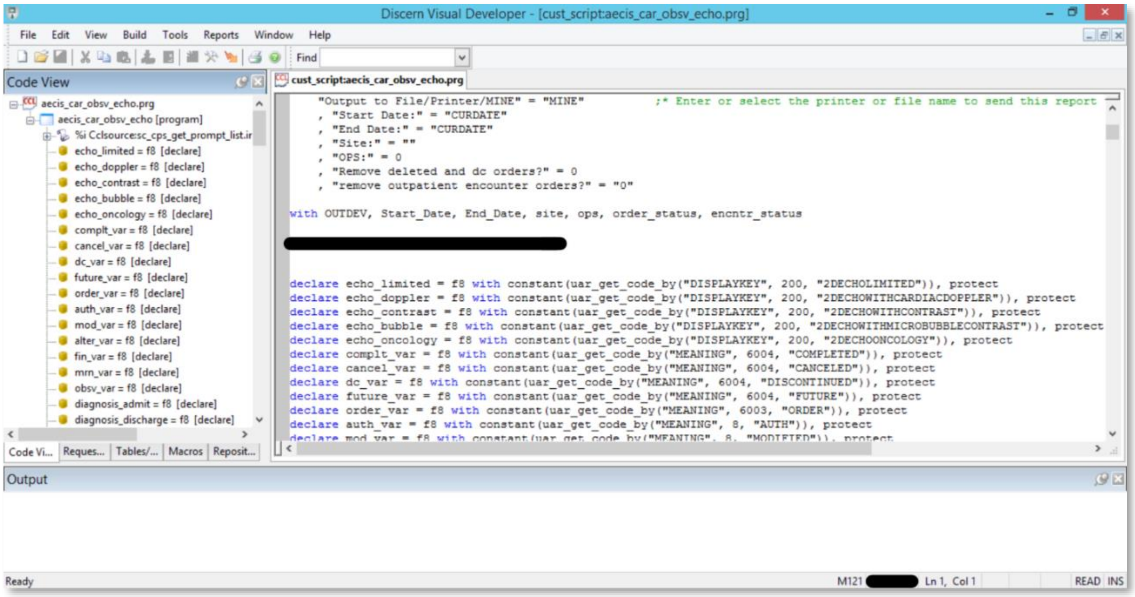
Inst_id – it is the unique id which contains the id of an instruction.

3.3. INTERFACE DESIGN

User interface (UI) design or user interface engineering is the design of user interfaces for machines and software, such as computers, home appliances, mobile devices, and other electronic devices, with the focus on maximizing usability and the user experience. In computer or software design, user interface (UI) design is the process of building interfaces that are aesthetically pleasing. Designers aim to build interfaces that are easy and pleasant to use. UI design refers to graphical user interfaces and other forms of interface design. The goal of user interface design is to make the user's interaction as simple and efficient as possible, in terms of accomplishing user goals (user-centered design).

Following are the interface designs of the software used in the process of the lifecycle of a service request:

- **Discern Visual Developer-**


Discern Visual Developer - [cust_script:aecis_car_obsv_echo.prg]
File
Edit
View
Build
Tools
Reports
Window
Help
Find
Code View
cust_script:aecis_car_obsv_echo.prg
aecis_car_obsv_echo.prg
aecis_car_obsv_echo [program]
%i Cclsource:sc_cps_get_prompt_list.ir
echo_limited = f8 [declare]
echo_doppler = f8 [declare]
echo_contrast = f8 [declare]
echo_bubble = f8 [declare]
echo_oncology = f8 [declare]
complt_var = f8 [declare]
cancel_var = f8 [declare]
dc_var = f8 [declare]
future_var = f8 [declare]
order_var = f8 [declare]
auth_var = f8 [declare]
mod_var = f8 [declare]
alter_var = f8 [declare]
fin_var = f8 [declare]
mrn_var = f8 [declare]
obsv_var = f8 [declare]
diagnosis_admit = f8 [declare]
diagnosis_discharge = f8 [declare]
Code Vi...
Reques...
Tables/...
Macros
Reposit...
Output
Ready
M121 [redacted]
Ln 1, Col 1
READ
INS

```
    "Output to File/Printer/MINE" = "MINE"          ;* Enter or select the printer or file name to send this report
    , "Start Date:" = "CURDATE"
    , "End Date:" = "CURDATE"
    , "Site:" = ""
    , "OPS:" = 0
    , "Remove deleted and dc orders?" = 0
    , "remove outpatient encounter orders?" = "0"

with OUTDEV, Start_Date, End_Date, site, ops, order_status, encntr_status

[redacted]


declare echo_limited = f8 with constant(uar_get_code_by("DISPLAYKEY", 200, "2DECHOLIMITED")), protect
declare echo_doppler = f8 with constant(uar_get_code_by("DISPLAYKEY", 200, "2DECHOWITHCARDIACDOPPLER")), protect
declare echo_contrast = f8 with constant(uar_get_code_by("DISPLAYKEY", 200, "2DECHOWITHCONTRAST")), protect
declare echo_bubble = f8 with constant(uar_get_code_by("DISPLAYKEY", 200, "2DECHOWITHMICROBUBBLECONTRAST")), protect
declare echo_oncology = f8 with constant(uar_get_code_by("DISPLAYKEY", 200, "2DECHOONCOLOGY")), protect
declare complt_var = f8 with constant(uar_get_code_by("MEANING", 6004, "COMPLETED")), protect
declare cancel_var = f8 with constant(uar_get_code_by("MEANING", 6004, "CANCELED")), protect
declare dc_var = f8 with constant(uar_get_code_by("MEANING", 6004, "DISCONTINUED")), protect
declare future_var = f8 with constant(uar_get_code_by("MEANING", 6004, "FUTURE")), protect
declare order_var = f8 with constant(uar_get_code_by("MEANING", 6003, "ORDER")), protect
declare auth_var = f8 with constant(uar_get_code_by("MEANING", 8, "AUTH")), protect
declare mod_var = f8 with constant(uar_get_code_by("MEANING", 8, "MODIFIED")), protect
```

Figure 3.2. Discern Visual Developer

Above figure 3.2. displays the coding software that is used by the employees. Here employees/engineers will be signing in using their organization based on password. This is coding software is called as discern visual developer, one can access this under a specific domain on which the work needs to completed and validated first i.e. is the non-production domain, then we can go and do the same for the production domain too.

