Con-Do-It: An Application for Plumbing Work Aggregation

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Part I

Plan

Chapter 1

Introduction

This report documents the knowledge developed during and as a result of the project conducted at IIITB as a collaboration between IIITB and APPL during August 2022 through November 2022. The primary objective of the project is to identify and elicit the requirements for the project through appropriate documentation and prototyping.

Chapter 2

Plan

2.1 Project Deliverables

The project deliverables are as follows:

1. A list of requirement features, their elaboration as use cases, scenarios and other appropriate forms as appropriate
2. Analysis of requirements in terms of their relative importance/priority, interaction and dependence
3. Analysis of non-functional requirements
4. Working prototype implemented and piloted in consultation with APPL.

2.2 Key Features

1. Location and rating based plumber allocation algorithm
2. Call Tracking and Status update
3. Rating mechanism for Plumber and the customer and other algorithms that are required for the solution
4. Pricing, Invoicing process and payment option
5. Plumber reimbursements
6. Knowledge bank (Link to technical contents)
7. Gamification to keep users engaged on the platform
8. Omni Channel capability for Consumer to raise a support request. etc

2.3 Plan

PI will devote approximately half a day (3 hours) of work every week on the project. This will include an hour of discussion with the project students. Two students of 3rd Year iMTech will devote approximately one day per person of work to the project. This will involve software development, team interaction, documentation, research and any other project related activities as necessary.

The team will meet at least once every week for update and weekly planning and technical discussion. APPL personnel will join these meetings every alternate week for brainstorming and feedback.

2.3.1 Timeline

An iterative prototype driven approach will be followed to execute the project. The deliverables and their expected timelines are as follows:

Deliverable	Date
Initialisation	
Requirement features List	August 29, 2022
Iteration 1	
Requirement analysis (v1)	September 05, 2022
Prototype design (storyboard)	September 12, 2022
Prototype implementation (v1)	September 26, 2022
Pilot (v1)	October 03, 2022
Iteration 2	
Feedback and requirement analysis	October 10, 2022
Prototype design and implementation	October 24, 2022
Iteration 3	
Feedback and requirement analysis	October 31, 2022
Prototype design and implementation	November 7, 2022
Ramp down	
Requirement Analysis Document	November 14, 2022
Architectural Design Document	November 21, 2022
Buffer	

Part II

Requirement Analysis

Chapter 3

Requirements

3.1 Main Features

The main features of the Con-Do-It application as follows:

3.2 Stakeholders

1. APPL
2. Plumbers
3. Customers
4. Service manager/officer
5. Suppliers

3.2.1 Plumber

A plumber deals with installation and repair requests originating from customers or otherwise. A plumber would be able to view all complaints assigned to him so far. The plumber can respond to active complaints assigned to him. He can order spares from the company warehouse. He can communicate with the customer and seek his approval to use any spares required for a repair job. He would be allowed to check out spares only if the customer has consented to pay for the spares/components.

3.2.2 Scenarios of Complaint Processing

1. Plumber sees a new complaint assigned to him.
2. Accepts
3. Customer gets notified about the plumber details.
4. System looks at the earliest available slots with the given plumber and shares with a list of suggested visit slots with the customer.
5. Customer selects a visit slot from among the provided slots. In case the customer doesn't find any of the suggested slots suitable, the system has to suggest more slots. For example, if the job is deemed urgent by the customer then later slots may not work for him. In such cases, other plumbers should be considered. On the other hand, if the customer is keen to be serviced by a particular plumber, and for that, he doesn't mind a later slot, such will be the suggestions made by the system.

At the time of raising a complaint, the customer may be asked to provide some helpful inputs, e.g.:

- Preferred times
- Plumber preference
- Urgency
- ...

The need to provide these details should be optional. It should be possible for the customer to go ahead with the complaint raising with/without providing any piece of information that the system solicits. The system algorithmically does the plumber and time allocation based on the information provided by the customer.

There are two types of services provided:

1. installation service
2. Repair and maintenance

Installation service involves components and procedures that are predictable. Hence, a quotation and payment can be done right up front at the time of raising the complaint. However, repair and maintenance work may incur unforeseeable costs. Hence, the final charges of a repair/maintenance work can be determined only after the completion of the task.

Repair and maintenance can be done for two types of customers: existing customers and outside customers. Pricing will be different for these two categories. Existing customers (who are availing service for equipments under warranty) will not be charged for visit.

For outside customers, visiting charges will be mandatory.

If the spare parts costs are deemed too high by the customer, and he wants not to go ahead with the service, the ticket will be closed as satisfactory.

No wallet option provided.

Charges will be decided based on various rules (e.g. location etc.) for any service/component. The service department will have an interface which will be used to define these rates.

3.3 Use Cases

1. Raising of plumbing complaint
2. Assignment of plumber to a complaint
3. Tracking of complaint
4. Closing of complaint
5. Feedback on service
6. Re-assignment of complaint

3.4 The Complaint

The states of a complaint object may be described in more detail through additional states.

- Initial
- Raised
- Assigned
- Accepted
- Under examination
- Quotation raised
- Under execution
- Task completed
- Payment completed
- Completed
- Abandoned
- Cancelled

