System and Software Architecture Description (SSAD)

SnApp – Voice Communication System

Team05

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10/13/14

Version History

Date	Author	Version	Changes made	Rationale
10/13/14	KT,HM	1.0	• Original template for use with Instructional ICM-Sw v1.0	• Initial draft for use with Instructional ICM-Sw v1.0

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1. Introduction

1.1 Purpose of the SSAD

The purpose of this document is to document the results of the Object Oriented Analysis and Design (OOA&D) of Voice Communication System. SSAD will be used as a reference to the architecture of the system. After delivery of the system, the maintainer and the client will use the SSAD to help understand the structure of the system.

1.2 Status of the SSAD

This is the first version of SSAD.

2. System Analysis

2.1 System Analysis Overview

The primary purpose of the Voice Communication System (VCS) is to enable the sales agents of SnApp to call customer and leads to market their products. The system also archives call logs and voice recordings of the calls for analytics, training and quality assurance purposes. VCS allows managers to monitor and intervene calls by sales agents to ensure quality or to close a sale.

2.1.1 System Context

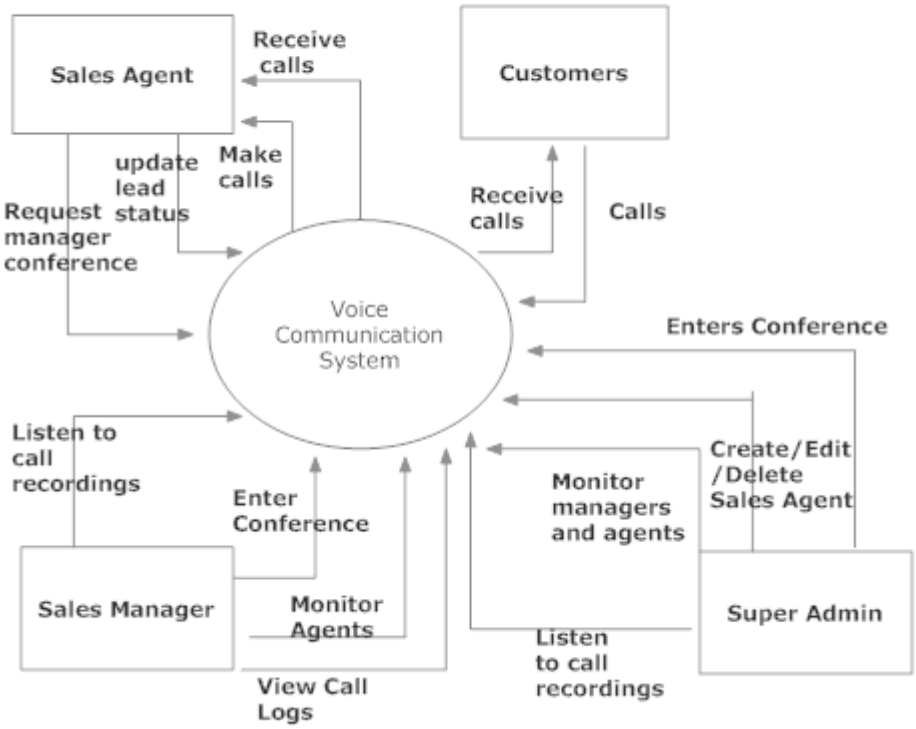


Figure 1: System Context Diagram

Table 1: Actors Summary

Actor	Description	Responsibilities
Customers	Customers and leads are individuals who are being called by the sales agents to sell the product.	Customers pick up calls and can make calls to the system.
Sales Agent	Sales agents are responsible for communicating with the customers and leads to sell the company's products.	Call the leads and customers, receive calls, update lead/customer status, request managers to conference into the call.
Sales Manages	Managers manage the Sales agents. Every sales agent is assigned a sales manager.	View call logs, listen to call recordings made by the agents under them. When notified by the sales agent, managers can also conference in on the ongoing call or listen the call on mute.
Super Admin	Super admins manages both managers and sales agents.	Super Admins are responsible for adding new sales agents, editing sales agent details, and assigning managers to sales agents, view call logs, listen to call recordings.

2.1.2 Artifacts & Information

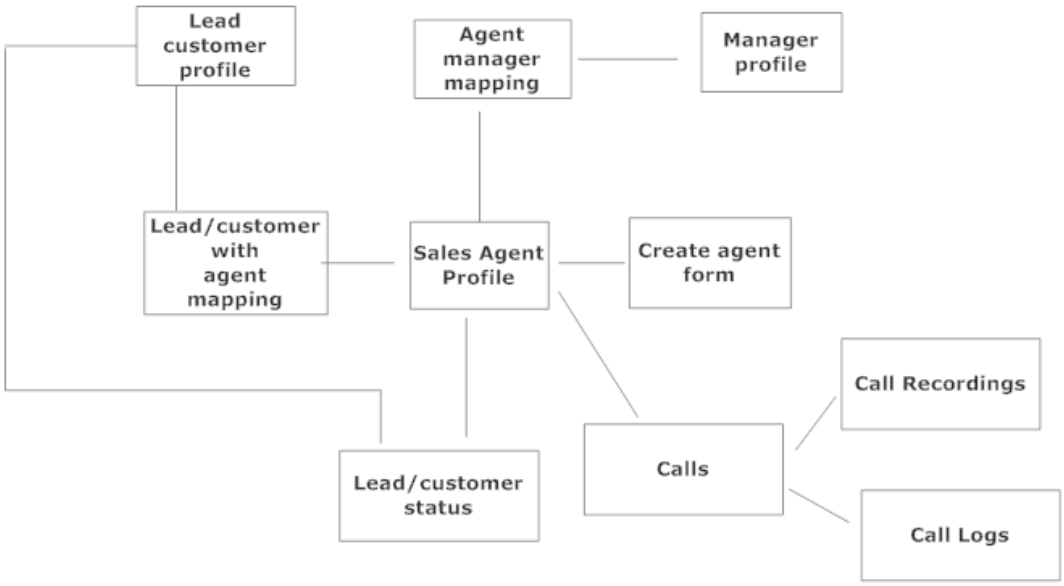


Figure 2: Artifacts and Information Diagram

Table 2: Artifacts and Information Summary

Artifact	Purpose
ATF-1 Create agent form	It is a form accessible by the super admin and is user to create new agent profiles or edit them.
ATF-2 Sales agent profile	It contains all the details about the sales agents. It is created using the create agent form. It is stored in the users table.
ATF-3 Agent -Manager Mapping	It states which manager manages which agent.
ATF-4 Manager Profile	It contains all the details about the sales manager. It is stored in the user table too.
ATF-5 Lead/Customer - Agent Mapping	It states which lead/customer is handled by which agent.
ATF-6 Lead/Customer Profile	It stores all the details about the lead/customers. It is stored in the CRM.
ATF-7 Lead/Customer Status	It describes the current status of a lead/customer like if a lead is hot or cold, or if lead gets converted to a customer.
ATF-8 Calls	These are the calls made using the Twilio API
ATF-9 Call Logs	This stores all the details of calls made including but not limited to caller number, callee number, duration in seconds, etc.
ATF-10 Call Recordings	All the calls are recorded and stored for training and quality purposes.

2.1.3 Behavior

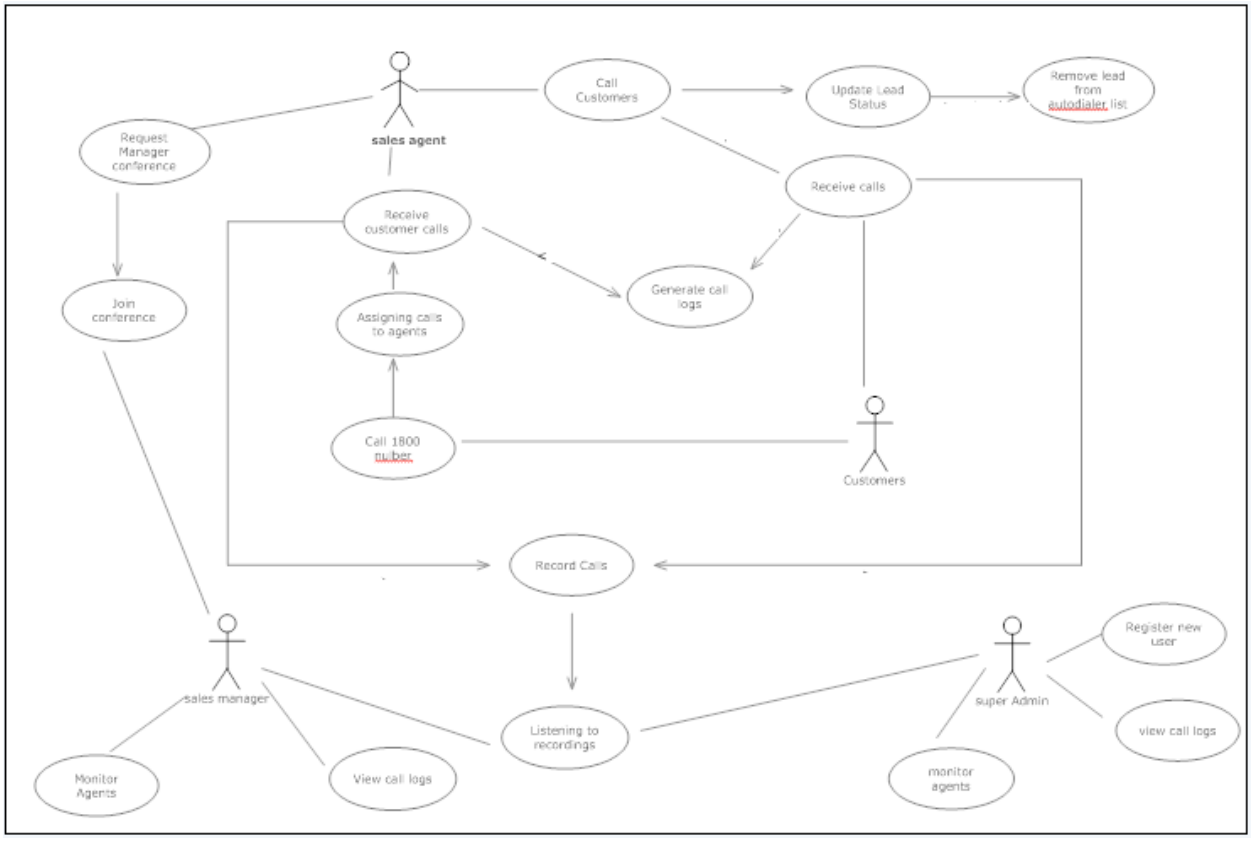


Figure 3: Process Diagram

2.1.3.1 Capability

2.1.3.1.1 Process

Table 3: Process Description

Identifier	UC -1 : Call Customers

Purpose	From a particular leads page click on the 'click to call button' to call the customer via the Twilio API framework.
Requirements	Twilio API authentication
Development Risks	None
Pre-conditions	User Agent is logged into the system. Lead's correct information is stored in the database and displayed on the Lead's screen page.
Post-conditions	If the user agent is logged in the system and lead information is correct, the call is made. Otherwise, some error message is displayed on the lead's screen.