Discern Visual Developer also known as dvdev is the software which is used to load, view, modify and develop the custom scripts in CCL. CCL(Cerner Command Language) is the language in which all the scripts are written, this language is very close relative of SQL as it includes about all the SQL commands we can usually perform, also it has conditionals like if else statements and has data structures like

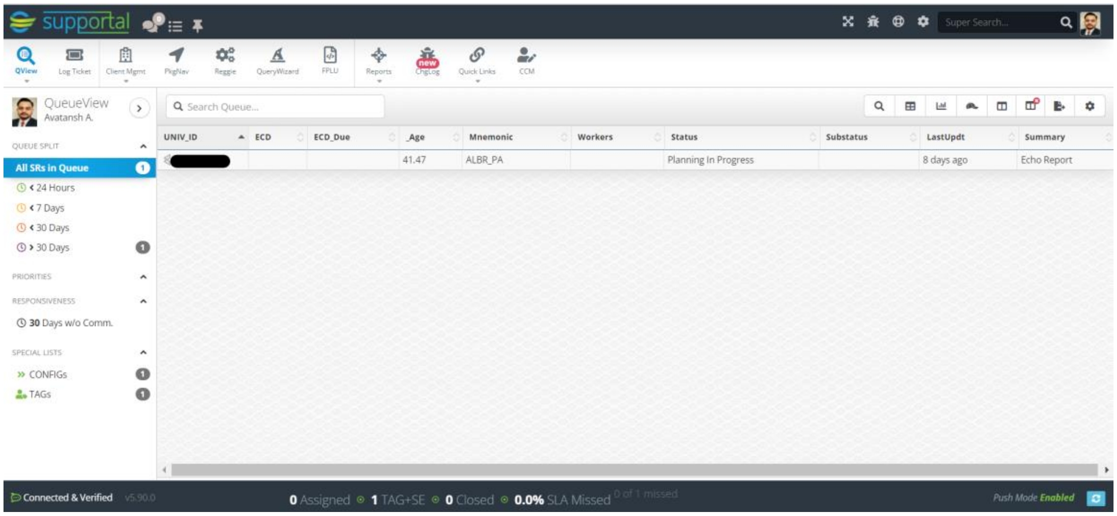
Record Structures which are designed to save the patients data and use it when needed, these feature make it different from SQL and is unique to the Cerner Corp.

Here in the Fig. 3.2 we can see that this code editor has various menus on the menu tab on the top, the file menu option helps the engineer to open, save, locate, import and export new or existing scripts. Then the edit menu option gives us the power to edit various parts of the script along with one of the most used option find and replace is present here. Then we have the View menu, here we can add or remove tables and various toolbar options can be customized from here, basically what are the various options one wants to see for ease in access can be selected and dissected from here, also we can control the options which control the code window and add features like line numbering. The build menu has options to run ad hoc queries, compile scripts and debug the files.

The layout menu has all options to modify the layout files, the tool menu is one of the most important menu where we have multiple builder options such as the prompt builder, query builder and the record builder, also we can add the variables, subroutines and code values to the script from here. The table menu is used when we need to modify a table in layout files. The Reports menu is again an important tab where we have option like CCLPROT which is used to find whether we have a file/object with a particular name, if yes then what is its path and other necessary details, then CCLGLOS gives the glossary about the queried variables/ data members from a table and tell all about that columns from the database and its tables.

Next to the menu bar, we have quick access options, these are the same options from different menus, which are very frequently used so they are placed here for ease in access along with the find option. Then we can see on the left side pane, this called the code view where the engineer can easily see the code in simple terms, like names and types of variables used in the loaded script, tables used and the columns in each tables etc., this is very essential and handy while coding the solution for the client. Right next to it is the coding window where we can see the code written in the CCL where there are multiple declarations just like the object oriented languages C++ and Java. On the bottom we have the output window where we can see the results after compilation of script. All these options make dvdev a very important and essential tool in the development of the solution required by the client and in the service request completion status.

- **Supportal –**



UNIV_ID	ECD	ECD_Due	_Age	Mnemonic	Workers	Status	Substatus	LastUpdt	Summary
[redacted]			41.47	ALBR_PA		Planning In Progress		8 days ago	Echo Report

Figure 3.3. Supportal Part 1

Above figure 3.2. displays the central management software that is used by the employees of the company as well as the TSA’s and some clients too. Here employees/engineers will be signing in using their organization based on password. After logging in there are many options one can explore and do the desired work accordingly.

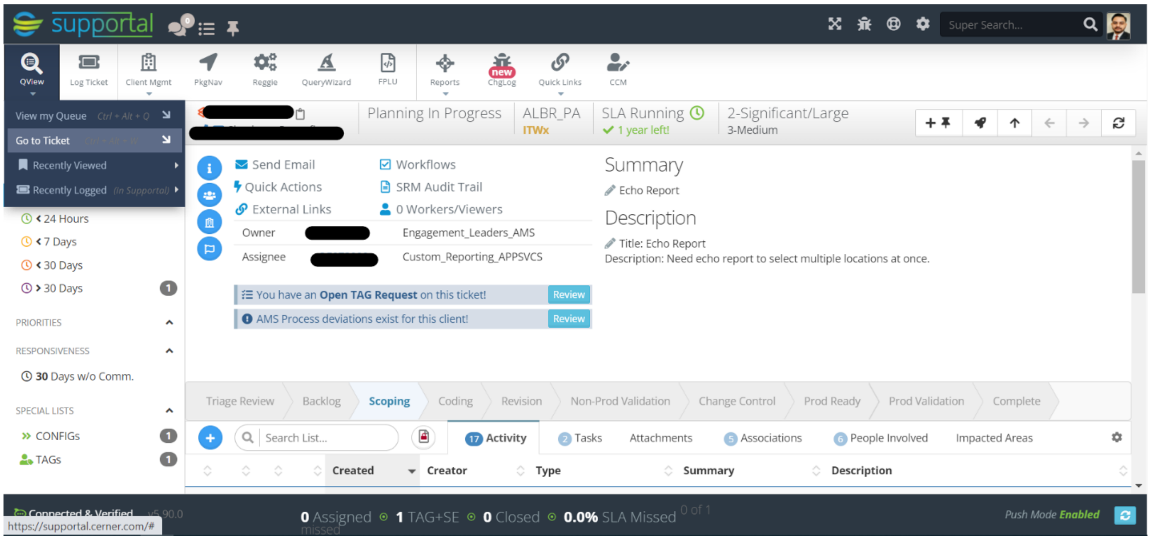
Supportal is a place where we can see the assigned SRs to an associate, also we can see various other information related to any SR using the SR no, which is a unique number. We can see for a specific SR that at what stage/state is SR is right now, its description i.e., what the client needs us to do in this SR, some confidential client details, ECD i.e., Estimated Completion Date to the SR can be set and seen, activity, permissions, people involved, related documents etc. Basically, it’s a place we refer to for any information needed on the SR.