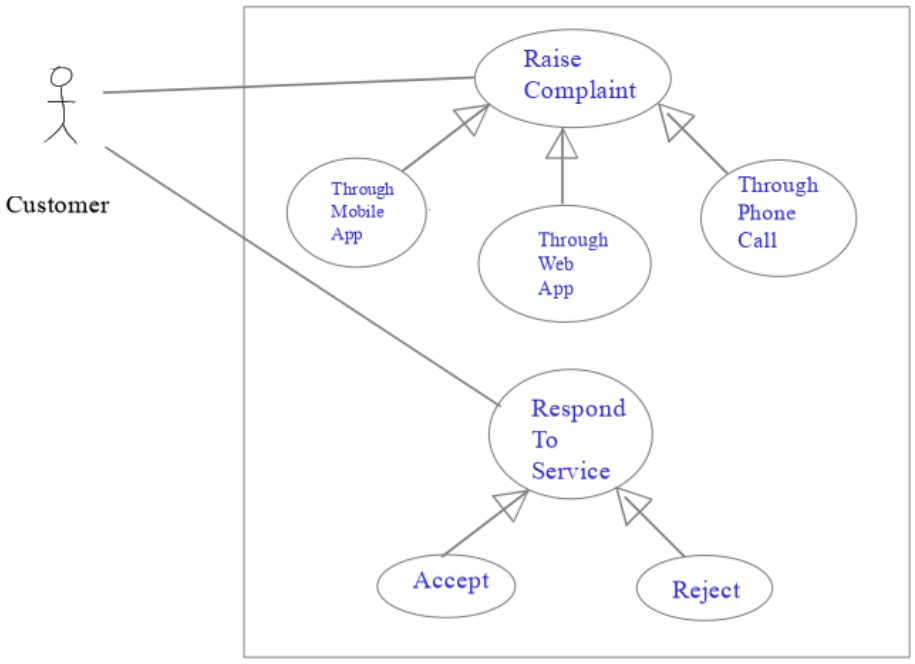


Figure 3.1: Use cases: Customer

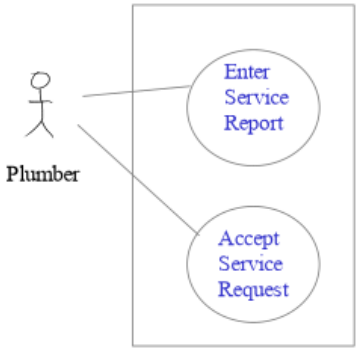


Figure 3.2: Use cases: Plumber

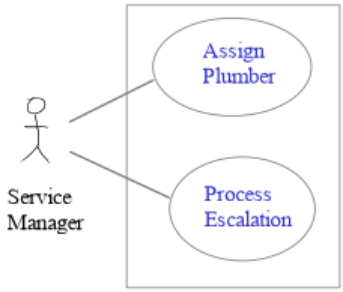


Figure 3.3: Use cases: Service manager

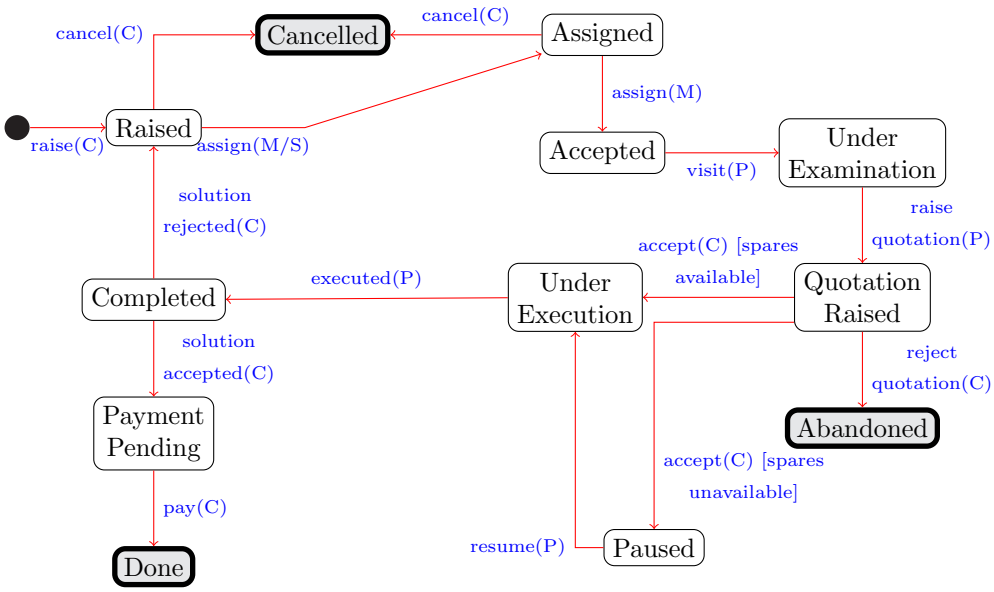


Figure 3.4: Complaint: State machine

3.5 Complaint Resolution

3.6 Component/Spare Part Procurement

The taxonomy of purchase mechanisms is presented pictorially in Figure 3.7. The ovals enclosed within dotted boxes are those for which the Con-do-it application must have additional features. Customer purchase is beyond the purview of the application.

- **Components available:** If a spare part/component required for a specific service is not available immediately, it would have to be procured. There are a number of ways in which a component may be procured.
- **Available in company warehouse/store:** In this condition, the plumber can order these from the company stores after taking approval from the customer. In such case, the corresponding cost will automatically get added to the invoice.
- **Outside purchase:** In this case, the spare part may have to be procured from some other source. Here, the customer may purchase it from outside and provide the same to the plumber. No changes need to be done to the invoice. The other option is that the plumber purchases it on his own, and raises a reimbursement request to the company. The company, after ensuring that necessary approval from the customer has been obtained, releases the money. Another alternative could be to purchase the part through the company. In this case, the company verifies that necessary approval from the customer has been obtained, and then orders the part on behalf of the plumber.

QUESTION (Sujit)
Suppose a plumber chooses to procure a spare from outside supplier through the company. I assume, this would happen through the purchase department (or something similar). Similarly, if the plumber procures a spare from outside and requests reimbursement, the finance department would have to reimburse the same. Hence, the both the above cases, the system would need to interface with some other internal system, viz. purchase requisition system in the former case and finance system in the latter.
Is my understanding correct?
ANSWER (Pankaj Jadhav)
There are two scenarios in Product or Spare requirement:

