Automation of the Software Production line through Continuous Code Build, Packaging, Deployment and Test Integration

Submitted By

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NIRMA UNIVERSITY

AHMEDABAD-382481

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Major Project

Submitted in fulfillment of the requirements

for the degree of

Master of Technology in Computer Science and Engineering

Submitted By

Shraddha Patel

13MCEC13

Guided By

Prof. Dhaval Jha

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Certificate

This is to certify that the major project entitled **"Automation of the Software Production line through Continuous Code Build, Packaging, Deployment and Test Integration"** submitted by **Shraddha Patel(13MCEC13)**, towards the partial fulfillment of the requirements for the award of degree of Master of Technology in Computer Science and Engineering of Institute of Technology, Nirma University, Ahmedabad, is the record of work carried out by her under my supervision and guidance. In my opinion, the submitted work has reached a level required for being accepted for examination. The results embodied in this project, to the best of my knowledge, haven't been submitted to any other university or institution for award of any degree or diploma.

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Statement of Originality

I, **Shraddha Patel**, Roll. No. **13MCEC13**, give undertaking that the Major Project entitled "**Automation of the Software production line through continuous code, build, deployment and test integration**" submitted by me, towards the partial fulfillment of the requirements for the degree of Master of Technology in **Computer Science & Engineering** of Institute of Technology, Nirma University, Ahmedabad, contains no material that has been awarded for any degree or diploma in any university or school in any territory to the best of my knowledge. It is the original work carried out by me and I give assurance that no attempt of plagiarism has been made. It contains no material that is previously published or written, except where reference has been made. I understand that in the event of any similarity found subsequently with any published work or any dissertation work elsewhere; it will result in severe disciplinary action.

Shraddha Patel

Date:

Place:

Endorsed by

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- Shraddha Patel

13MCEC13

Abstract

Project is about Automating tasks like Compiling source code and generating Binary codes, Packaging binary code, Integrating and Running tests, Deployment of the product so that the product can be available for use. If we perform All these tasks manually it will increase production time also it is tiresome and it depends upon the skills of individuals which ultimately affects the quality. Solution is to perform these tasks using scripts which reduces production time and human errors, increases productivity, provides efficiency, reliability, reproducibility, accuracy and thus increased quality.

Abbreviations

RPAS	Retail Predictive Application Server
FC	Fusion Client
RPAC	RPAS Plug-gable Automation Component.
RSC	RPAS Simulated Client

Contents

Chapter 1

Introduction

1.1 Project Definition

Automation of the Software production line through continuous code, build, deployment and test integration.

1.2 Motivation

- When the tasks like build, packaging, deployment and testing of products are performed manually it increases production time as well as it is tiresome and it also depends upon the skills of individuals which affects the quality.[1]

- Solution is to perform these tasks using scripts which give many advantages like,

    1. Reduces Production time

       - Integration systems executes the Job of automation and so it can also run job during nights as well for long hours. System triggers the automated task so production time will be reduced.

    2. Reduces human errors

       - Machines performing the repeated tasks are less likely to make errors compared to Humans.

    3. Increases Productivity

       - Reduction in Production time and Errors will automatically increases Productivity.

4. Re-usability

   - Automated scripts can be reused to perform similar kind of tasks.

5. Accuracy and High Quality

   - Decreased errors will improve final product accuracy and Quality.

1.3 Overview of Project

Project is about Automating the act of performing wide variety of tasks like [2]

- Build

  - Automation of build process relies on simple, repeatable tasks which compiles source code in to binary code.

  - Build scripts are the first step and build script can be in the form of shell scripts,batch scripts or ant scripts.

  - Building automation script is going to mean that you are first preparing the environment according to your operating system and then running the appropriate compiler against the code, using specific compilation options and putting your output files somewhere separate from the original code base.

- Packaging binary code

  - After task of compilation is completed we can write the script that generates the artifacts from the output files for deployment.

- Running tests

  Two RPAS utilities RPAC(RPAS Plug-gable Automation Component) and RSC(RPAS Simulated Client) allow rapid development of tests scripts.

  – RPAC utility enables the creation of highly customizable automated test suites for the RPAS server

  – RPAS Simulated Client (RSC) is a testing utility that will help to create a set of tests that would be performed by a client connecting to the domain.

- Deployment

  - Automating the task of deployment means running the script which makes soft-

ware product up and running or active by installing it and configuring it in live environment.