Table 3: Typical Course of Action

Seq#	Actor's Action	System's Response
1	[User Agent] Enters user agent landing page on login	
2	[User Agent] Clicks on 'show leads list' link	Leads List is displayed on the screen
3	[User Agent] Click on a lead's name	Lead screen of that particular lead is displayed
4	[User Agent] click on 'click to call button' to call that lead	Softphone screen pops up with the call being made
5	[Customer] Picks up the call	Call successful with call details

Table 4: Alternate course of action

Seq#	Actor's Action	System's Response
1	[User Agent] Enters user agent landing page on login	
2	[User Agent] Clicks on 'show leads list' link	Leads List is displayed on the screen
3	[User Agent] Click on a lead's name	Lead screen of that particular lead is displayed
4	[User Agent] click on 'click to call button' to call that lead	Softphone screen pops up with the call being made
5	[Customer] does not pick up call	Softphone screen minimizes

Table 6: Process Description

Identifier	UC - 2 : Update Lead status
Purpose	Once a call is completed, a lead may become a hot lead or a customer. This will enable the sales agent to change the status of a lead/customer.
Requirements	Completed call with a clear lead interested / disinterested status

Development Risks	None
Pre-conditions	User Agent is logged into the system. Lead's or customer's status changes after a call.
Post-conditions	If a valid status is entered, then the status of that lead/customer is updated. This may result in the lead being removed from the autodialing list

Table 7: Typical Course of Action

Seq#	Actor's Action	System's Response
1	Sales Agent selects a status for the lead/customer from a dropdown list.	System saves the changes and takes the necessary actions.

Table 8: Process Description

Identifier	UC -3 : Remove lead from auto dialer list
Purpose	If a lead is disinterested or is very interested, there is no need to keep him/her in the auto dialer list. If disinterested, then the lead does not wish to be called, and if very interested, there is no need to autodial that number at random times.
Requirements	Valid change in status of a lead after a phone call.
Development Risks	None
Pre-conditions	Change in lead status which requires removal of lead from the auto dialer list
Post-conditions	The lead is never autodialed again by the system.

Table 9: Typical Course of Action

Seq#	Actor's Action	System's Response
1	Sales Agent selects a status that requires removal of lead from the auto dialer list, for the lead/customer from a dropdown list.	The system removes the lead from all the autodialing lists the lead is a part of.

Table 10: Process Description

Identifier	UC -4 : Request Manager conference
Purpose	In the ongoing call with a customer, if the lead needs manager's help or the customer wishes to talk to the manager, the lead request the manager for the conference

Requirements	There is an ongoing call
Development Risks	None
Pre-conditions	User and the customer is connected on the call and User Agent requests manager conference
Post-conditions	If manager is available, he will accept the conference request otherwise he rejects it.

Table 11: Typical Course of Action

Seq#	Actor's Action	System's Response
1	[User Agent] Clicks on the 'request manager conference' button on the screen lead's page in between the ongoing call	Conference request is sent via Twilio API
2	[Manager] notified of the request by the agent	A window displaying Agent's name and requesting conference pops up on the manager screen.
3	[Manager] Accepts the conference request	Connects the manager to the user agent ongoing call. Notifies the user agent of manager's acceptance.

Table 12: Alternate Course of Action

Seq#	Actor's Action	System's Response
1	[User Agent] Clicks on the 'request manager conference' button on the screen lead's page in between the ongoing call	Conference request is sent via Twilio API
2	[Manager] notified of the request by the agent	A window displaying Agent's name and requesting conference pops up on the manager screen.
3	[Manager] Rejects the conference request	Cancel conference request is notified to the user agent

Table 13: process description

Identifier	UC -5: Monitor Agents
Purpose	If manager needs to know what a particular agent assigned to him is doing on the call, he can directly monitor that agent's ongoing call.
Requirements	

	That agent that the manager wants to monitor is assigned to that manager
Development Risks	Twilio API might not have the functionality of listening to calls on mute.
Pre-conditions	The agent is in an ongoing call
Post-conditions	If the agent is in an ongoing call, the manager can listen to the call on mute else the manager cannot listen.

Table 14: Typical Course of Action

Seq#	Actor's Action	System's Response
1	[Manager] Clicks on 'view agent activities' button on his home page	Redirected to the page containing the lists of agent's under him and their current status (whether on call or not)
2	[Manager] If agent is on call , manager clicks on the link 'listen-in' next to that agent details	Twilio API brings up the softphone screen indicating that manager can listen-in on mute.
3	[Manager] Listens-in on the call on mute	

Table 15: Process Description

Identifier	UC -6 : Receive Calls
Purpose	For agents to receive calls by the customer/lead on the 1-800 number
Requirements	Assigning of calls received via the 1-800number to agents by the system. Ability to determine if the required agent is busy or not.
Development Risks	Ability of Twilio API to allocate calls received on a 1-800 number is still unknown.
Pre-conditions	Calls received from the leads/customers via the 1-800 number is properly allocated to the right agent.
Post-conditions	The call goes through to the desired agent or goes to voicemail.

Table 16: Typical Course of Action

Seq#	Actor's Action	System's Response
1	Lead/Customer will call using the 1-800 number	The system will assign the call to the appropriate agent

2	The agent will pick up the call	Logs the call and begins recording.

Table 17: Alternate Course of Action

Seq#	Actor's Action	System's Response
1	Lead/Customer will call using the 1-800 number	The system will assign the call to the appropriate agent
2	The agent is unavailable	The call is directed to voice mail.

Table 18: Process description

Identifier	UC -7: Record calls and call details
Purpose	All the outgoing and incoming calls in the system are recorded and the details of the calls are stored in the logs to be viewed by the sales manager or the super admin
Requirements	Calls are made by the particular agent
Development Risks	Twilio API stored the information of the calls in a different way. Processing that information might be difficult
Pre-conditions	User agent makes a call or gets an incoming call
Post-conditions	call details and call records are stored in the database

Table 19: Typical Course of Action

Seq#	Actor's Action	System's Response
1	[User Agent] Calls a customer via click to call/ auto dialer or gets an incoming call from a customer	softphone screen pops up with the callee and caller number
2	[Customer] picks up the call or disconnects the call	Twilio API records the calls and records the call details like duration, start time, end time, callee and caller number, mode of call (outgoing/incoming) and whether the call was picked or disconnected

Table 20: Process description

Identifier	UC -8:View Call Logs and listen to call recordings
Purpose	sales manager can view past call logs or listen to call recordings

Requirements	Twilio API supports call recordings and call logging
Development Risks	Twilio API stored the information of the calls in a different way. Processing that information might be difficult. Also, we are not sure if Twilio API supports recording calls.
Pre-conditions	Calls are logged and recorded
Post-conditions	when manager clicks on view call logs and listen to recording link, they should be able to view logs and listen to recordings

Table 21: Typical Course of Action

Seq#	Actor's Action	System's Response
1	[Manager] clicks on 'View Agent Activities' link on their home page.	Redirected to the page containing the lists of agent's under him and their current status (whether on call or not)
2	[Manager] Clicks on view call logs link next to an agent name.	Twilio API gets the record of all the calls, duration, start time, end time etc. listed day wise.
3	[Manager] clicks on listen to recording link next to a call log	Twilio API grabs the recording from the database and downloads it on the manager's workstation

2.1.4 Modes of Operation

The CSC Volunteer Tracking System, as we envision implementing it, will operate in only one mode, so nothing further need be said of modes of operation.

2.2 System Analysis Rationale

The voice communication system will contain the following 3 types of users:

1. User Agents: User agents will use the system to make/receive calls to the leads or other snApp customers. User agents can also request managers for conferencing.
2. Sales Managers: sales managers will use the system to monitor ongoing calls on mute, view call logs, listen to call recordings and conference in the ongoing call.
3. Super Admin: super admin will use the system to add/edit or create new user agents in the system. Number provisioning for each agent will also be done by super admin.

Since we have to use Twilio API framework for processing all call related things the high risk item in the VCS will be whether Twilio will get integrated with the existing SnApp CRM and whether Twilio will provide all the features to be implemented.