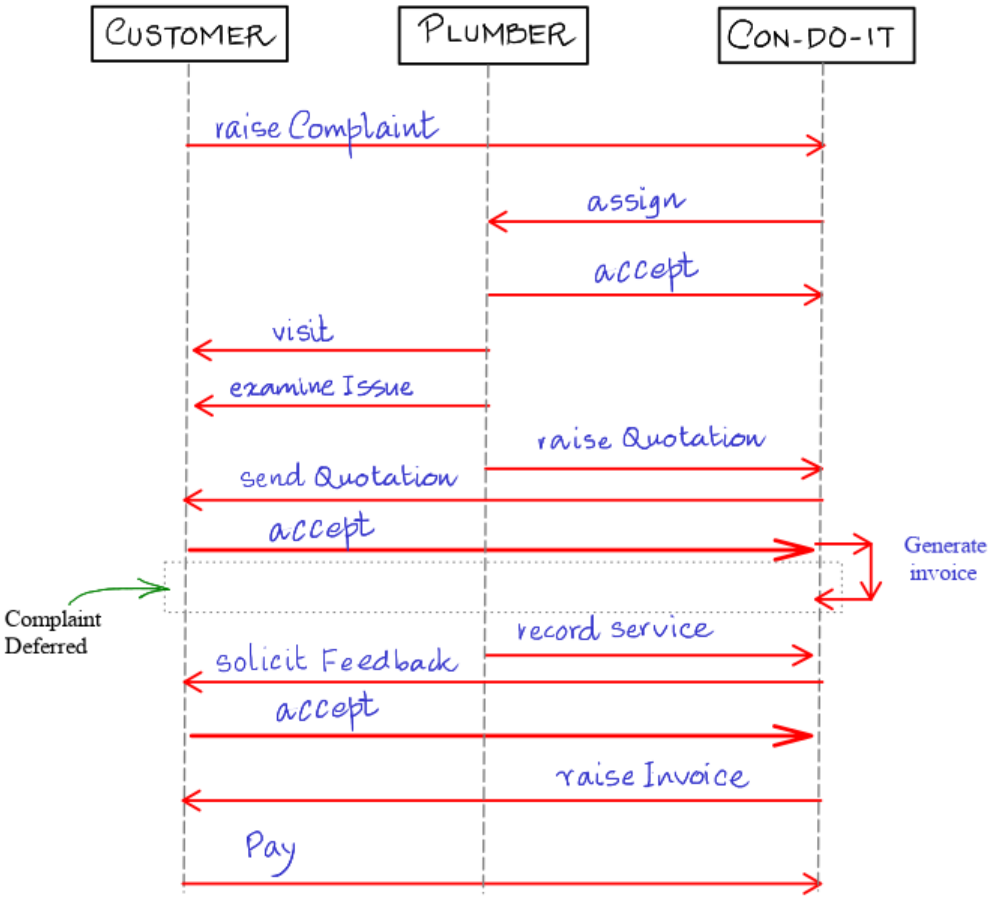


Figure 3.5: Complaint resolution: Basic

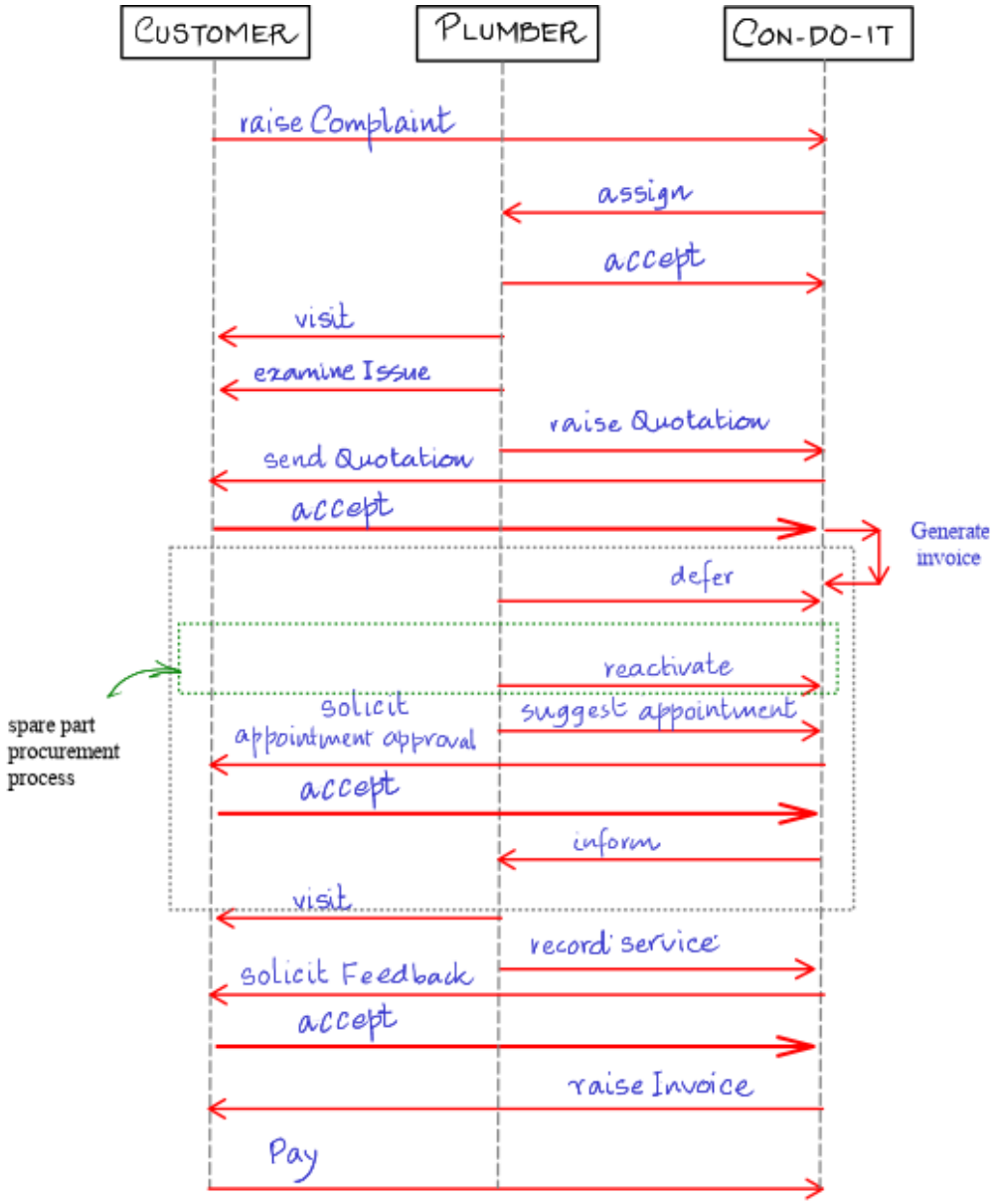


Figure 3.6: Complaint resolution: Component Procurement

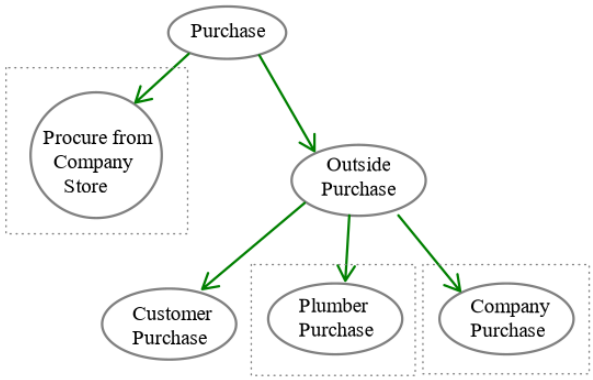


Figure 3.7: Component Procurement

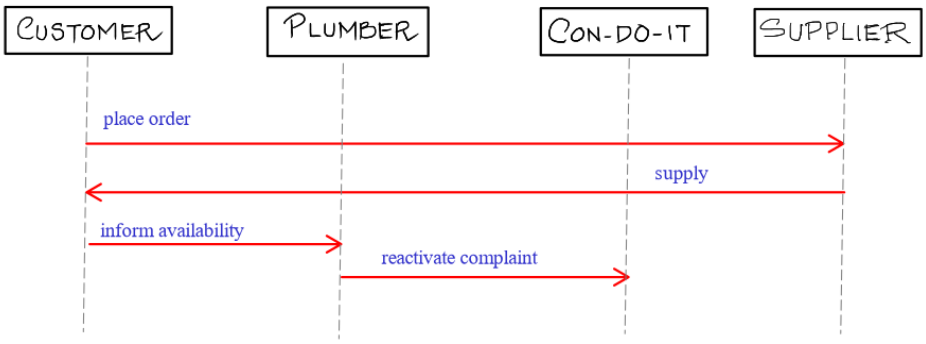


Figure 3.8: Component Procurement: Customer Purchase

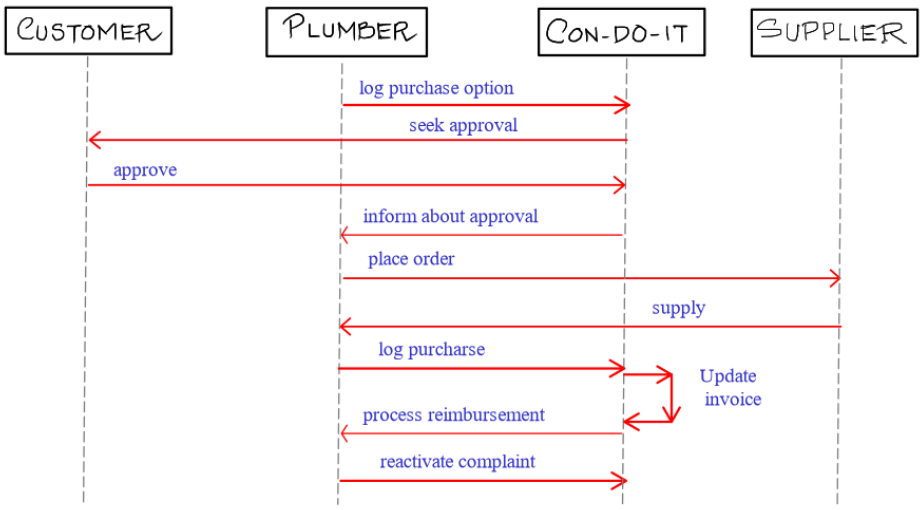


Figure 3.9: Component Procurement: Plumber Purchase

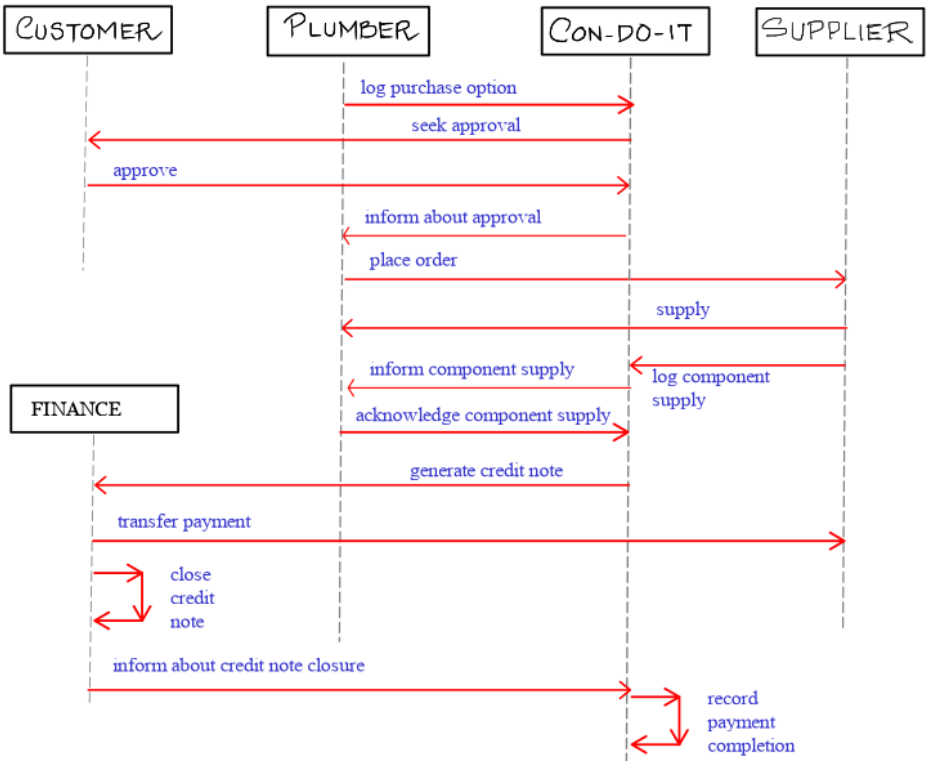


Figure 3.10: Component Procurement: Plumber Purchase (Cashless)

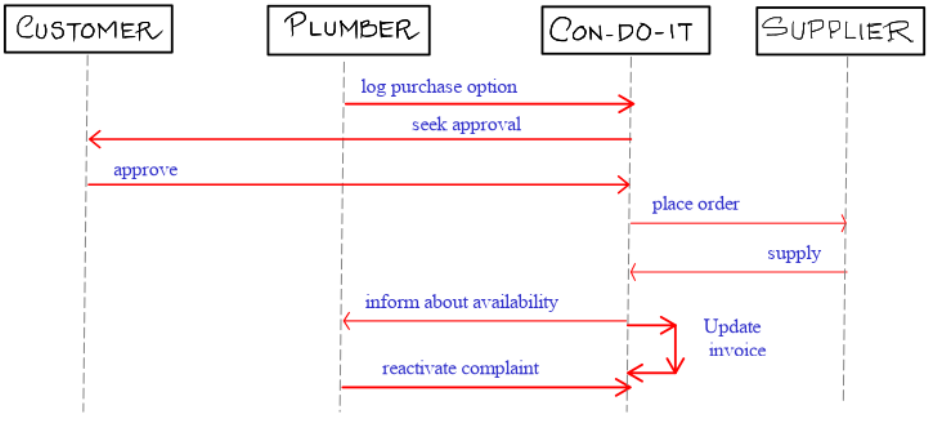


Figure 3.11: Component Procurement: Company Purchase

Free of Cost (FOC): Plumber will seek approval from APPL Service manager by submitting the defect and purchase proof image > Plumber pick the product from nearest dealer or DP (Distributor Partner) on loan basis after approval > Defective Product or Spare will be submitted to APPL Service manager by plumber along with defect return challan generated from the system against the complaint > APPL Service manager will route the challan to APPL finance for Credit note[1] > Finance will pay the amount to DP and mention the CN closure note in CRM.

Billing or Chargeable: Plumber will generate the quote from system or CRM along with the nearest dealer or DP name (Rate are predefined and fixed) > Get the quote approved from end customer > Reach out to nearest Dealer or DP for getting the necessary Product or Spare along with proper tax invoice > Collect the part charges from customer after replacing it > Submit the payment to Dealer or DP from where he/she took the material on loan basis. This process is applicable for non APPL brand product however the plumber will be incentivized only on sale of APPL product or spare against uploading of valid DP or dealer invoice.