Other than this we have various options on the top such as Qview which shows the queries, log ticket gives an option to log a ticket, client management gives various options to manage the client, and so on related options are provided on the menu tab.

On the left hand side we have this navigation bar where we can see various filters according to which we can see the changes on the right hand query/ ticket pane, we have options like All SR’s, <24 hours, <7 days categories to filter out the SR’s. in the bottom we can see the amount of SR in each category like the config, TAG’s and ECD’s which shows the respective SR’s in each of the selected accordingly.

On the right hand we can see the SR’s are clearly listed and have different columns which can be customized from the options given on the right top corner and we can see specific information regarding each SR like the universal id which is the unique id through which we identify each SR as unique, the ECD time and due date, the age of the SR, the status of the SR, when was the last update on this SR and lastly the summary of what has to be done or asked in the SR by the client.

Now if we click the particular SR we are redirected to another page of Supportal as follows and where we can see additional information related to that particular SR.



[redacted]
[redacted]

Planning In Progress

ALBR_PA ITWx

SLA Running ✓ 1 year left!

2-Significant/Large 3-Medium

Owner [redacted] Engagement_Leaders_AMS

Assignee [redacted] Custom_Reporting_APPSVCS

You have an **Open TAG Request** on this ticket! Review

AMS Process deviations exist for this client! Review

Summary

Echo Report

Description

Title: Echo Report
Description: Need echo report to select multiple locations at once.

Connected & Verified v5.90.0
https://supportal.cerner.com/#

0 Assigned ⊙ **1** TAG+SE ⊙ **0** Closed ⊙ **0.0%** SLA Missed 0 of 1 missed

Figure 3.4. Supportal Part 2

The figure 3.4. displays the Supportal software where we are viewing the details of a particular SR. Here if we notice the first and the most important thing that is mentioned on the information tab is the universal id or the SR number which is the unique identification for the SR, then followed by the client name and the client organization along with the IT solution being used by them, then we have the current status of the SR with the work effort required to complete the SR.

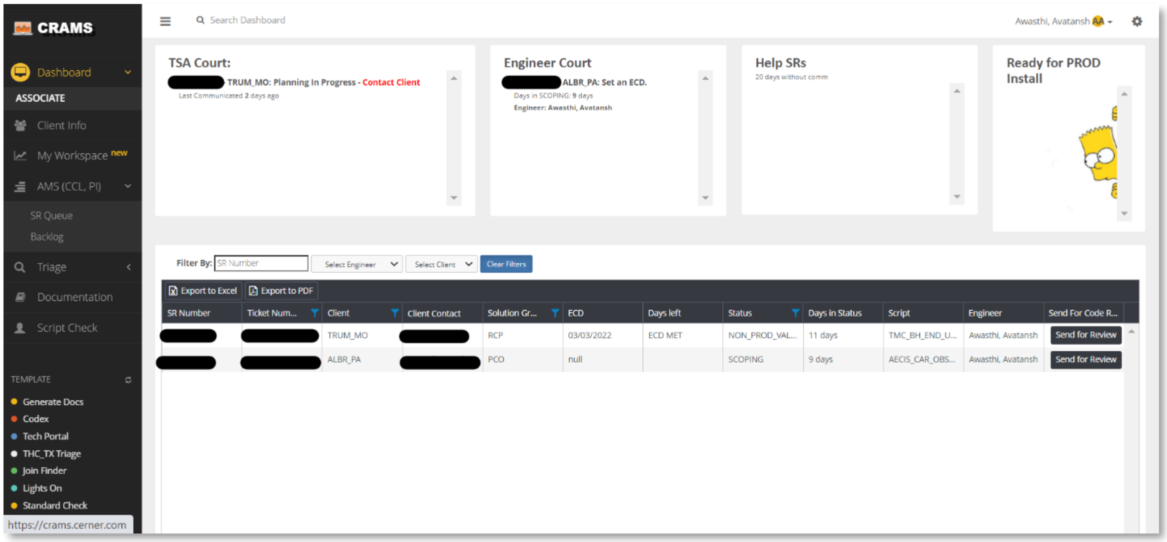
The navigation pane on the left remain the same which will take us to the previous pages or any other page as selected, but on the right hand we have the SR details, the first part contains two sections, the left one has all the important links and quick actions that might be required by the engineer to change the status or upload documents or set and ECD’s etc., whereas the right section contains information like the summary of the SR followed by the detailed description of the SR, here we can notice and view the requirements stated by the client briefly.

On the bottom we can see the current status of the SR along with the stages it has done, and stages it has to complete further, also just below it we can see that information tab on which we have various options like the activity tab, this is the most important as we come to know most of the information related to script of the particular SR and what are all the activities that have been done in the past for this SR, what are the permissions given and documents uploaded, the client communications done to understand more clearly about the SR are given here, then we have other options which are helpful for the engineer to understand more n more about the SR.

Overall we get an overview about a particular SR and the assigned SR from this portal which is centrally used by the employees of the company to keep track of the SR and the tickets in the pipeline.

- **CRAMS –**

Custom Reporting Application Management System(CRAMS) Portal is a sophisticate piece of software which Cerner uses to track the team's performance using visual representation, here we have various navigation items which lead to different SharePoint pages which shows us data regarding how the team is doing and what stage the SRs of the team are etc. This is used by specific associate to see all the SR's related to that associate as the Supportal dashboard only shows the current SR's you have on which you are working, but here you can see the exact status of the assigned SR's. Also, this software shows us the backlog of SR's that we have, we can sort and filter this data according and get SR backlog for a particular team or of a particular patient.



TSA Court:

[redacted] TRUM_MO: Planning In Progress - Contact Client
Last Communicated 2 days ago

Engineer Court

[redacted] ALBR_PA: Set an ECD.
Days in SCOPING: 9 days
Engineer: Awasthi, Avatansh

Help SRs

20 days without comm

Ready for PROD Install

Filter By: SR Number | Select Engineer | Select Client

SR Number	Ticket Num...	Client	Client Contact	Solution Gr...	ECD	Days left	Status	Days in Status	Script	Engineer	Send For Code R...
[redacted]	[redacted]	TRUM_MO	[redacted]	RCP	03/03/2022	ECD MET	NON_PROD_VAL...	11 days	TMC_BH_END_U...	Awasthi, Avatansh	Send for Review
[redacted]	[redacted]	ALBR_PA	[redacted]	PCO	null		SCOPING	9 days	AECIS_CAR_OBS...	Awasthi, Avatansh	Send for Review

Figure 3.5. CRAMS

Basically, there are 3 types of SR's:

a) Correction

b) Enhancement and

c) New

a) The correction SR is related to solving a pre-existing script which needs to be corrected and we might need to remove some features if needed to rectify the error.

b) In the enhancement SR the client is telling to add a feature to the pre-existing script.

c) Finally, in the new SR, the client needs us to make a new script from scratch, here the client specifies all the features, and the requirements are cleared so that the desired script with essential features can be provided, this is usually a tedious and time taking SR as we must connect and work multiple times with the client.