3. Technology-Independent Model

3.1 Design Overview

3.1.1 System Structure

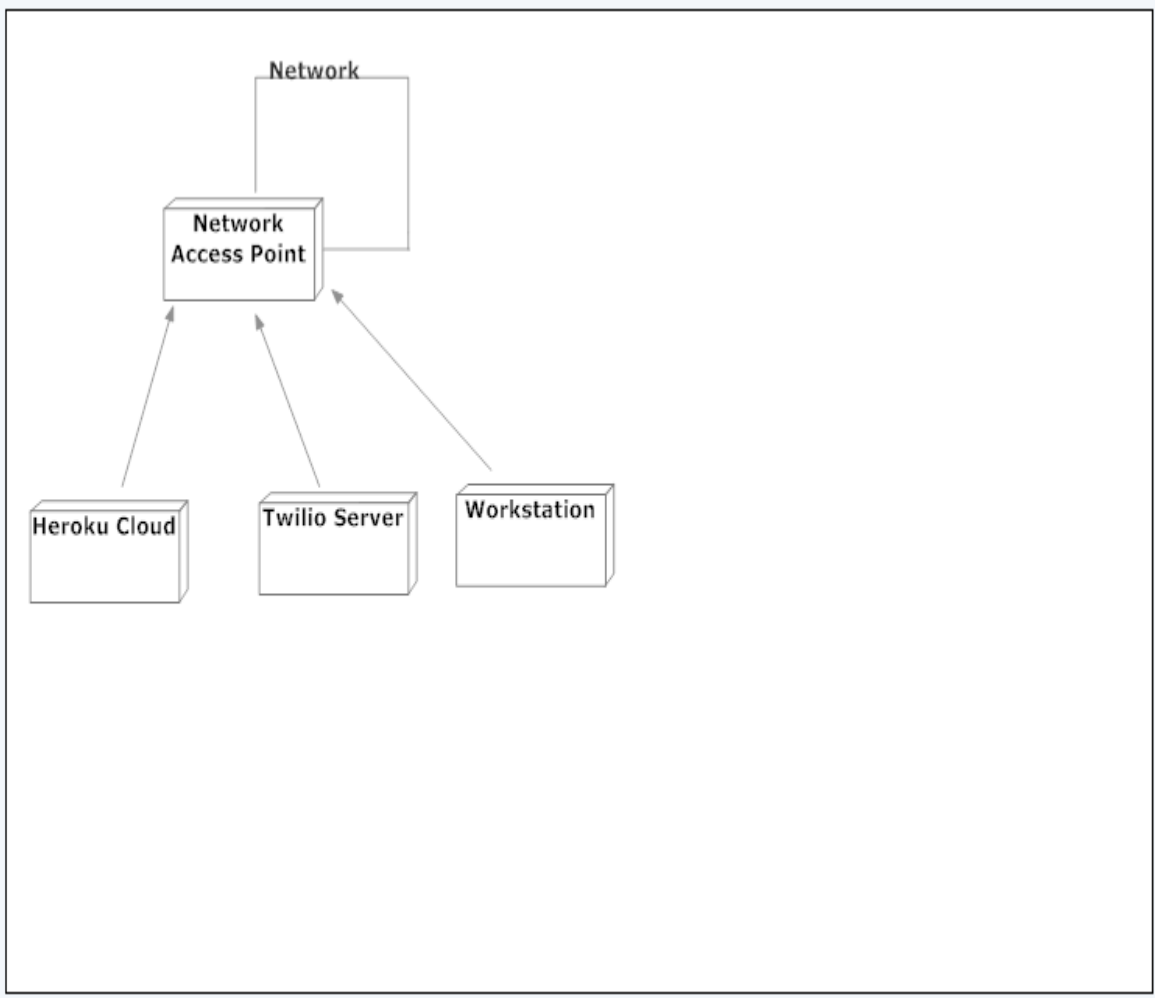


Figure 4: Hardware Component Class Diagram

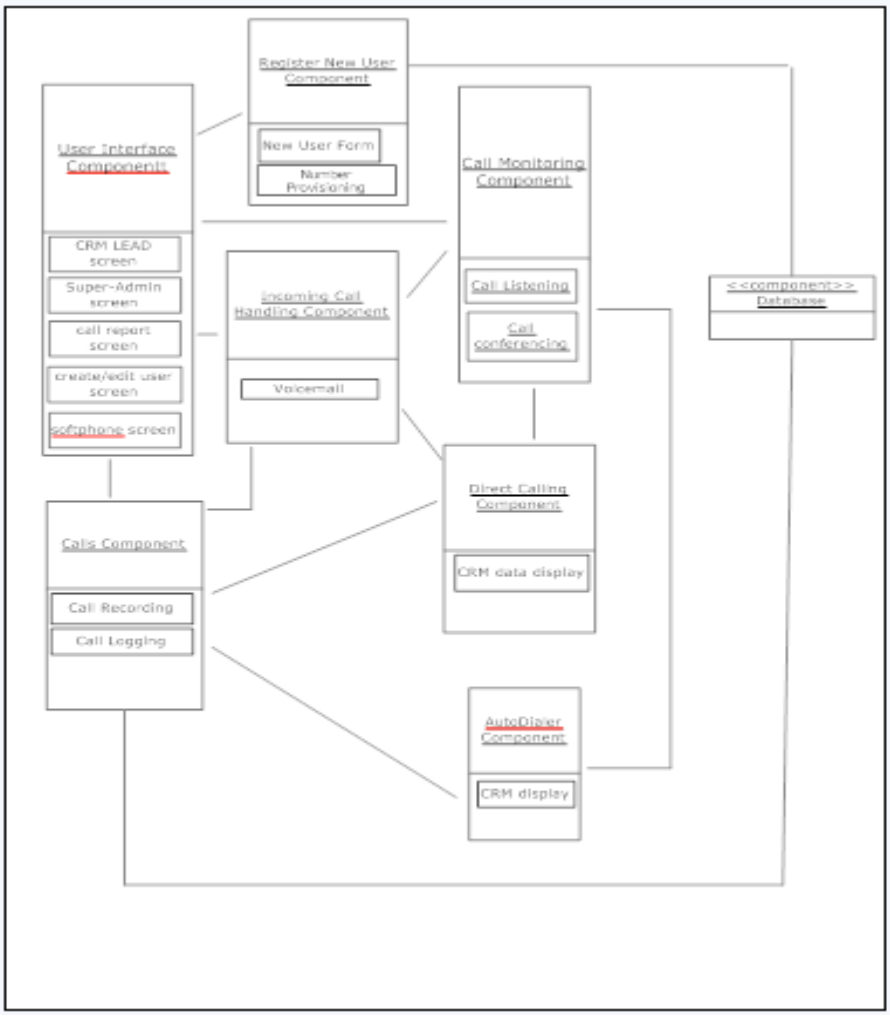


Figure 5: Software Component Class Diagram

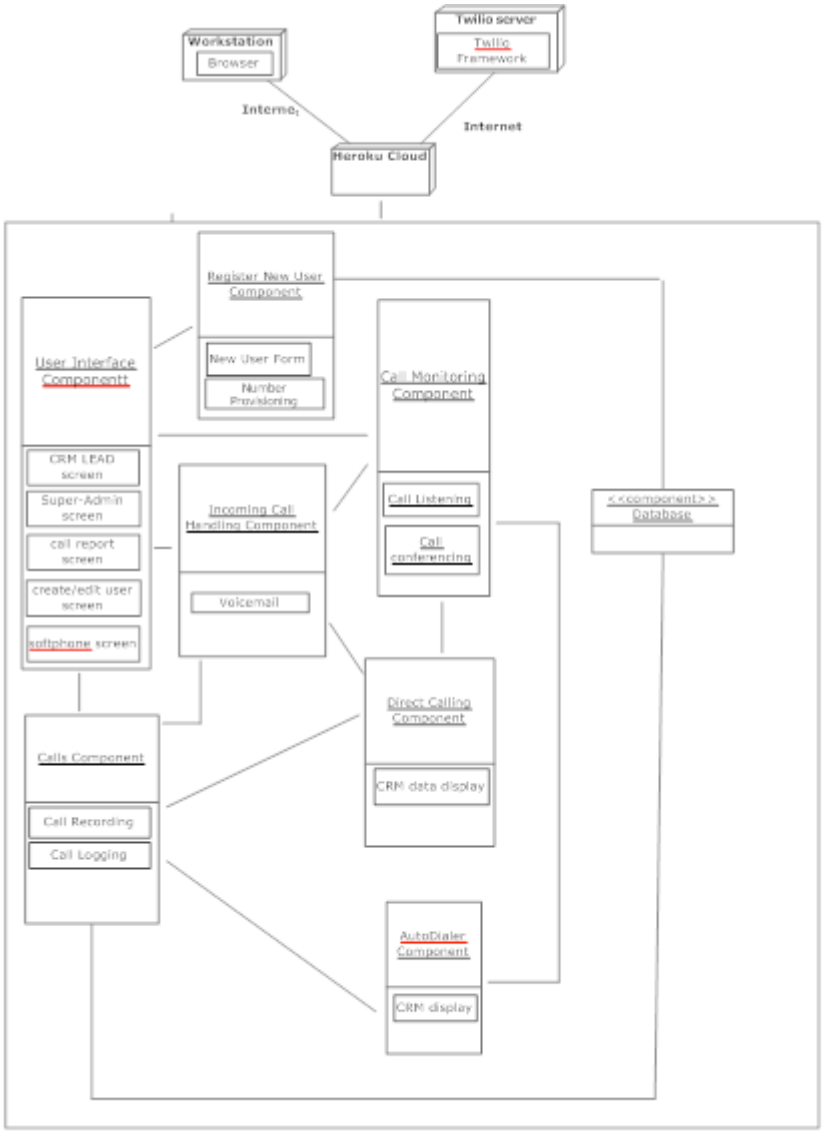


Figure 6: Deployment Diagram

Table 22: Hardware Component Description

Hardware Component	Description
Workstation	Workstations are the computers that the sales agent, sales manager and the super admin use to access the system. The workstation needs to be connected to a network access point (e.g. a router) to have access to the internet.
Network Access Point	It is the router or some other device used to provide access to the internet.
Twilio Servers	All the calls are routed through Twilio's server. Call recording and storage is also handled by this component.
Heroku Cloud	The application will be deployed on the Heroku cloud.

Table 23: Software Component Description

Software Component	Description
User Interface Component	This component contains Voice Communication System web pages for use by all User Agents, Managers and super admins. Its primary component is the softphone screen which will be used to make all calls.
Register new user Component	This component will be used by the super admin to add new users into the system and provisions numbers to the new users.
Calls Component	This component will be involved in functions like call recording and call logging for outgoing calls made through click to call button, autodial and incoming calls. This component will store the recordings and call logs in the DBMS
Incoming call handling component	This component will be involved in handling incoming calls in the voice communication system. It will contain a voicemail message if in case no agent is available to pick the incoming calls
Call Monitoring Component	This component will perform the function of listening in on calls and call conferencing. It will be used by the manager to listen in to ongoing calls by agents or help the manager to accept/reject call conference requests made by managers.
Direct Call component	This component will be used by the user agent to make direct calls to a particular lead by clicking on a click to call button.
Autodial component	This component will be used by the user agent to autodial all the leads in the autodial list. Once a lead picks up the call, this component will fetch the CRM display screen of that particular lead.
DBMS component	This is the Database Management System (DBMS) that stores all data used by the VCS