Part III

Design

Chapter 4

Architecture

4.1 Context

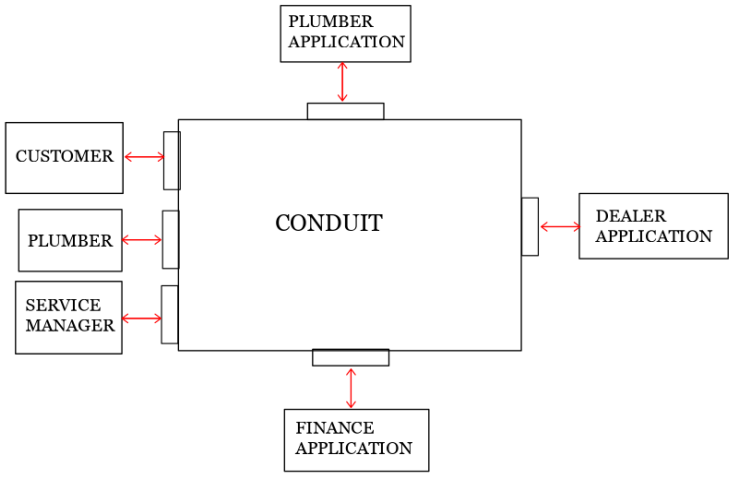


Figure 4.1: Architectural Context

Chapter 5

User Interface

5.1 Common

5.2 Customer Interface

5.3 Plumber Interface

The plumber's dashboard's most important item is the "My Complaints". When the plumber selects this option, the list of complaints will be shown to the plumber. The complaints may be sorted as per different criteria, e.g. name of the customer, date of raising, date of acceptance, date of completion, state (e.g. raised, completed etc.)

When the plumber selects a particular complaint, what gets shown to him depends on the state of the complaint. For example, if a complaint has already been accepted, there should be no option provided to accept/reject it. If a complaint has been paused, the plumber should not be allowed to do anything in it unless it is resumed.

This restriction of available choices will limit the number of decisions or choices the plumber has to make at any point in time. This will lead to increased usability.

5.4 Service Manager Interface

5.4.1 Plumber Suggestion

A service manager will be responsible for many discretionary activities. For now, many of the processes which will end up as automated will be routed through the service manager. A service manager would have the provision to either explicitly delicate the process to an algorithm, or execute it himself. For example, when a new complaint is raised, depending on the region, the same will be routed through a regional service manager. The service manager may then decide to manually produce a set of suggestions for the customer or invoke the algorithm to do it automatically.