Now, the priority of the SR, this can be set by the respective team after the client sends a priority increase request mail to the triage team who then review and evaluate the issue and assign the priority for the particular SR.

Lastly, the points for an SR, the points that are given to an associate after the completion of the SR, is decided on the same factors mentioned above, i.e. if a SR is new and its priority is utmost it will be awarded the most points, where as a correction and less priority will be given and assigned less points, but these SR's also take fewer time so, usually an associate after spending considerate amount of time in the team, makes a balance between these kind of SR's and the available bandwidth time with them.

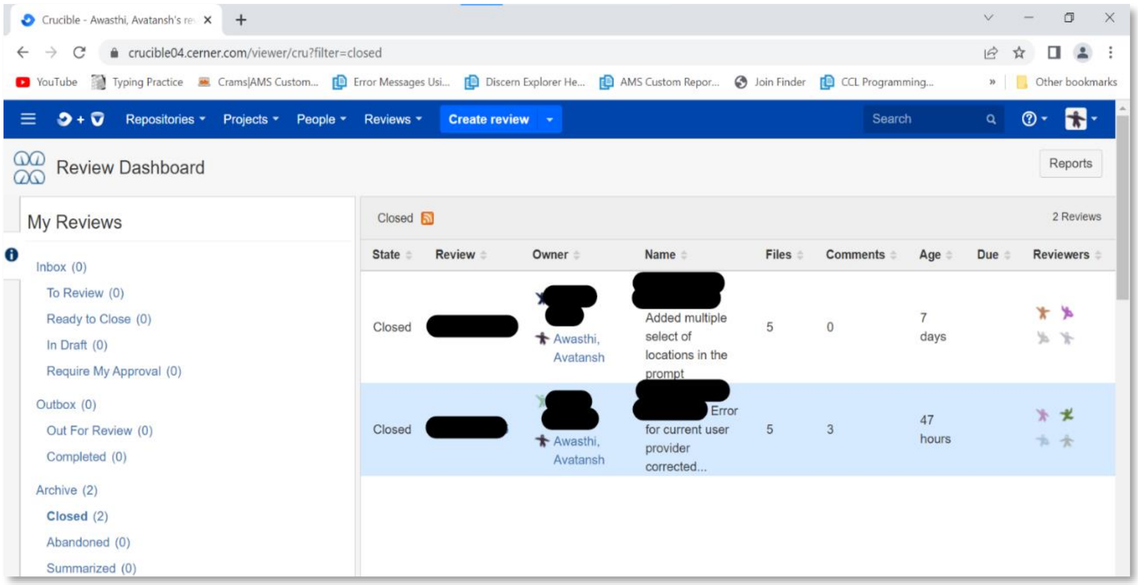
The team works to complete the monthly targets and each member associate of the teams contributes to this target by working the respective SR’s, the manager is in continuous contact with the associates to keep track of each SR’s the team is working on and makes sure that most of the SR’s are closed and completed in time.

- **Crucible –**

This is the online software which is used to facilitate the code review process of the code that is done by the engineer as a solution to the SR by the client. Code reviews are methodical assessments of code designed to identify bugs, increase code quality, and help developers learn the source code.

Code reviews act as quality assurance of the code base. Software developers should be encouraged to have their code reviewed as soon as they’ve completed coding to get a second opinion on the solution and implementation. The reviewer can also act as a second step in identifying bugs, logic problems, or uncovered edge cases. Reviewers can be from any team or group as long as they’re a domain expert. If the lines of code cover more than one domain, two experts should review the code.

Developing a strong code review process, or utilizing version control, sets a foundation for continuous improvement and prevents unstable code from shipping to customers. Code reviews should become part of a software development team’s workflow to ensure that every piece of code has been looked at by another team member. The code review process is an important part in spreading knowledge throughout an organization and shipping high quality products to customers.



Closed

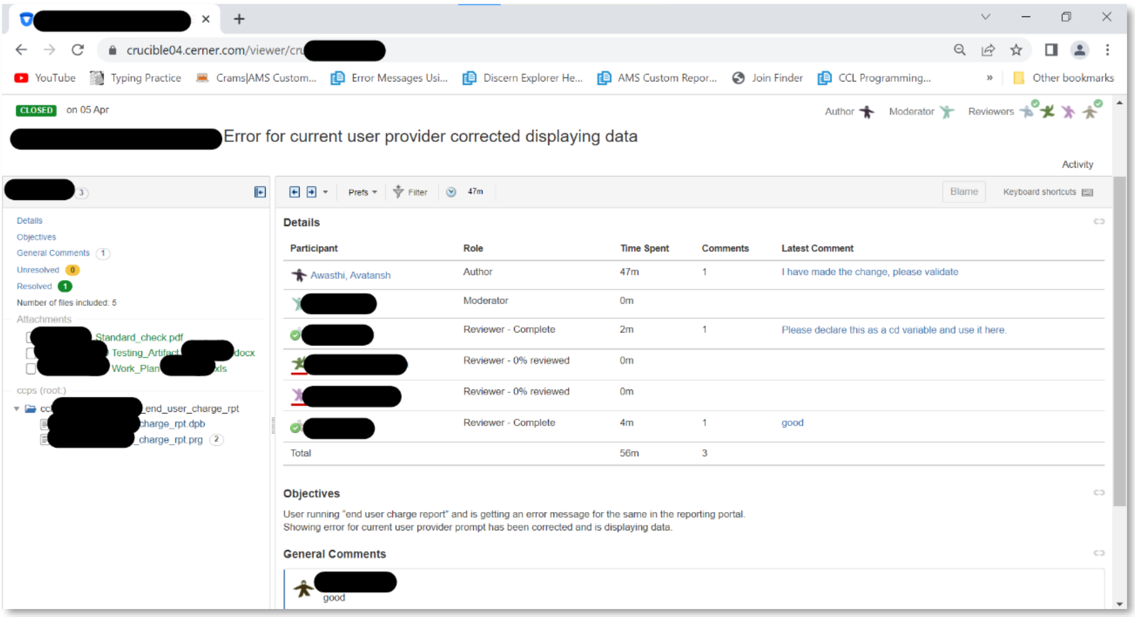
2 Reviews

State	Review	Owner	Name	Files	Comments	Age	Due	Reviewers
Closed	[redacted]	[redacted] Awasthi, Avatansh	[redacted] Added multiple select of locations in the prompt	5	0	7 days		
Closed	[redacted]	[redacted] Awasthi, Avatansh	[redacted] Error for current user provider corrected...	5	3	47 hours		