3.1.2 Design Classes

3.1.2.1

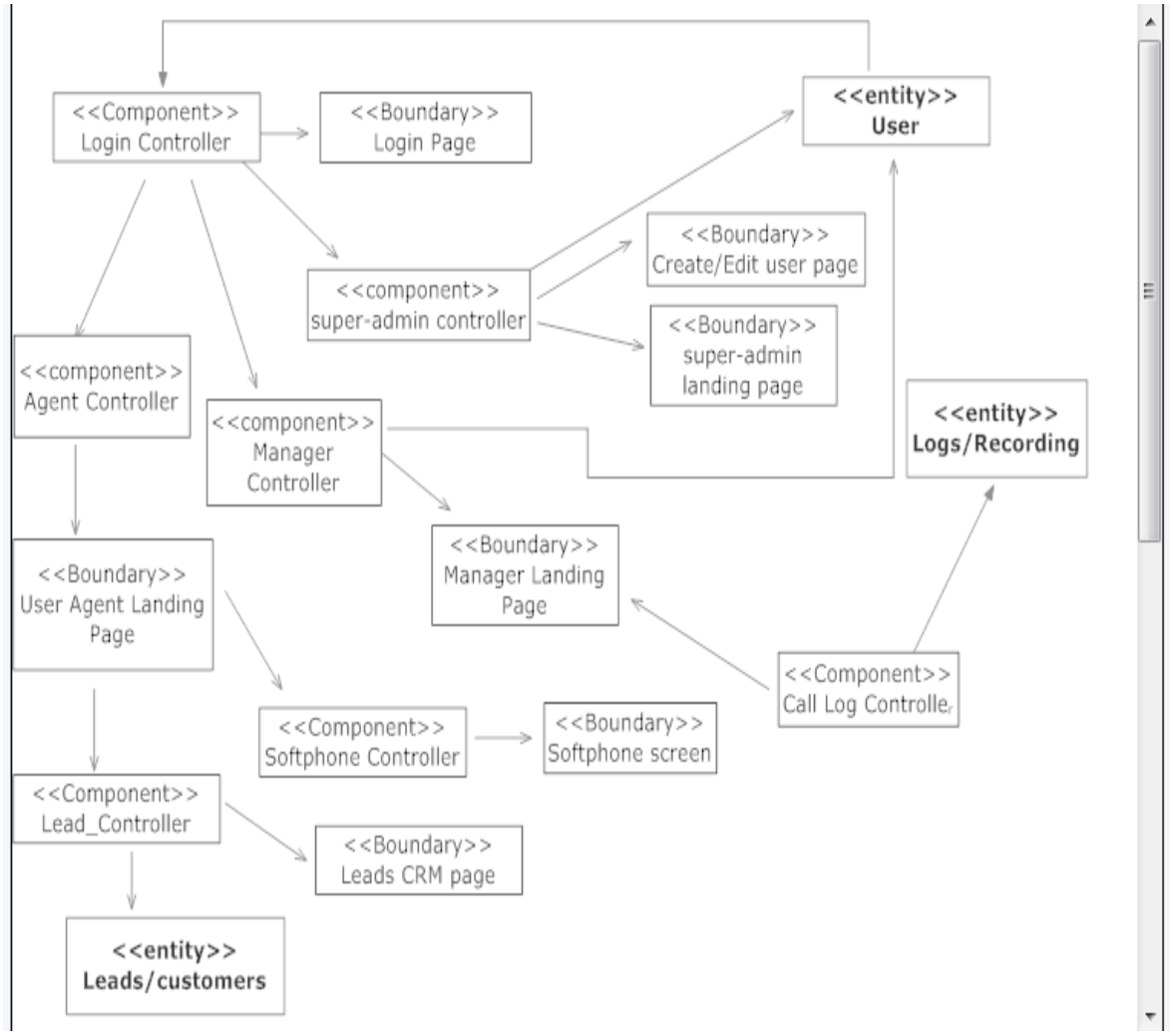


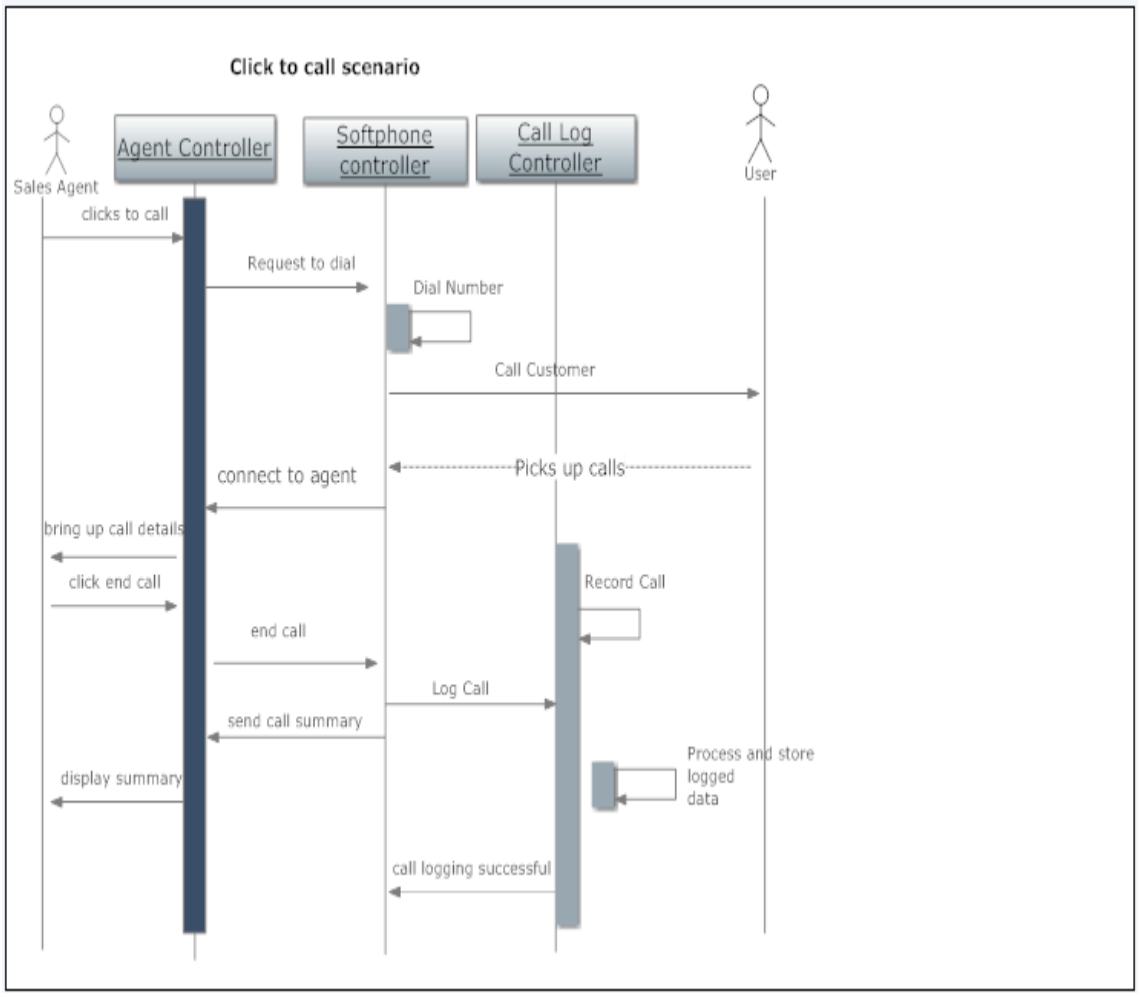
Figure 7: Design Class Diagram

Table 24: Design Class Description

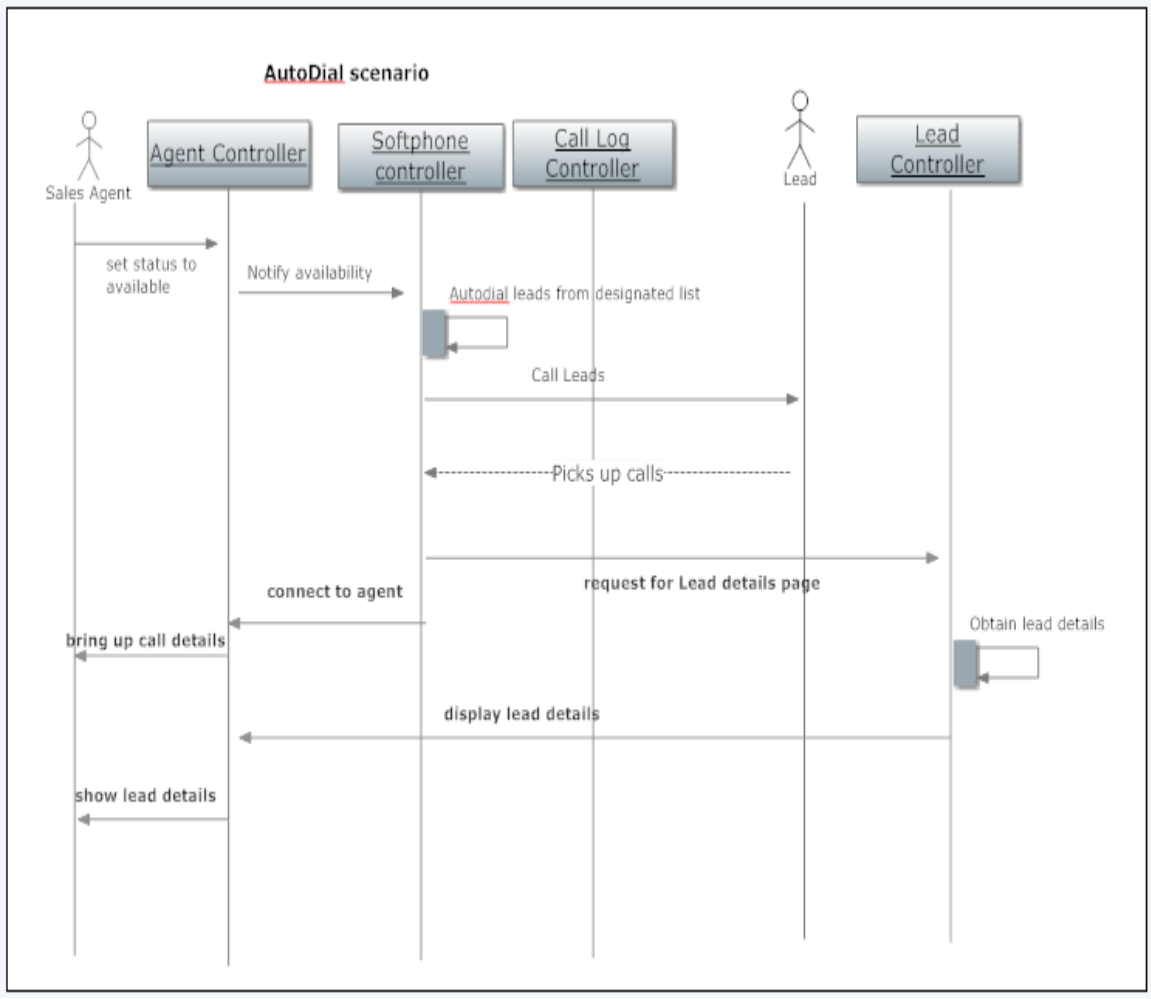
Class	Type	Description
Login Page	Boundary	The sales agents, managers and super admin use this page to log into the system.
Login Controller	Control	The login controller receives user credentials from the login page and validates the user. If successfully validated it calls the Agent Controller, Manager Controller or SuperAdmin Controller depending on the type of user.
Agent Controller	Control	Agent controller is responsible for handling various tasks related to sales agents.
User Agent Page	Boundary	It is the sales agent landing page after successful login. The agent can access autodialing, click to call, view lead details from this page.
Manager Controller	Control	Manager controller is responsible for handling various tasks related to sales managers.
Manager Landing Page	Boundary	It is the sales manager landing page after successful login. The manager can access monitor agents, view logs and listen to recordings from this page.
SuperAdmin Controller	Control	SuperAdmin controller is responsible for handling various tasks related to super admin.
SuperAdmin Landing page	Boundary	It is the super admin landing page after successful login. The super admin can access create/add new user, provision number and monitor managers and agents from this page.
Create/Edit User page	Boundary	The super admin uses this page to create/edit agent details.
Lead Controller	Control	Lead Controller is responsible for handling various tasks related to lead and customers. It provides access to the CRM to bring up details of the desired leads and customers.
Leads CRM Page	Boundary	It displays the details of leads and customers and provides link to click to call.
Softphone Controller	Control	Softphone controller is responsible for accessing all the functions related to calls and conference.
Softphone Screen	Boundary	It provides a dial pad for dialing numbers and displays call and conference summary.
Call Log Controller	Controller	Call log controller is responsible for handling logging and recording functions of the system and retrieving them.
Users	Entity	It stores the user details and type (sales agent, sales manager, super admin)
Leads/Customers	Entity	It is basically the CRM that stores the details of leads and customers.
Logs/Recordings	Entity	It stores the call logs and call recordings. As for now this will be handled by Twilio.