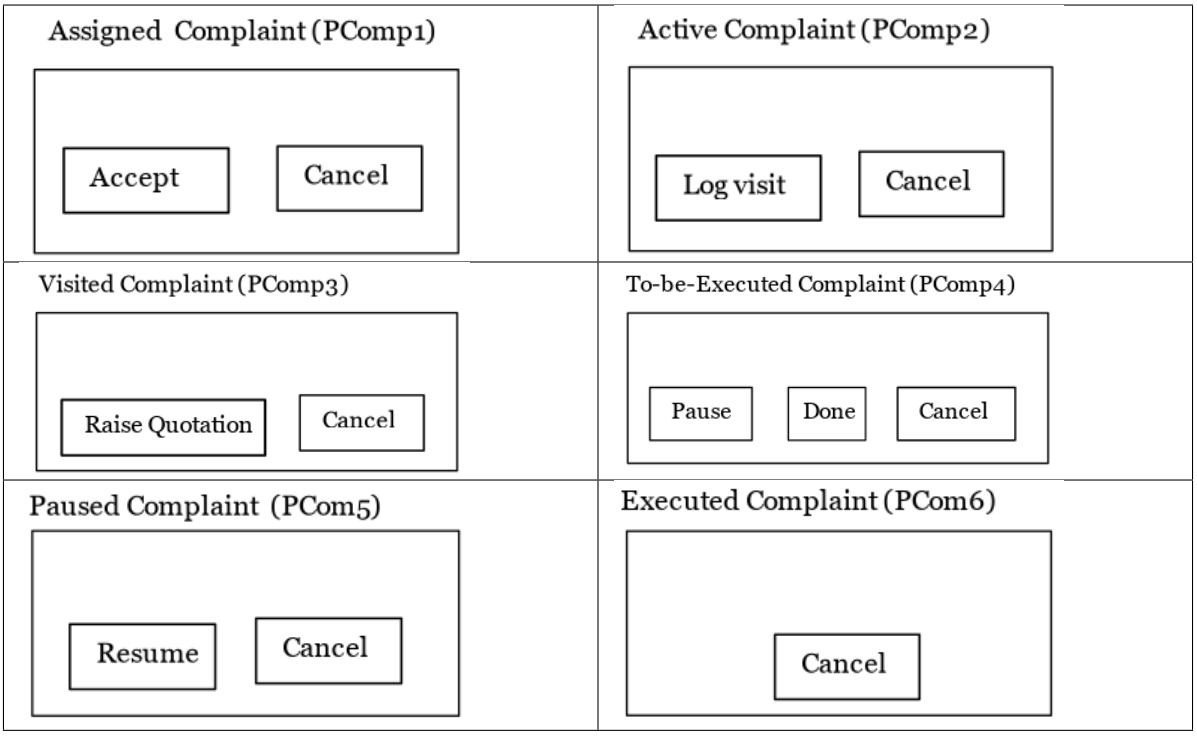


Figure 5.1: Plumber screens

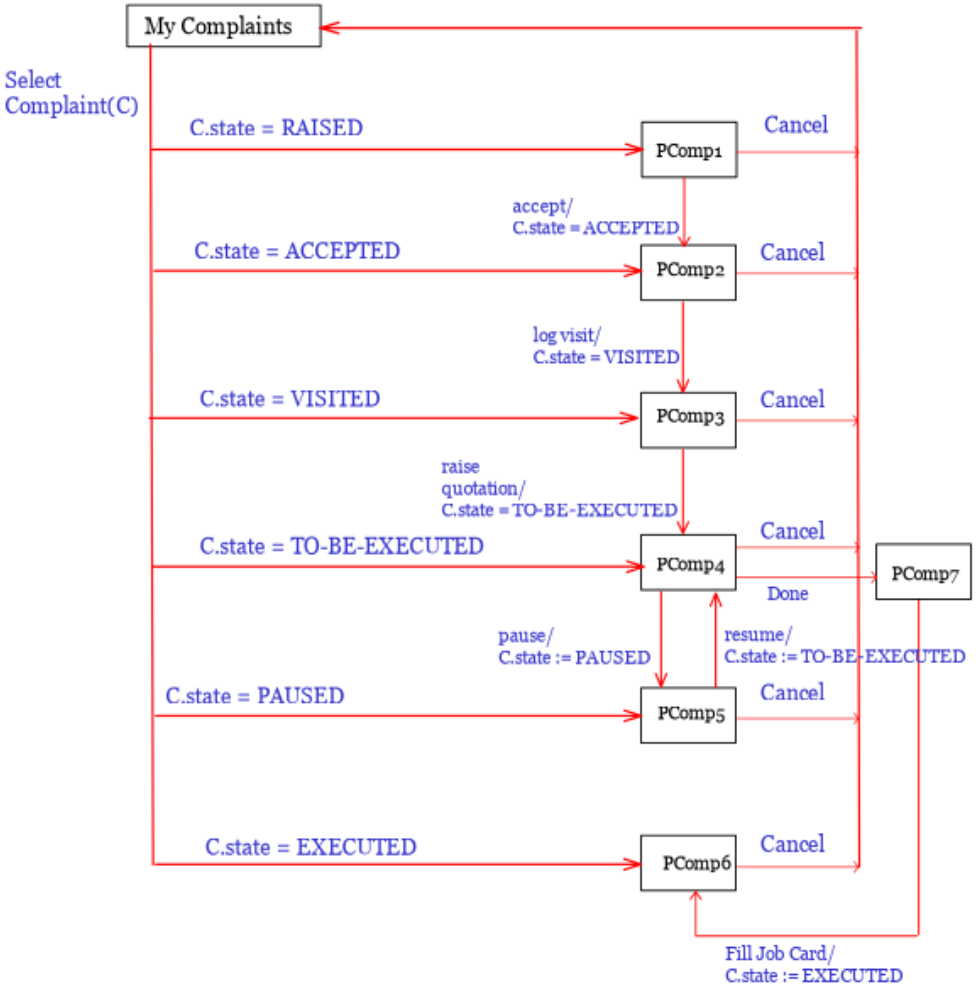
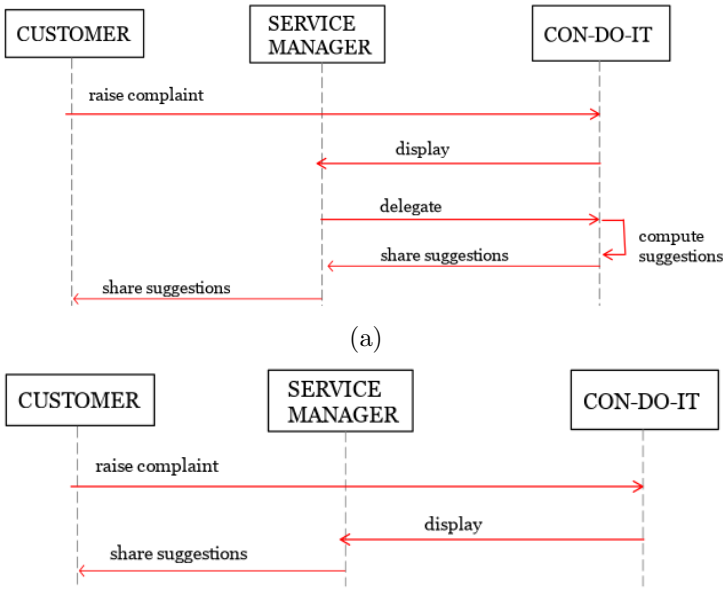


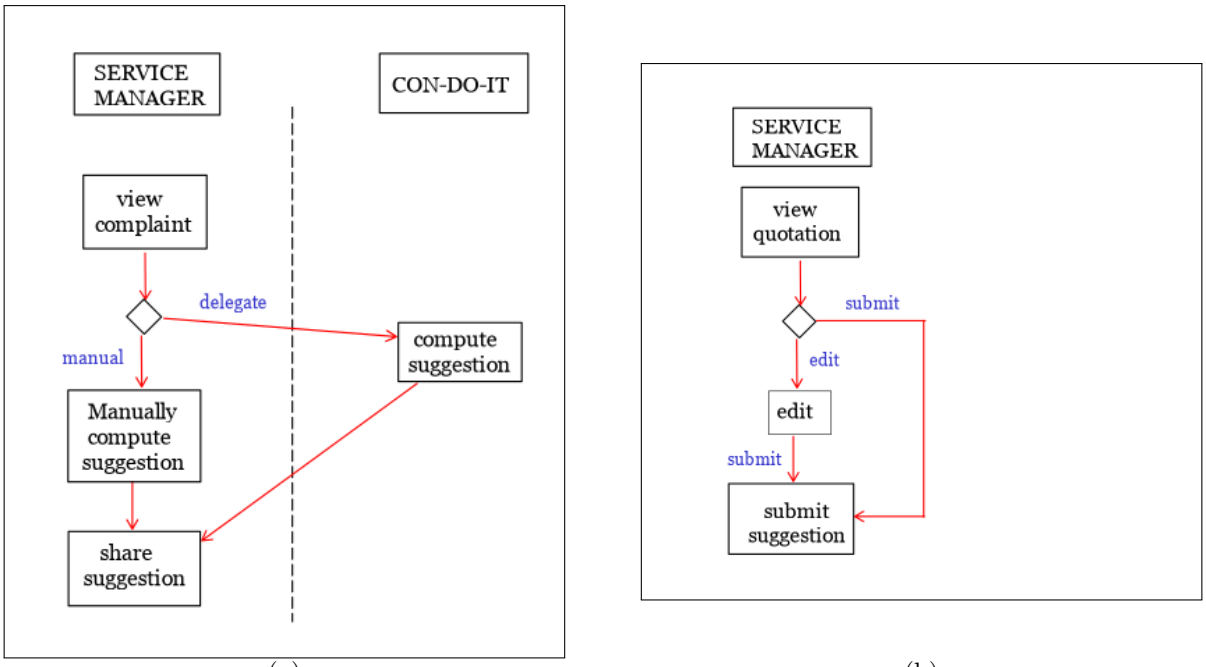
Figure 5.2: Plumber UI Navigation



(a)

(b)

Figure 5.3: Plumber Suggestion: (a) Automatic; (b) Manual



(a) (b)

Figure 5.4: Activity diagrams for plumber suggestion: (a) Automatic; (b) Manual

Chapter 6

Object Model

Chapter 7

Algorithms

7.1 Plumber Assignment

Part IV

Prototype System and Demo

Chapter 8

Installation

Chapter 9

Using/Testing the Prototype

The demonstration is arranged as test cases. Each test case is *manually executed* starting from an initial state. The application is brought to the initial state in the *setup* step of a test case. The setup step does the following:

1. **setup DB:** Put the database in an appropriate state.
2. **Launch UI:** Launch the appropriate UI screen as the starting point of the test case.