Figure 3.6. Crucible Dashboard

The above figure 3.6. displays the crucible dashboard which plays a very important role in the testing of the code that has been coded as the solution for the SR given by the client. Here in the dashboard of the code review platform, we can see that on the left we have a navigation bar from where we can move to different categories on the platform, then on the right we can see the reviews that are out for review, here we can see that I have put two codes out for review, and we can see some information regarding the same like, firstly the state of the review which is closed in this case, which means that two of the reviewers that were reviewing this particular code review have successfully approved the changes and the code done for the solution of the SR, then we can see the review name, this is a unique alpha numeric code assigned as name to each code review, then the owner of the review which in this case is myself, and then the name of the description of the review which includes the summary of the change done and asked by the client for the particular SR, then we have the number of files uploaded for the particular review, and the comments by the reviewers in case they want to convey something that need to be changed or corrected, the we have the age of the review that means time the review have been under review.

Next when we go to one of these reviews we can view more information regarding the SR and the code review, the details we can see here are as follows.



[redacted] Error for current user provider corrected displaying data

Details
Objectives
General Comments 1
Unresolved 0
Resolved 1
Number of files included: 5

Attachments
☐ [redacted] Standard_check.pdf
☐ [redacted] Testing_Artifact [redacted] docx
☐ [redacted] Work_Plan [redacted] xls

ccps (root:)
ccl[redacted]_end_user_charge_rpt
[redacted] charge_rpt.dpb
[redacted]_charge_rpt.prg 2

Details

Participant	Role	Time Spent	Comments	Latest Comment
Awasthi, Avatansh	Author	47m	1	I have made the change, please validate
[redacted]	Moderator	0m		
[redacted]	Reviewer - Complete	2m	1	Please declare this as a cd variable and use it here.
[redacted]	Reviewer - 0% reviewed	0m		
[redacted]	Reviewer - 0% reviewed	0m		
[redacted]	Reviewer - Complete	4m	1	good
Total		56m	3	

Objectives

User running "end user charge report" and is getting an error message for the same in the reporting portal.
Showing error for current user provider prompt has been corrected and is displaying data.

General Comments

[redacted]
good

Figure 3.7. Crucible Review Page

Here we are able to observe that the name of the review is on the top, then on the left side pane we can see the attachments done to this code review these are actually a set of standard files like the testing artifact which contain the information regarding the SR and how to access the solution, the workplan which contains the steps of roll back or backout in case of emergency, the standard checklist which contains the score of the code script against the standards of code which again are check with a software called the standard check available in the CRAMS navigation pane, then we have the script itself with the extension of .prg standing for program and a .dpb file standing for the prompt selection file. Also, we can see that issues like unresolved and resolved too.

Over to the next pane we can see details regarding the code review like the participants, where we can see the name of the owner and the other review peer participants, we can see their roles in the next column, then we can see the time spent by each of the participant and the comments done if any. If any two of the reviewers successfully approve the changes made in the attached files then we can say that the code review is in complete status.

4. IMPLEMENTATION

4.1. IMPLEMENTATION APPROACHES

The implementation procedure adopted for converting the objectives into an actual working model was a scrum, agile model. It involved the following phases:

1. Getting the requirement of a new module
2. Brainstorm the necessary functionalities to be made available in a module.
3. 4 weeks sprint to complete the task allotted
4. Discussion and analysis
5. Follow BDD and TDD approaches
6. Correctly implementing the test cases
7. Check code coverage. If above 85% then continue, else back to step 5
8. Run a security scan to check for code vulnerabilities
9. Fix all the bugs and vulnerabilities reported.
10. Push the code to GitHub.
11. Maintain Code Documentation
12. Close the tasks once the code review is completed using Crucible.

4.2. CODING STANDARDS

An object-oriented driven strategy was followed to create and provide solutions. For the structure of the code, Behavior-Driven Development and Test-Driven development approaches were followed.

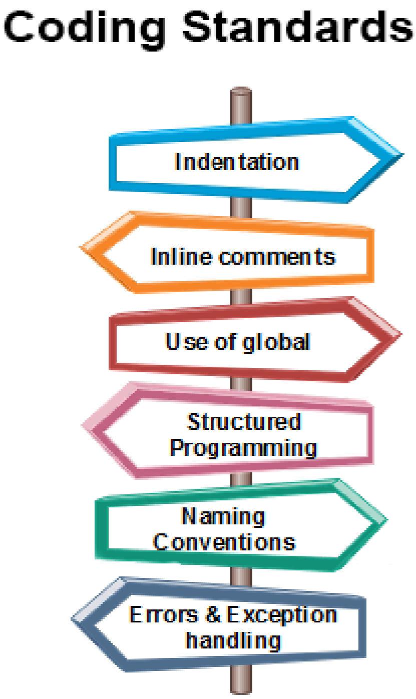


Figure 4.1 Coding Standards

I. Behavior-Driven Development:

Behavior-driven development (BDD) is an Agile software development methodology in which an application is documented and designed around the behavior a user expects to experience when interacting with it.

By encouraging developers to focus only on the requested behaviors of an app or program, BDD helps to avoid bloat, excessive code, unnecessary features, or lack of focus. This methodology combines, augments, and refines the practices used in test-driven development (TDD) and acceptance testing.