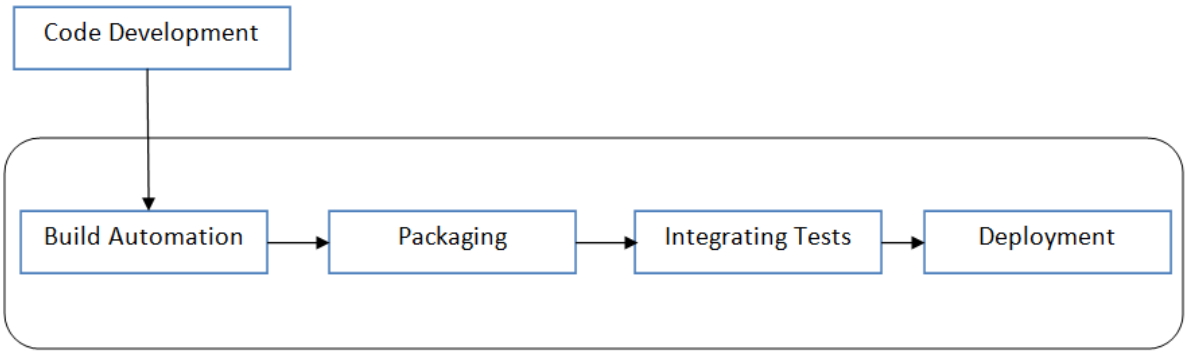


Figure 1 - Project Overview

Chapter 2

Literature Survey

2.1 RPAS

RPAS stands for Oracle Retail Predictive Application Server. It provides foundation for Oracle Products. It doesn't provide any business logic but it enables the Applications(Product) to store,manipulate and retrieve data. It also provides user interface for accessing these data.

2.1.1 RPAS Platform Components

- RPAS Server

  RPAS server consists of two main components :

  1. RPAS Domain
  2. Domain Daemon

- RPAS Client

- Configuration Tools

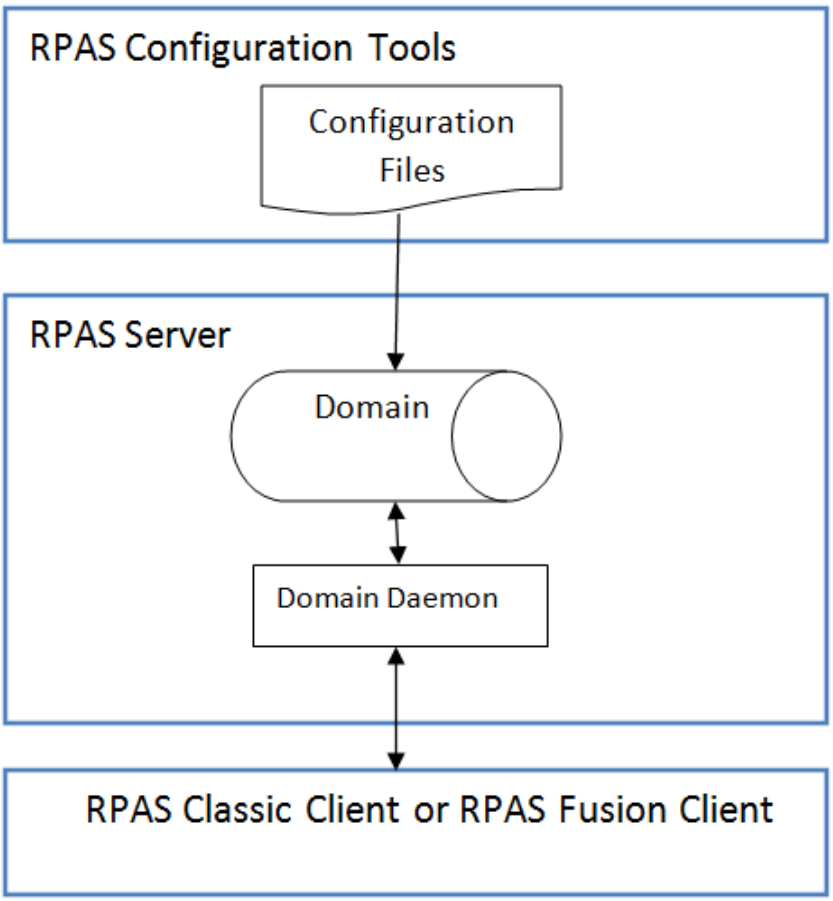


Figure 2 - RPAS Platform Components

2.2 RPAS Domain

- Main Component of RPAS server is Domain.
- Domain is collection of directories and files which contains data of RPAS Application.
- RPAS domain contains MultiDimensional Database.

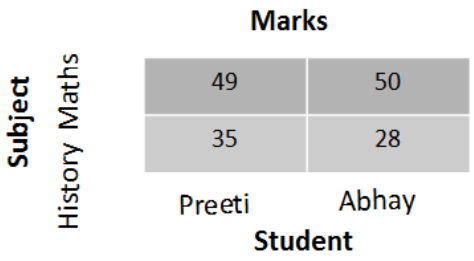
2.2.1 MultiDimensional Database

- Multidimensional database(MDB) systems provide a multidimensional view of data within database.
- For Predictive applications,Multidimensional database provides quick and efficient access to data. Consider the comparison of RDBMS and MDB.
- Consider Marks obtained by different Students for different subjects. Representation in RDBMS and MDB is shown below.