The test launch screen (available only for demo) is as shown in Fig. 9.1.

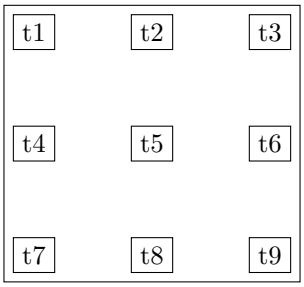


Figure 9.1: Test launch screen

9.1 Testing Using the Complaint State Machine

Here, we utilise the complaint state machine (Fig. 3.4) to design test cases. In doing so, the application must first be brought to a state where there is a customer who is about to raise a complaint. Thereafter, each test case below traverses one path leading from from the *init* state to one of the final states (*Cancelled*, *Done*, *Abandoned*).

9.1.1 Testing the complaint state machine: tsm_1

On launching tsm_1, the following setup steps take place:

1. **setup DB:** The DB contains the following:
   (a) One customer: C_1
   (b) A few plumbers: P_1, P_2, P_3
   (c) A service manager: M_1
   (d) A set of components: Co_1, Co_2, Co_3
   (e) ...
2. **Launch UI:** Dashboard of customer C_1

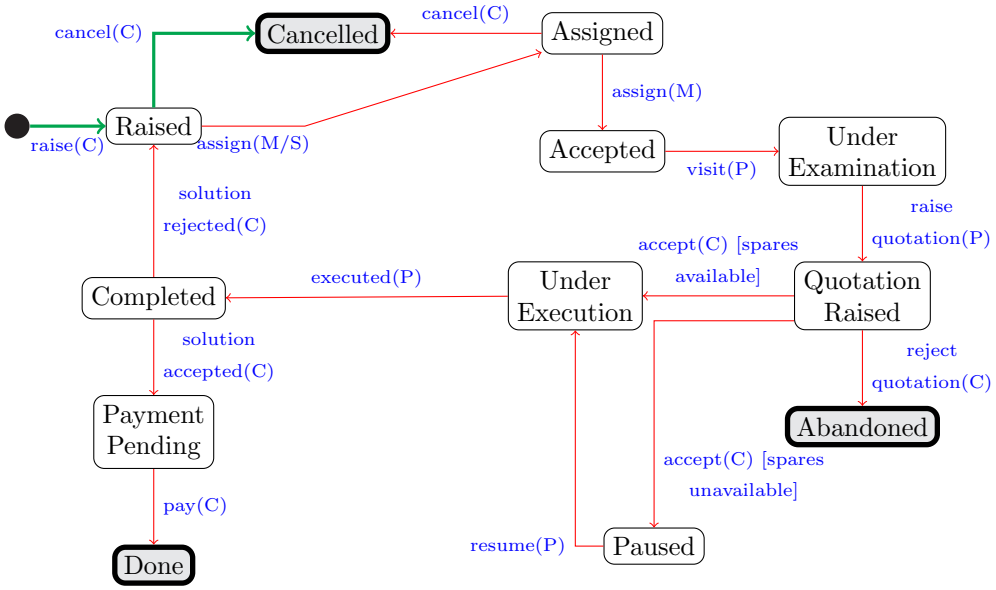


Figure 9.2: Testing the complaint state machine: tsm_1

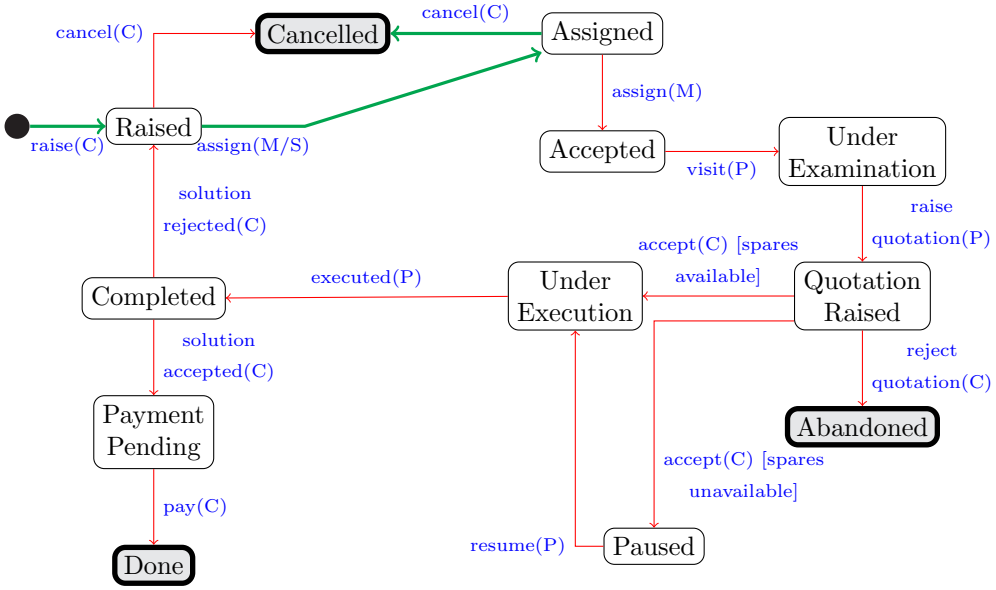


Figure 9.3: Testing the complaint state machine: tsm_2

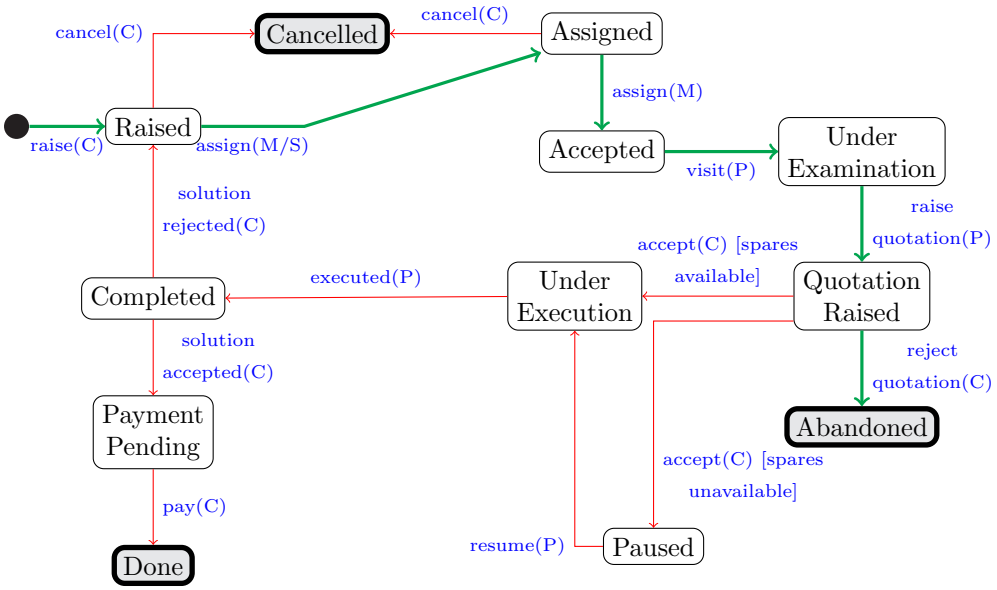


Figure 9.4: Testing the complaint state machine: tsm_3

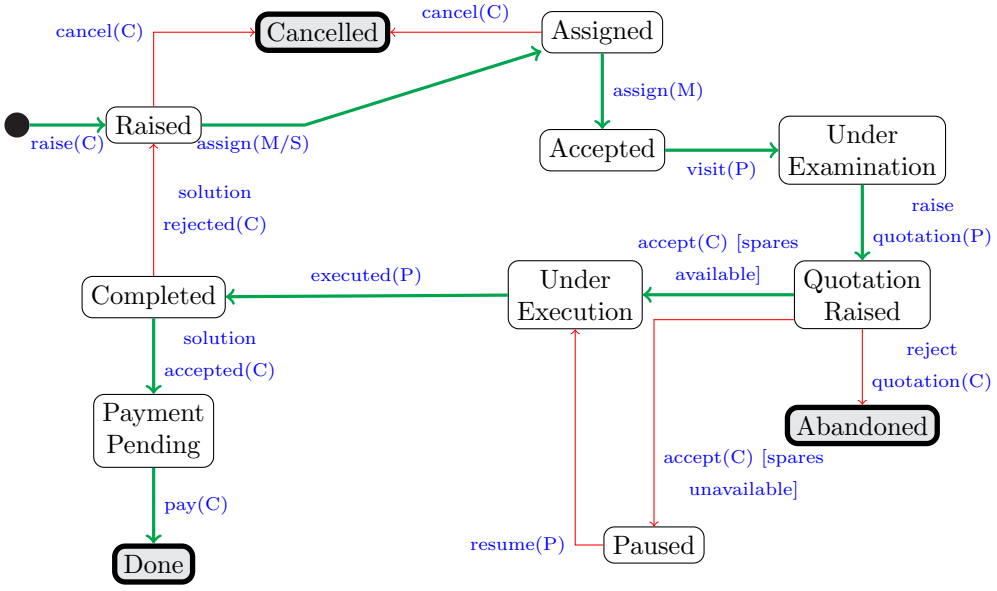


Figure 9.5: Testing the complaint state machine: tsm_4

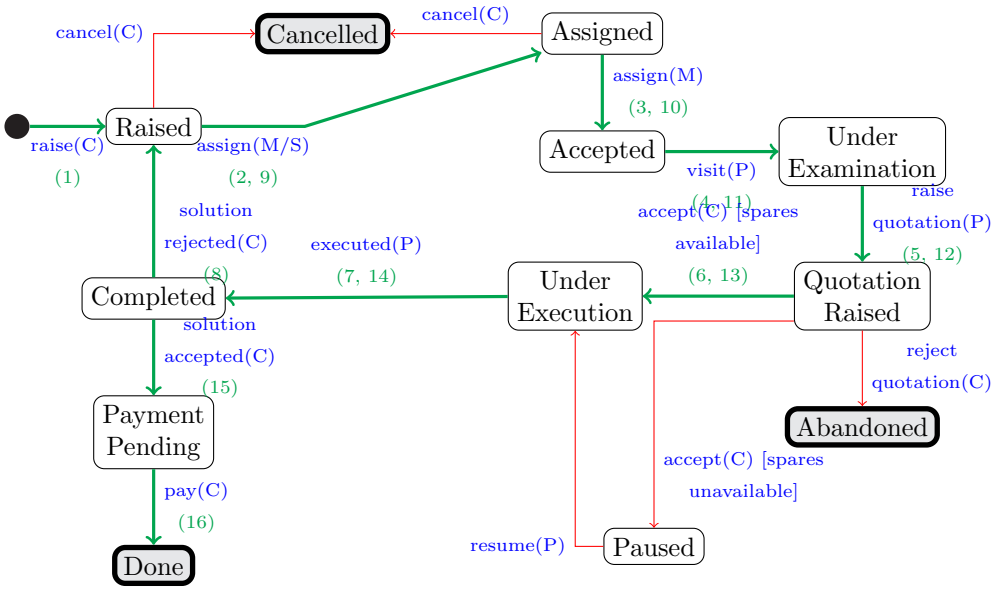


Figure 9.6: Testing the complaint state machine: tsm_5

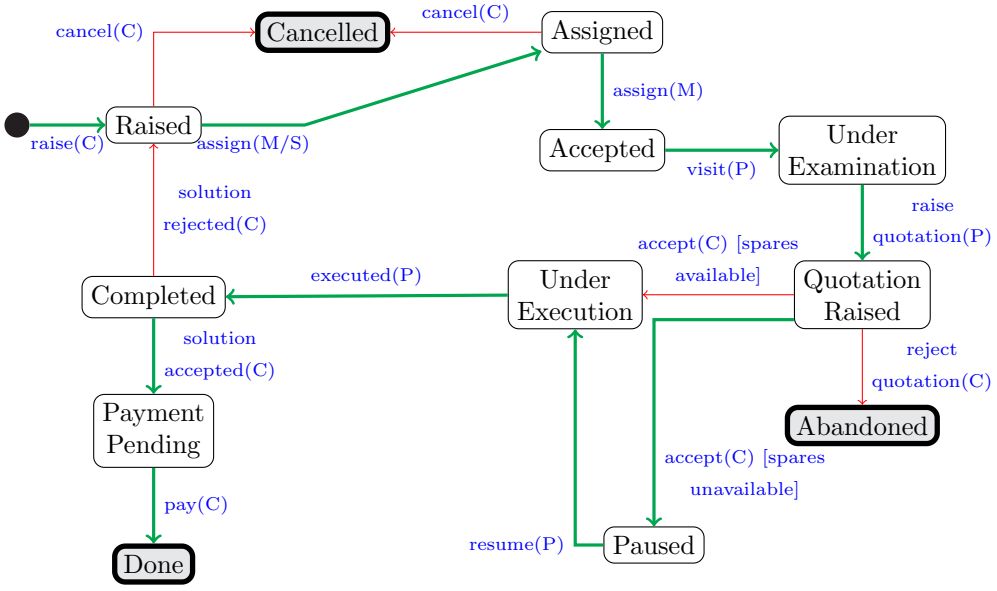


Figure 9.7: Testing the complaint state machine: tsm_6

Chapter 10

Evolving the Implementation