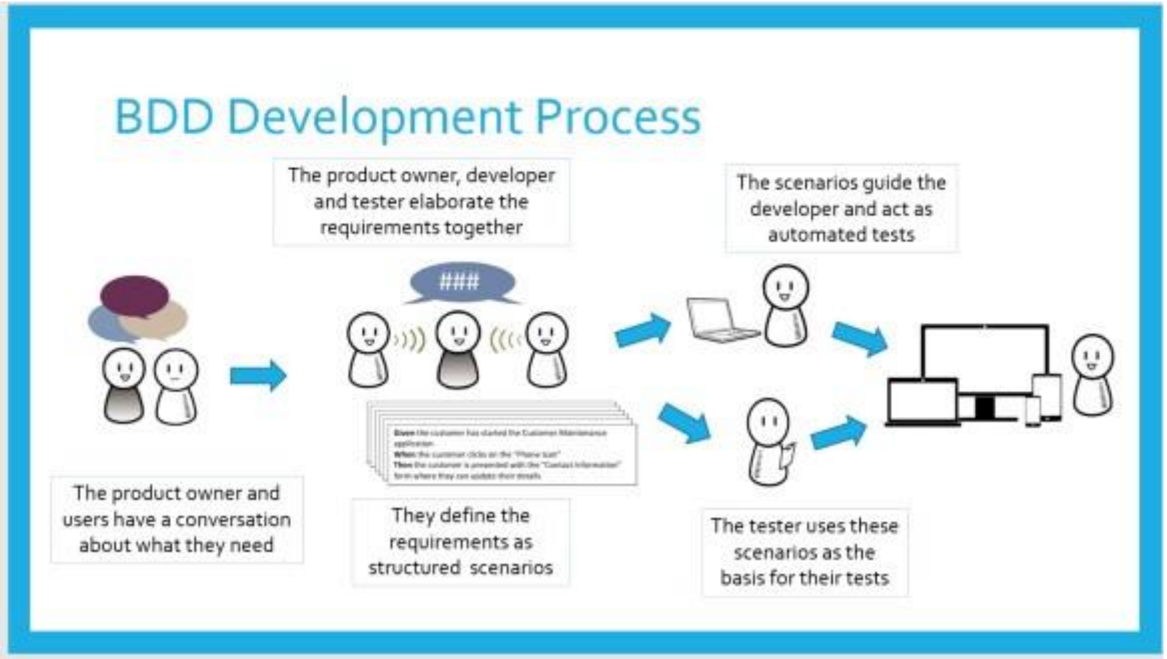

BDD Development Process
The product owner, developer and tester elaborate the requirements together
The scenarios guide the developer and act as automated tests
###
Given the customer has started the Customer Maintenance application.
When the customer clicks on the "Phone Icon"
Then the customer is presented with the "Contact Information" form where they can update their details
The product owner and users have a conversation about what they need
They define the requirements as structured scenarios
The tester uses these scenarios as the basis for their tests

Figure 4.2 BDD Development

The primary purpose of the BDD methodology is to improve communication amongst the stakeholders of the project so that each feature is correctly understood by all members of the team before the development process starts. This helps to identify key scenarios for each story and to eradicate ambiguities from requirements.

The goal of BDD is a business readable and domain-specific language that allows you to describe a system's behavior without explaining how that behavior is implemented. Here is the simple snipped from the project to illustrate it better:

Feature: To log into the system. The user should be signed into the system when he/she provides a valid username and password.

Scenario: Successful login using the organization's valid credentials.

Given: User is at the Login Page

When User enters credentials

| username | password |

| test@cerner.com | ****** |

And User login into a system

Then lands on the dashboard

II. Test-Driven Development:

TDD can be defined as a programming practice that instructs developers to write new code only if an automated test has failed. This avoids duplication of code. TDD means “Test Driven Development”. The primary goal of TDD is to make the code clearer, simple and bug-free. Test-Driven Development starts with designing and developing tests for every small functionality of an application. In the TDD approach, first, the test is developed which specifies and validates what the code will do.

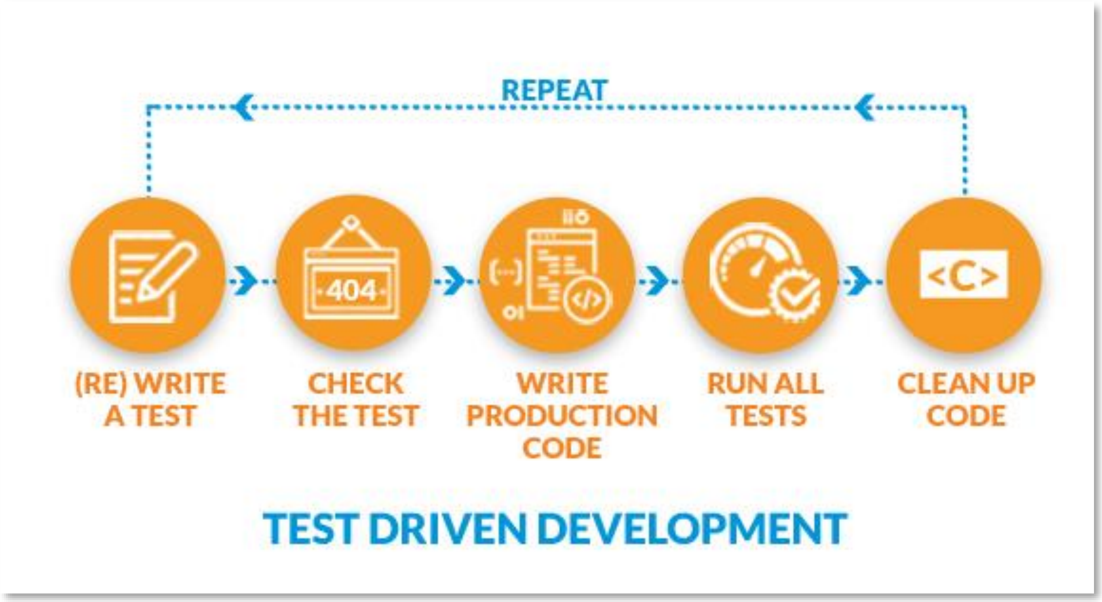


Figure 4.3 TDD Development

In the normal Software Testing process, we first generate the code and then test it. Tests might fail since tests are developed even before the development. To pass the test, the development team must develop and refactors the code. Refactoring a code means changing some code without affecting its behavior. The simple concept of

TDD is to write and correct the failed tests before writing new code (before development). This helps to avoid duplication of code as we write a small amount of code at a time to pass tests. (Tests are nothing but requirement conditions that we need to test to fulfill them).

Test-Driven development is a process of developing and running an automated test before the actual development of the application. Hence, TDD is sometimes also called Test First Development. The following steps define how to perform the TDD test:

- Add a test.
- Run all tests and see if any new test fails.
- Write some code.
- Run tests and Refactor code.
- Repeat.

Some clarifications about TDD:

- TDD is neither about "Testing" nor about "Design".
- TDD does not mean "write some of the tests, then build a system that passes the tests.
- TDD does not mean "do lots of Testing."

The coding standard mainly focused on the following categories:

i) Readability

- Scan-ability
- Avoiding misleading formatting
- Accessibility - readable and editable by users using the widest variety of hardware, including non-visual accessibility interfaces.
- Readability of code when quoted in rustic error messages

ii) Aesthetics

- the sense of 'beauty'.
- consistent with other languages/tools

iii) Specifics

- compatibility with version control practices - preserving diffs, merge-friendliness, etc.
- preventing rightward drift
- minimizing vertical space

iv) Application

- ease of manual application
- ease of implementation (in tools/editors/code generators)
- internal consistency
- the simplicity of formatting rules.