3.1.3 Process Realization

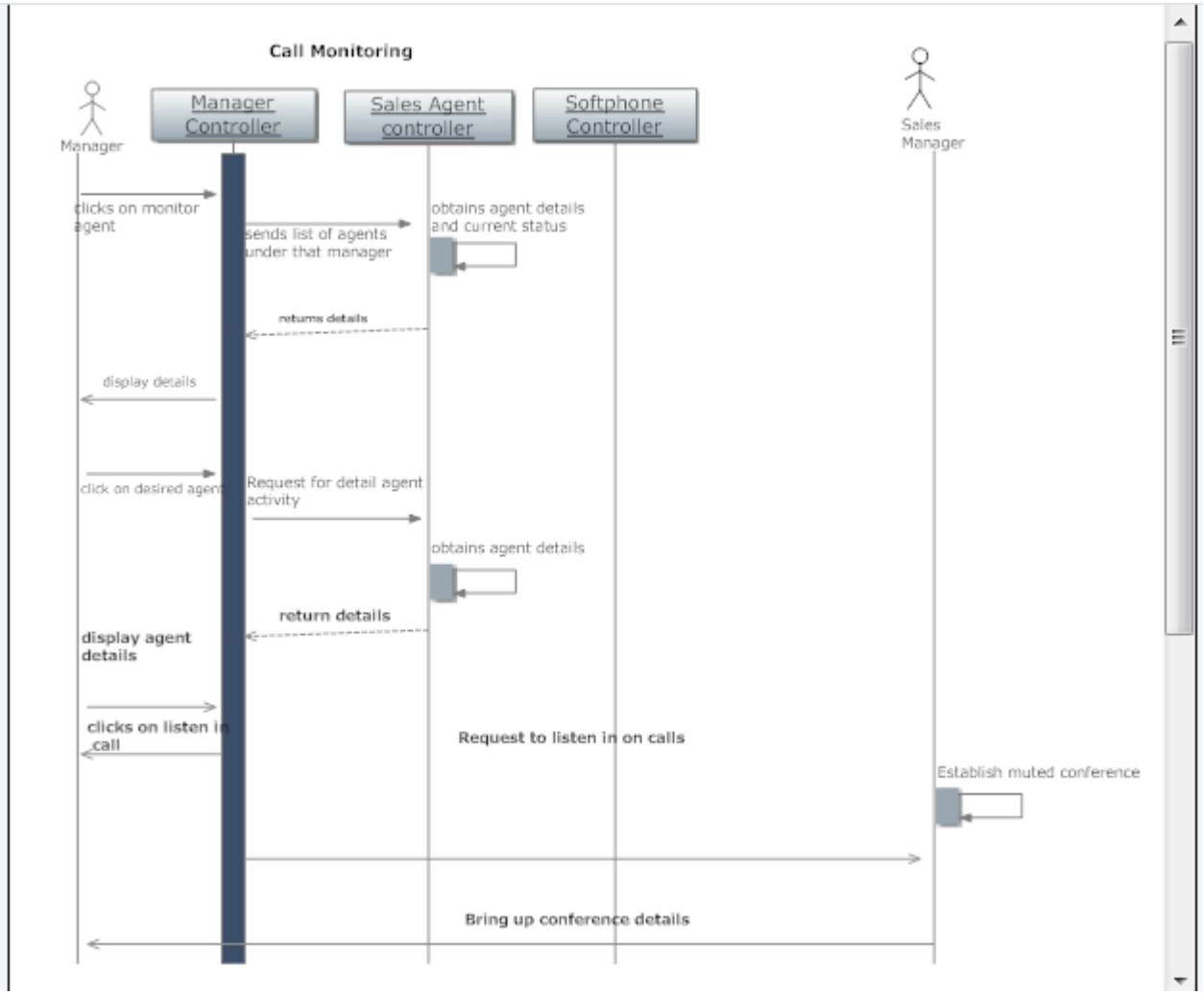
Scenario 1: click to call



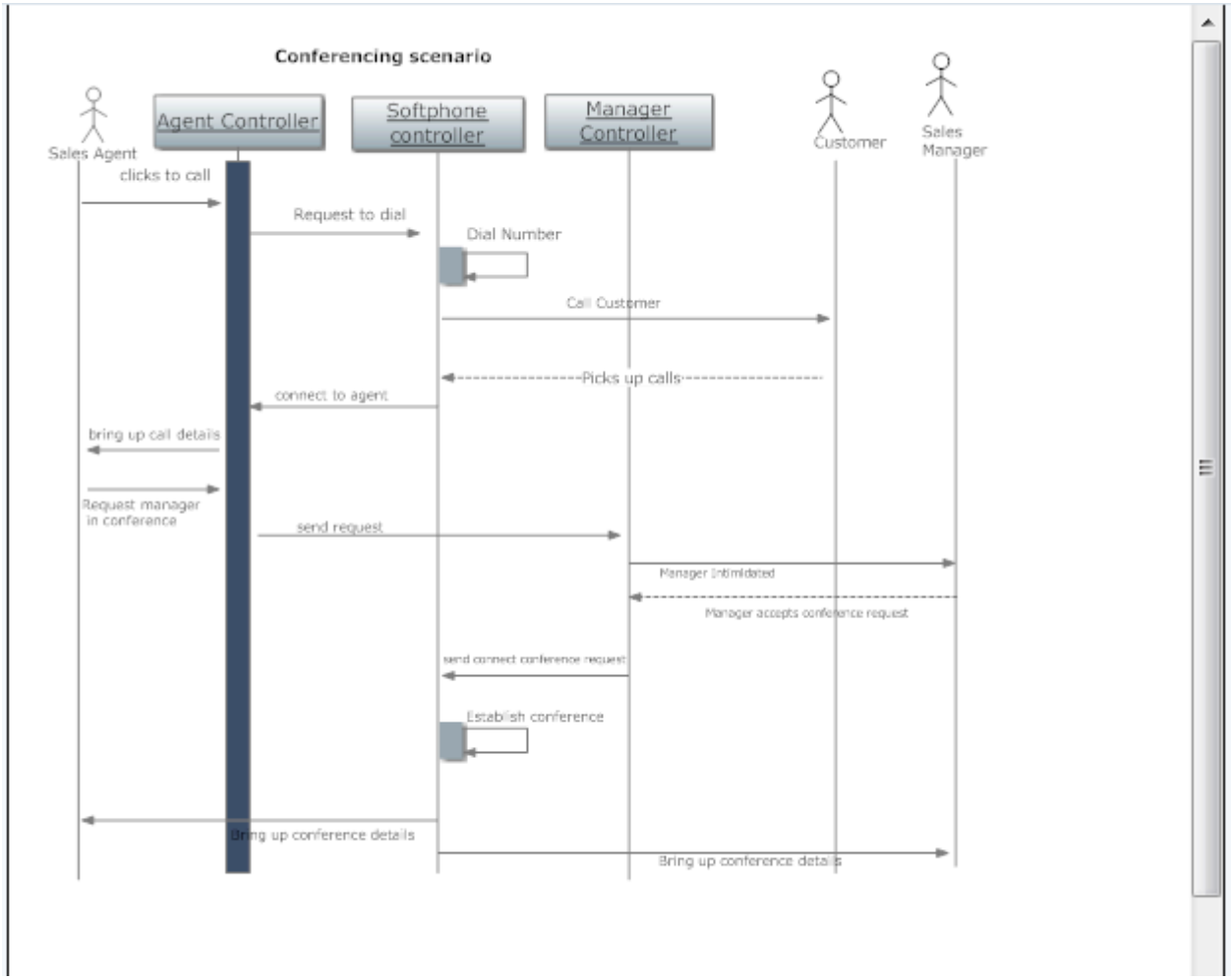
Scenario 2: Autodial



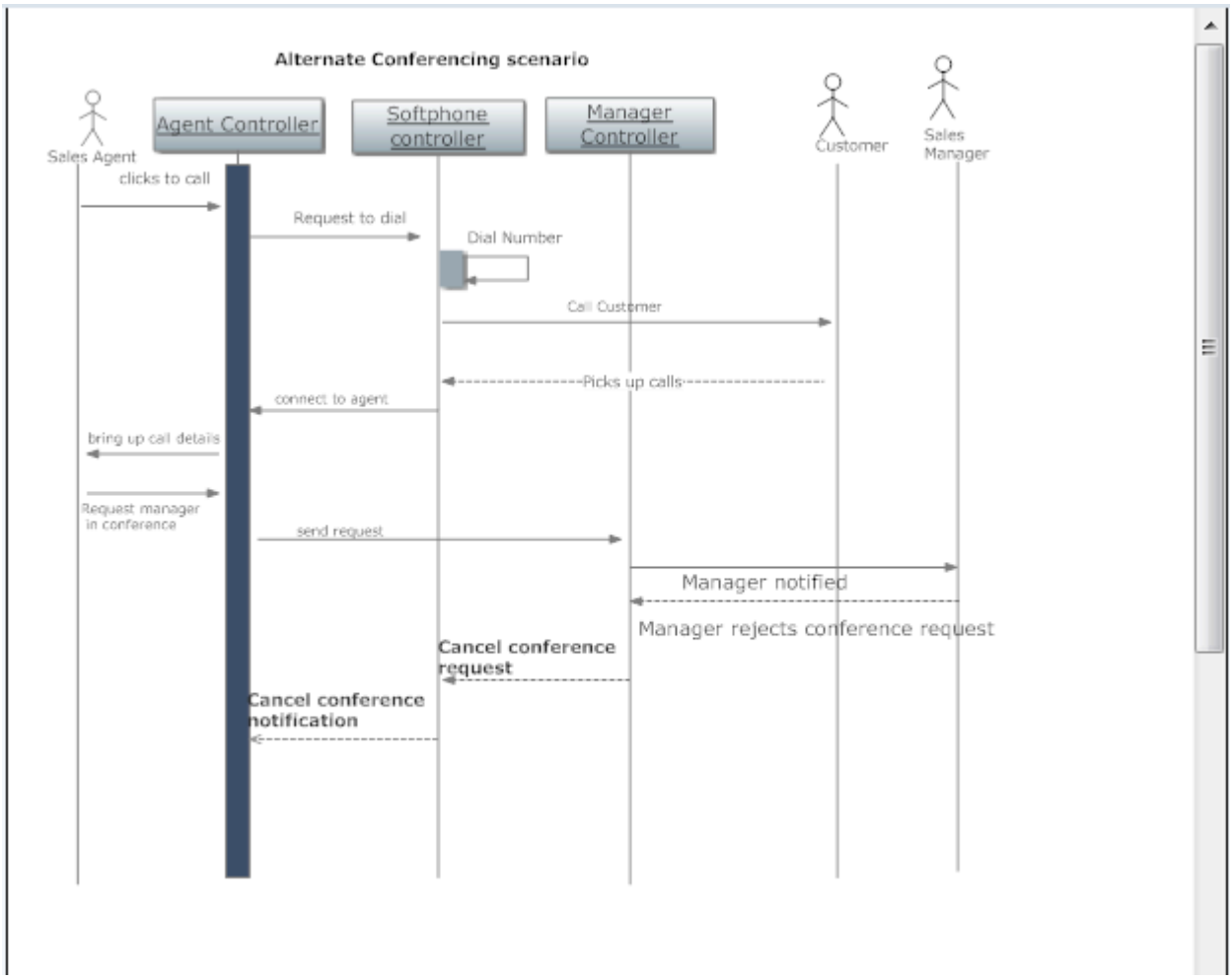
Scenario 3: Call Monitoring



Scenario 4: Call Conferencing



Scenario 4.1: Alternate call conferencing scenario



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3.2 Design Rationale

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3. Super Admin : super admin will use the system to add/edit or create new user agents in the system. Number provisioning for each agent will also be done by super admin.

Since we have to use Twilio API framework for processing all call related things the high risk item in the VCS will be whether Twilio will get integrated with the existing SnApp CRM and whether Twilio will provide all the features to be implemented.