5. TESTING

5.1 TEST PLAN

Software testing represents the ultimate view of the specification, design, and coding and is also considered to be the critical element of software quality assurance. In the software engineering process, testing is considered to be a destructive step rather than a constructive one.

The software test case design methods are integrated into a well–planned series of steps by a software testing strategy. These series of steps result in the successful construction of software. Testing includes the set of activities that are planned in advance and conducted systematically. Good quality software must include methods that can apply to both large-scale and small-scale industries economically and effectively. To affirm such software quality is the underlying motivation of program testing.

For the successful completion of this project, the modules were designed, implemented, and released as small scrums. It is then tested and the next step is carried on. As new flaws occur, the additions are included in the system, implemented, and released as scrums again. They are further tested for accuracy. If any further requirements are found, they will be considered again and the same steps will be followed.

5.2 TESTING APPROACHES

Software testing is an investigation conducted to provide stakeholders with information about the quality of the product or service under test. Software testing can also provide an objective, independent view of the software to allow the business to appreciate and understand the risks of software implementation.

A test strategy is an outline that describes the testing approach of the software development cycle. It is created to inform project managers, testers, and developers about some key issues of the testing process. This includes the testing objective, methods of testing new functions, total time and resources required for the object, and the testing environment.

Test strategies describe how the product risks of the stakeholders are mitigated at the test- level, which types of tests are to be performed, and which entry and exit criteria apply. System design documents are primarily used, and occasionally conceptual design documents may be referred to. For every stage of development design, a corresponding test strategy should be created to test the new feature sets.

Software testing can be stated as the process of validating and verifying a software product for the following:

i) Meeting the requirements that guided its design and development.
ii) Works as expected.
iii) Is it possible to be implemented with the same characteristics?

Software testing, depending on the testing method employed, can be implemented at any time in the development process. However, most of the test effort occurs after the requirements have been defined and the coding process has been completed. As such, the methodology of the test is governed by the software development methodology adopted.

Following are the types of testing that are utilized popularly in the software industry.

1. White Box Testing

It is conducted when the tester has access to the internal data structures and algorithms including the code that implements these. White-box testing methods can also be used to evaluate the completeness of a test suite that was created with black-box testing methods. This allows the software team to examine parts of a system that are rarely tested and ensures that the most important function points have been tested.

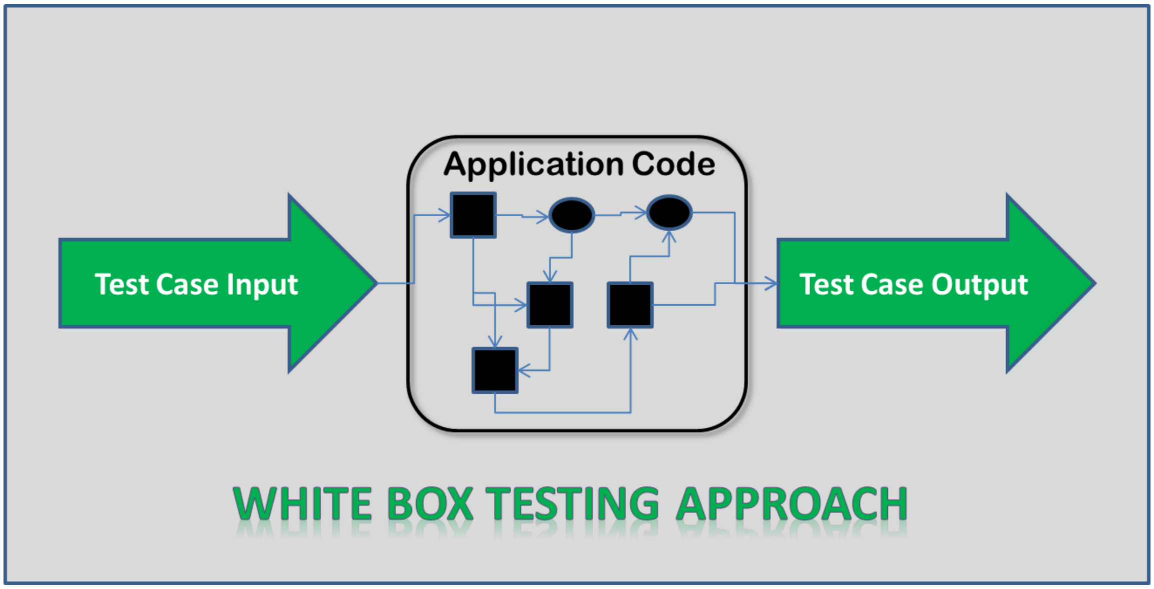


Figure 5.1 White Box Testing

Two common forms of code coverage are -

- Function coverage, which reports on functions executed.
- Statement coverage, which reports on the number of lines executed to complete the test.

They both return code coverage metrics, measured as a percentage.

2. Black-Box Testing

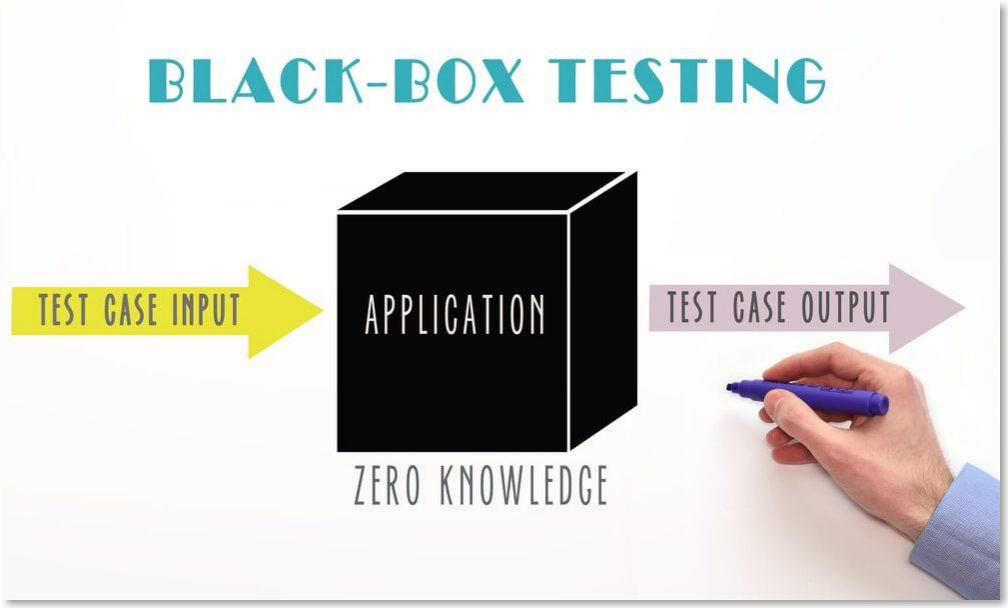


Figure 5.2 Black Box Testing

It treats the software as a "black box" without any knowledge of the internal implementation. Black-box testing methods include equivalence partitioning, boundary value analysis, all-pairs testing, fuzz testing, model-based testing, exploratory testing, and specification-based testing.