4. Technology-Specific System Design

4.1 Design Overview

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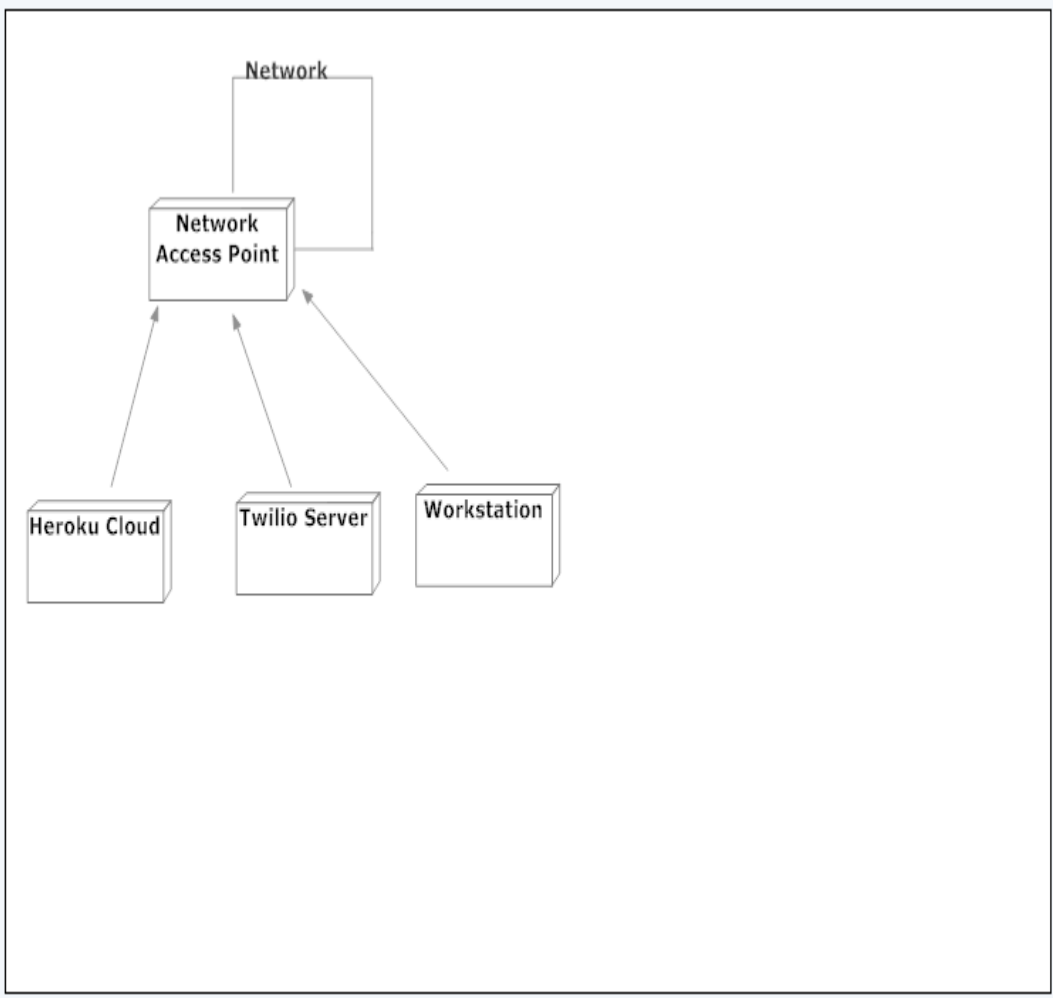
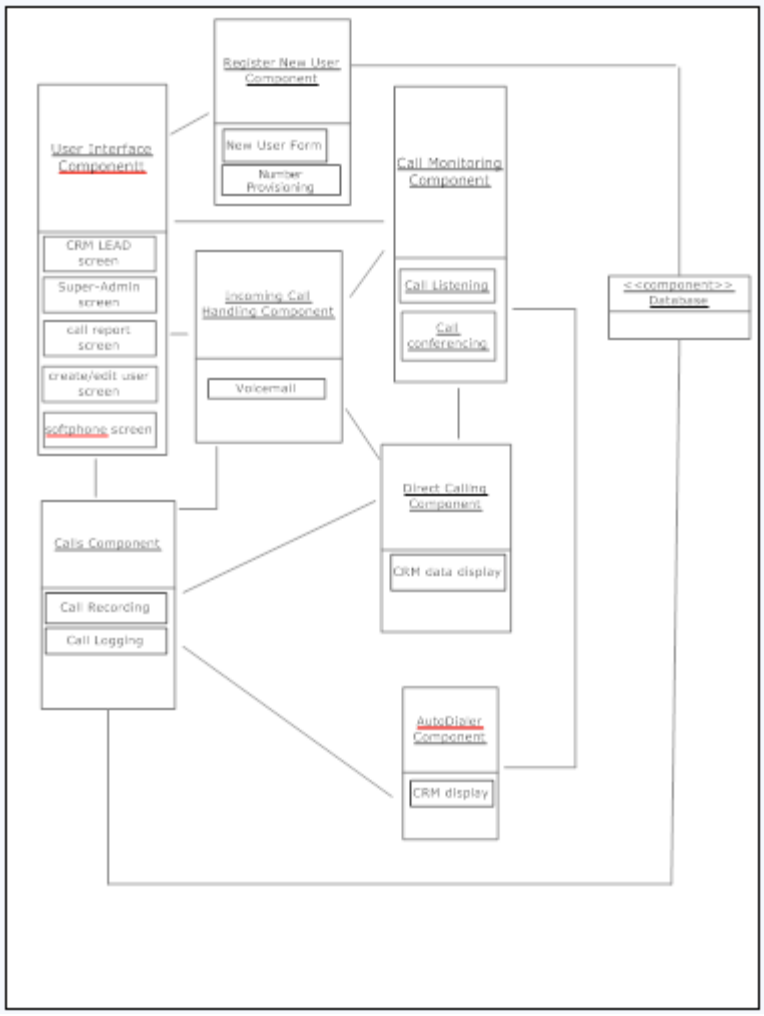


Figure 9: Hardware Component Class Diagram



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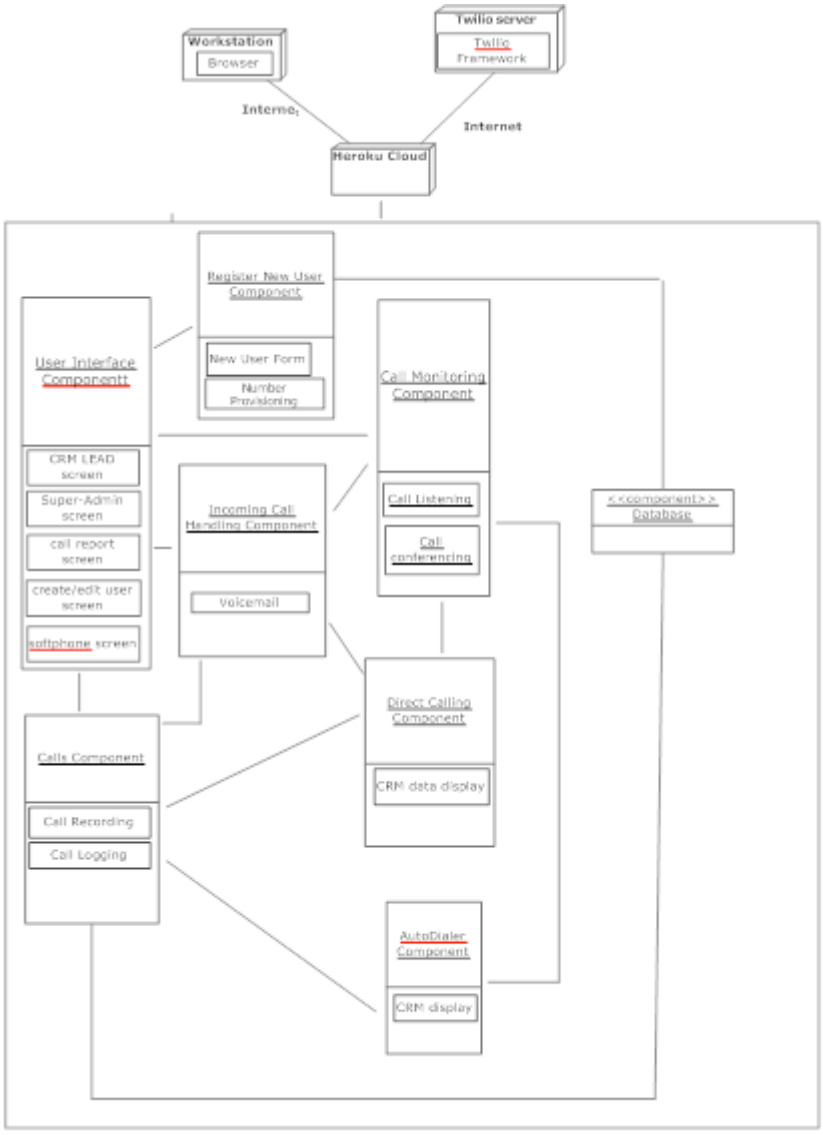

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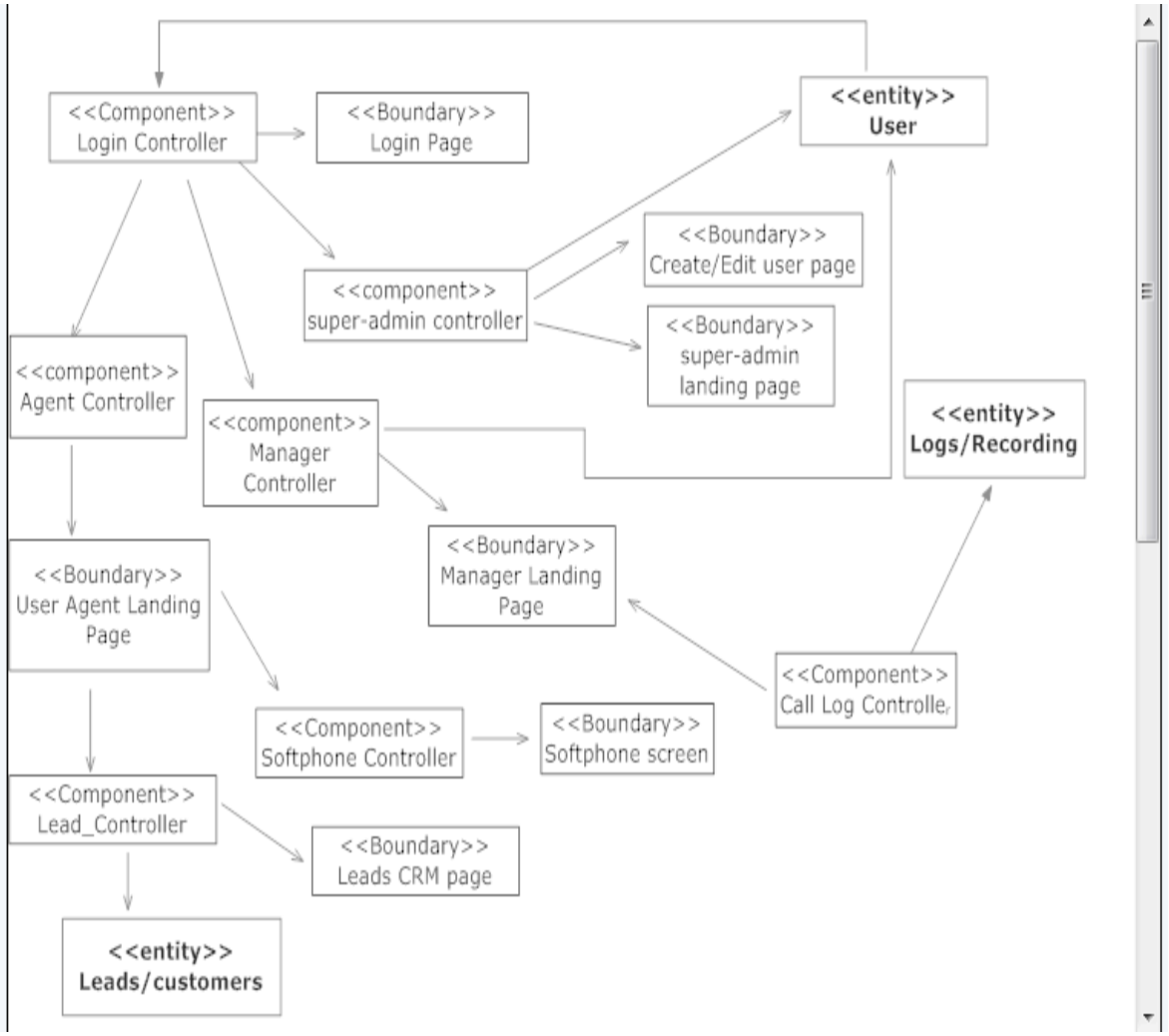
4.1.2 Design Classes