3. System Testing

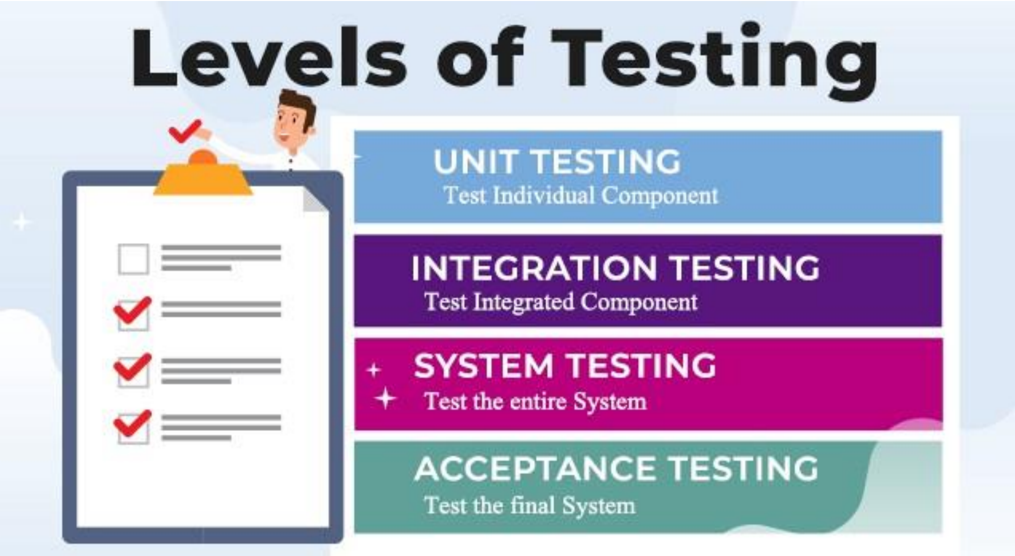


Figure 5.3 System Testing

It is very vital. While integrating the system there might be certain errors in the system. The error needs to be detected and eliminated otherwise the system performance may go down drastically. The entire system when ready must be thoroughly checked with the system requirement specification. Once this has been done most of the work in the phase is over.

4. Stress Testing

Figure 5.4 Stress Testing

Stress testing implies testing the system under extreme conditions. We have made sure that the system works properly no matter how the inputs are given.

5. Condition Testing

Condition testing is a test case design method that exercises the logical condition contained in a program module. This testing method focuses on testing each condition in the program. The aim of conditional testing is not only to locate errors to locate in the condition but also to locate the error in the program.

6. Data Flow Testing

This method selects the test path of a program according to the location of the definition and uses of variables in the program. The flow of the data or the variable from one module to another has been checked.

5.3 TEST REPORTS

After executing codes and successfully accomplishing the test cases in real time, it can be concluded that the solutions provided to the clients are vigorously tested and passed only after this essential step.

6. CONCLUSION

This solution was designed to help automate and facilitate the workflow and process of all the tasks and activities related to service requests. End-users will have requests and specific associates will raise a ticket to fulfill the requests by clients on the portal. Further, associates will code the request and validate the code by multiple code reviewers and get feedback from the client.

i) It will minimize the risk of the tickets being assigned to the wrong teams which will further lower the risk of conflict.

ii) It will help everyone to monitor or keep track of the active buckets which every team is working on within the organization.

iii) Associates will have a shared sense of consciousness as the system and software used now are shared centrally and are updated in real-time.

6.1 DESIGN AND IMPLEMENTATION ISSUES

Following are the points where issues were faced:

- The challenging part of validating outbound communication tracker input is that it requires connecting two different servers in order to pull all the information.
- Whenever the scripts are modified it requires efforts to run the workflow that causes a high wait time.
- Difficult to automate workflows that are complex in nature.

6.2 ADVANTAGES AND LIMITATIONS

6.2.1. ADVANTAGES

- As the system is now organized centrally there is no need for hassles through spreadsheets or email inboxes trying to figure out the issues and their resolution processes.

- It will assist in improving requestors' perceptions of the support experience by troubleshooting the basic steps of agent-assisted support in terms of consistency and transparency along with information.

- The system enables the requests to get prioritized according to the requirement and difficulty of a query, instead of being handled in the order they are received.

- The system provides managers with a view into the work of the employees which can help brighten the staff development opportunities.

- The data created by the software helps to drive the resourcing decisions, and process improvement and enables the tuning of support processes to increase customer satisfaction.

6.2.2. LIMITATIONS

The Learning Curve - All new systems entail a learning curve, so expect a slowdown while your staff gets to know a new system. In the end, the benefits should outweigh that cost. Be aware that customers and clients will also need time to acclimate to the changes. Hang-ups and snags are natural with a new system. They will happen, so be prepared to deal with them efficiently.

6.3 FUTURE ENHANCEMENT

In the fast-paced business environment of today, with the new technology tools the user nowadays want mobile for all their support-related activities, there is a need for organizations to adapt to the speed of technology to ensure smooth service delivery.

There are a few key elements that stand out and seem to shape the future of this transformation.

Customer experience is the game-changer in the future. To deliver and support high-quality customer service, organizations should invest in ensuring the top customer experience. Customer satisfaction has achieved a new parameter for measuring an organization's success in the service management space. To remain in the game, the support helpdesk teams are now taking a customer-centric approach to service delivery by implementing the best practices and continuing the process with improved techniques.

This is the Age of Artificial Intelligence (AI). AI is already revolutionizing the way industries function.

There was a time when AI was only seen in movies and novels but now it has become reality like self-driving cars, PA robots, and many more. Natural Language Processing (NLP) is a technique that can be used in self-service portals and can make users communicate with chatbots and virtual agents, thereby improving the response rate. NLP techniques can also help deflect a major chunk of tier 1 queries/tickets. Machine Learning (ML) technique can be used to perform predictive analytics in the service helpdesk. By that, the large volume of service helpdesk data can be analyzed to detect patterns and relationships between past occurrences.

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