4.1.2.1



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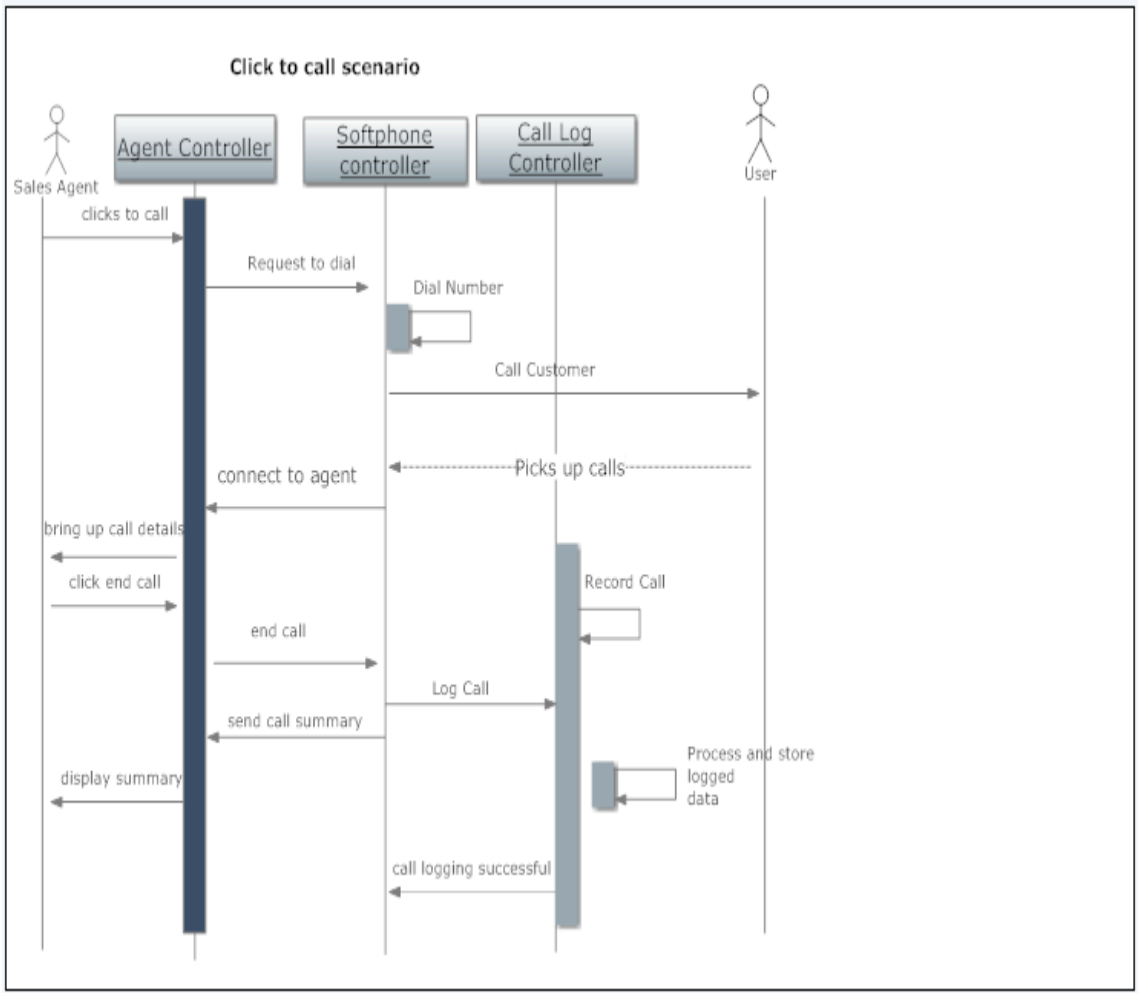
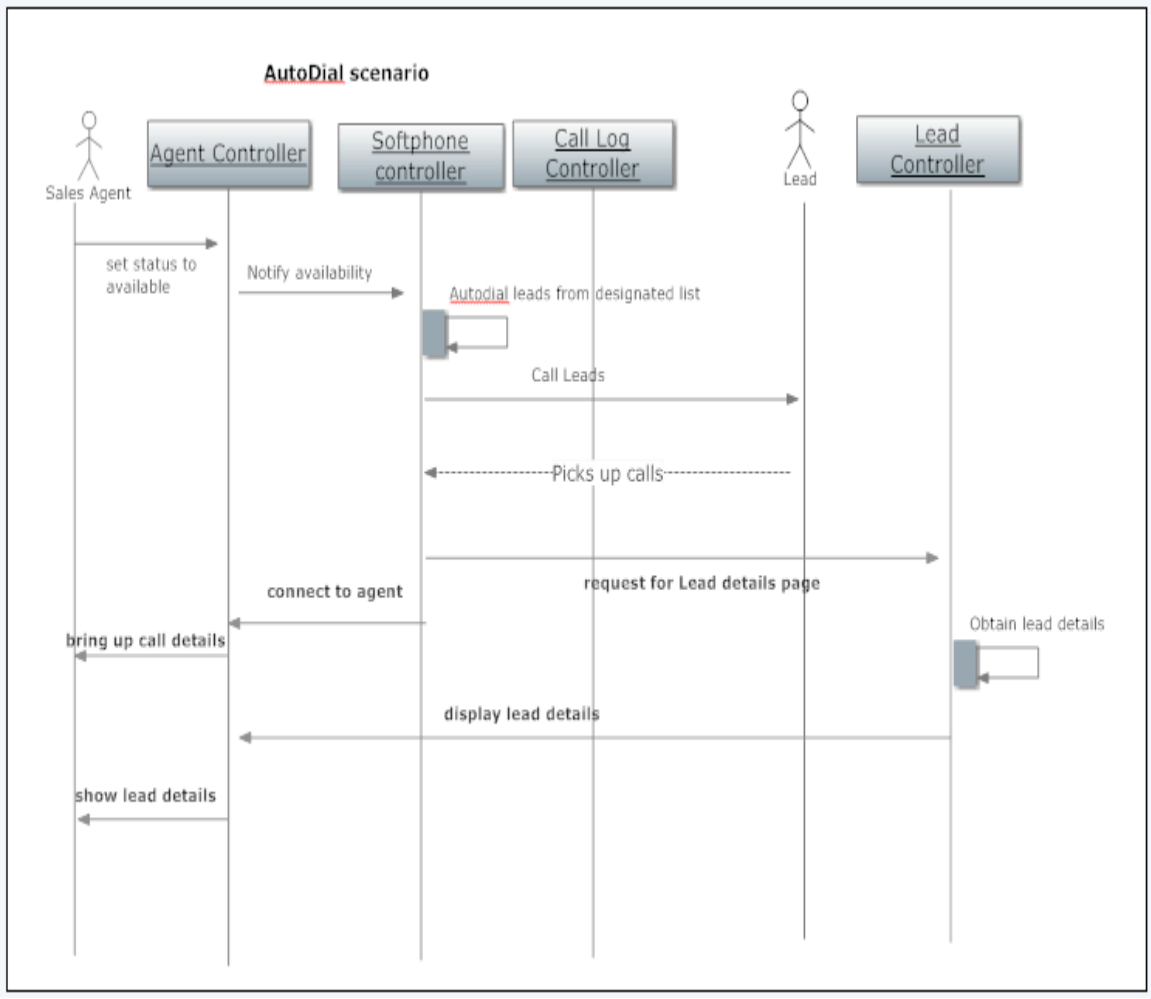
4.1.3 Process Realization

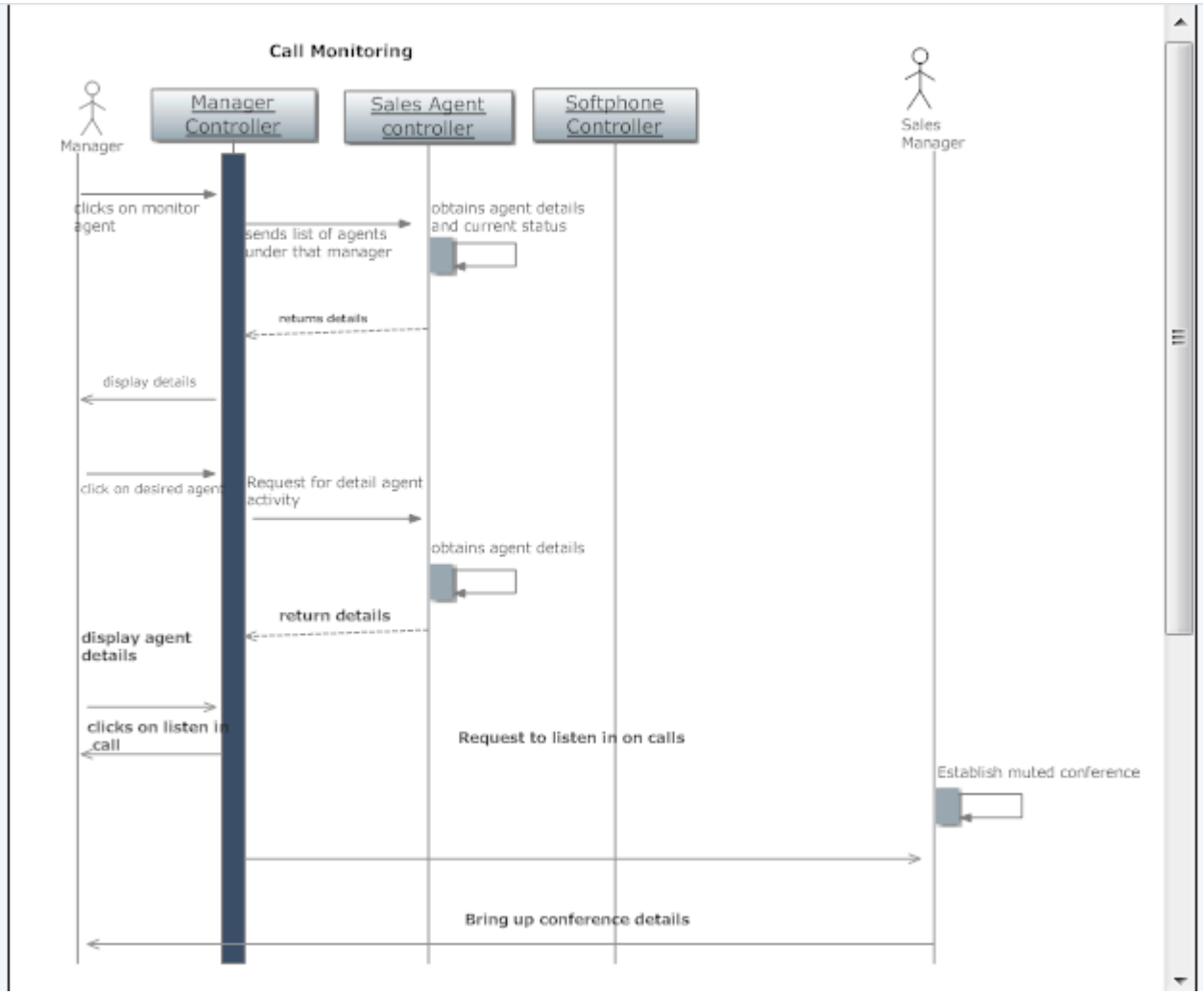
Scenario 1: click to call



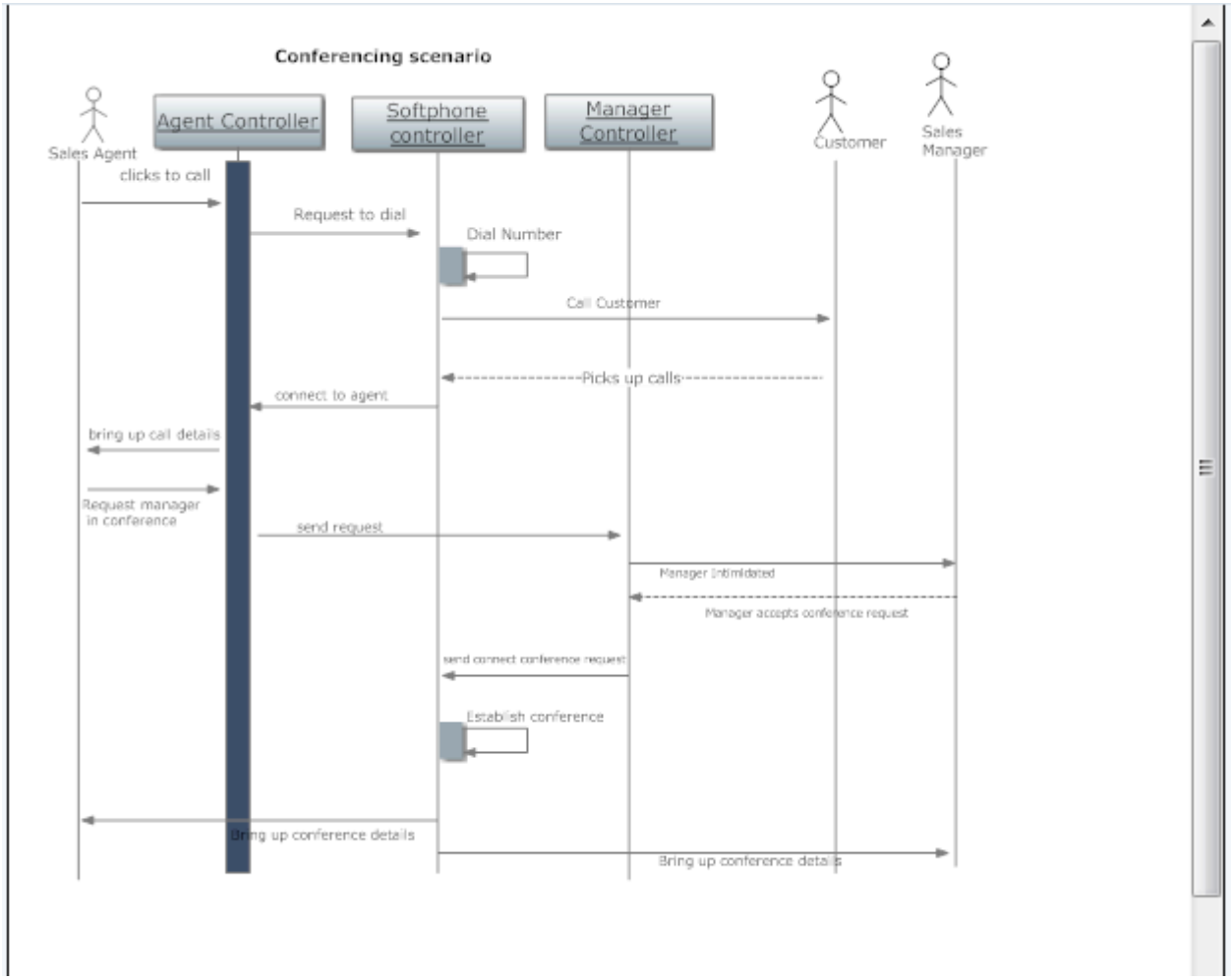
Scenario 2: Autodial scenario



Scenario 3: Call Monitoring



Scenario 4: Call Conferencing



Scenario 4.1: Alternate call conferencing scenario

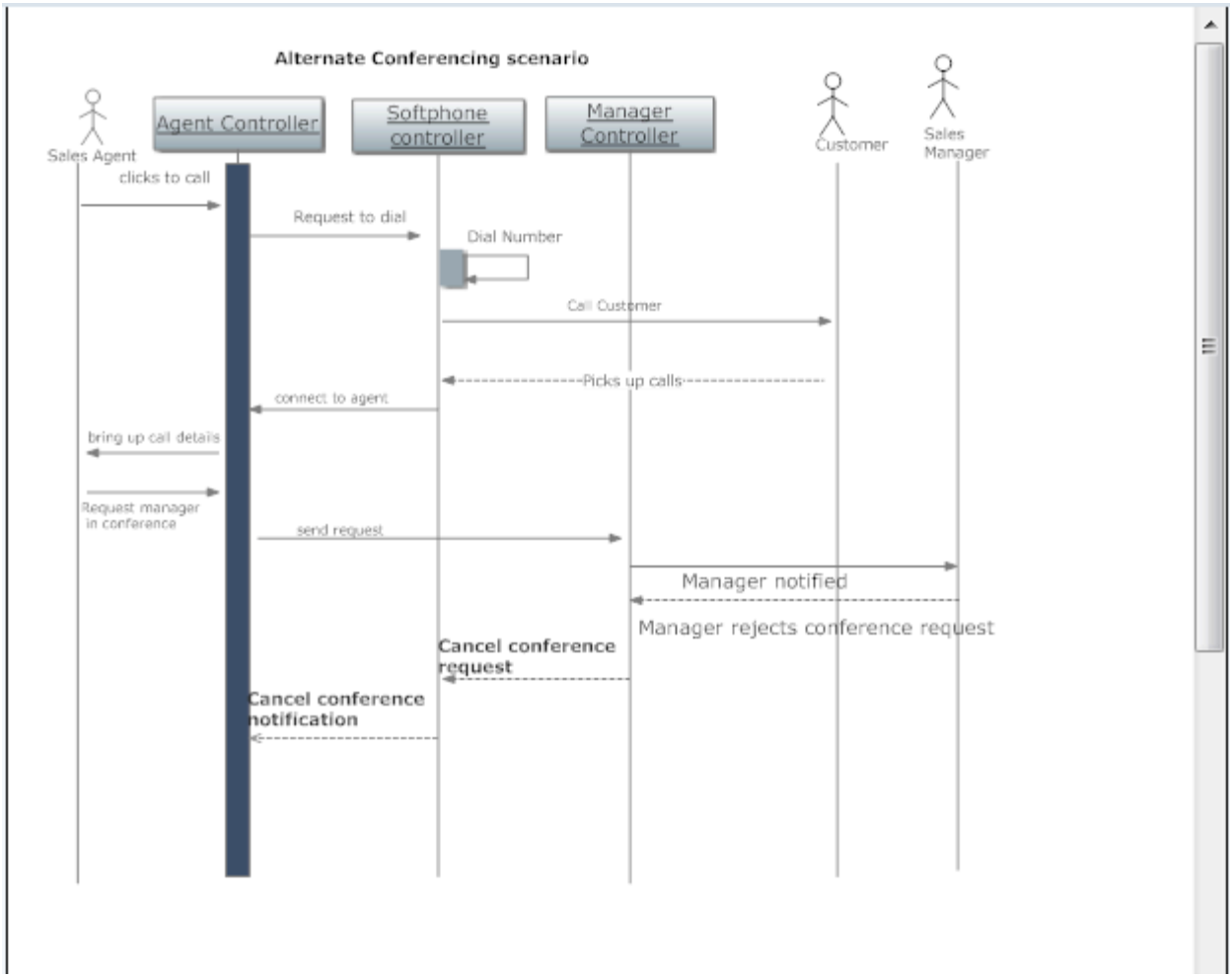


Figure 13: Process Realization Diagram

4.2 Design Rationale

We adopted a Model-View-Controller (MVC) architecture because our client mandated the use of Ruby on Rails, which is a MVC framework. This architecture helps us to separate the user interface, business logic and the database access and management. We are using PostgreSQL as our DBMS. Components of the (MVC) architecture are given as follows:-

Views:-
User Interfaces (pages and screens)

Controllers:-

Login component
Agent component
Manager component
SuperAdmin component
Lead component
Softphone component
CallLog component

Model:-
Access to DBMS

The functionality is broken down into controllers in such way that each component performs specific functions that do not overlap with the functions assigned to any other component. For example, the Agent component does not perform any functions that deal with SuperAdmin's functionality since those belong to the SuperAdmin component.

5. Architectural Styles, Patterns and Frameworks

Table 28: Architectural Styles, Patterns, and Frameworks

Name	Description	Benefits, Costs, and Limitations
MVC architecture	MVC architecture provides clear separation between the user interface, business logic and data storage and management.	Benefits: The separation the three components, allows the re-use of the business logic across applications. Also, Multiple User Interfaces can be developed without concerning the code base. Developer specialization and focus: - The developers of UI can focus exclusively on the UI screens without bogged down with business logic. - The developer of Model / business can focus exclusively on the business logic implementations, modifications, updating without concerning the look and feel and it has nothing to with business logic. Limitations: The MVC pattern introduces new levels of indirection and thereof increases the complexity of the solution. -It also increases the event-driven nature of the user-interface code, which can become more difficult to debug.
Ruby on rails	Ruby on Rails, or simply Rails, is an open source web application framework written in Ruby. Rails is a full-stack framework that emphasizes the use of well-known software engineering patterns and paradigms, including convention over configuration (CoC),don't repeat yourself (DRY), the active record pattern, and model–view–	.Benefits : Ruby on rails can cut significant chunks of code from projects. It also makes debugging the code very easy (because it is an MVC architecture). Cost: Ruby on rails is 100% free and runs on Linux which is also

	controller (MVC).	open source. Limitations: Since many people in our team are new to ruby on rails, learning it in a very short span of time can be difficult.