RDBMS

Subject	Student	Marks
Maths	Preeti	49
Maths	Abhay	50
History	Preeti	35
History	Abhay	28

MDB



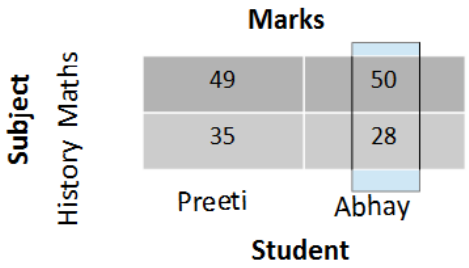
2.2.2 RDBMS vs. MDB

- Marks obtained by Abhay can be easily grouped and calculated.

RDBMS

Subject	Student	Marks
Maths	Preeti	49
Maths	Abhay	50
History	Preeti	35
History	Abhay	28

MDB

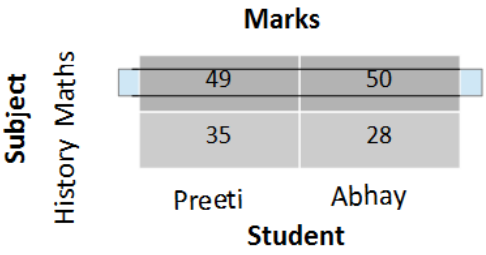


- With Multidimensional databases,any specific position can be viewed easily. Thus, total marks for subject Maths can easily be found.

RDBMS

Subject	Student	Marks
Maths	Preeti	49
Maths	Abhay	50
History	Preeti	35
History	Abhay	28

MDB



2.3 RPAS Domain Daemon

- Process which allows you to connect to the RPAS Server and a domain using the RPAS Clients.
- Provides channel for communication between Client and Server side Domains.
- It is a process that runs on server side and waits for request from the client.

2.4 RPAS Client

- RPAS Client provides user interface to access and manipulate data in the domain on RPAS Server. [3]
- Setting up a Domain Daemon is the first step and after that configuring RPAS client according to that will open doors for the client to access domain.
  - Workbook : Contains local copy of data from RPAS Domain in which end user can view and manipulate.
  - Wizards : Set of dialogues that require you to answer a sequence of questions or enter selections regarding the content of workbook.
  - Worksheets : Multidimensional spreadsheets used to display information for a workbook. One or more worksheets make up a workbook.

2.5 RPAS Fusion Client

- The RPAS Fusion Client is the Web-based Rich Client for the Retail Predictive Application Server (RPAS) platform.
- It is a web based Client through which you can access and manipulate data within Domain.[3]
- The Fusion Client uses the same RPAS server as the Windows-based RPAS Client. In addition to the enhanced user experience, the Fusion Client provides access to a larger number of users and a greater degree of platform independence.

2.6 RPAS Configuration Tools

- It provides user interface to configure server.
- Configure RPAS Products according to specific customer's requirements and parameters.

2.7 WebLogic Server

- Weblogic server is a Java Application server. It is a software that can service the request of the applications which are deployed on it.
- Web servers can work with HTTP protocol while Application servers are designed to work with HTTP as well other protocols like RPC RMI.
- Web servers are mostly designed to serve static pages like images and HTML content and they will redirect a request for dynamic contents to Application servers like Weblogic server.

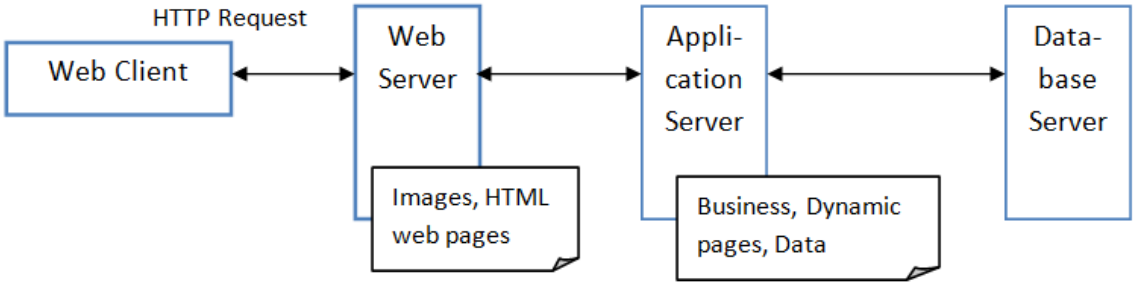


Figure 3 - WebLogic Application Server

2.7.1 WebLogic Domain

- Domain is the main Administration unit for weblogic server.
- Weblogic domain contains Admin server, managed servers, Clusters and Data sources.

- One Admin Server is always included as a part of Domain by default. We can also add one or more WebLogic Server instances called Managed Servers. We can also include clusters as a part of Domain.
- Administrator server provides a main point for managing and maintaining the domain.[3]
  - Oracle WebLogic Server Administration Console : Graphical User Interface to the administrator server.
  - Oracle WebLogic Server Node Manager : A Java program that enables you to remotely stat and stop the administrator and managed server instances.
  - There is one Admin Server and all the other Oracle WebLogic Server instances are known as Managed Servers.

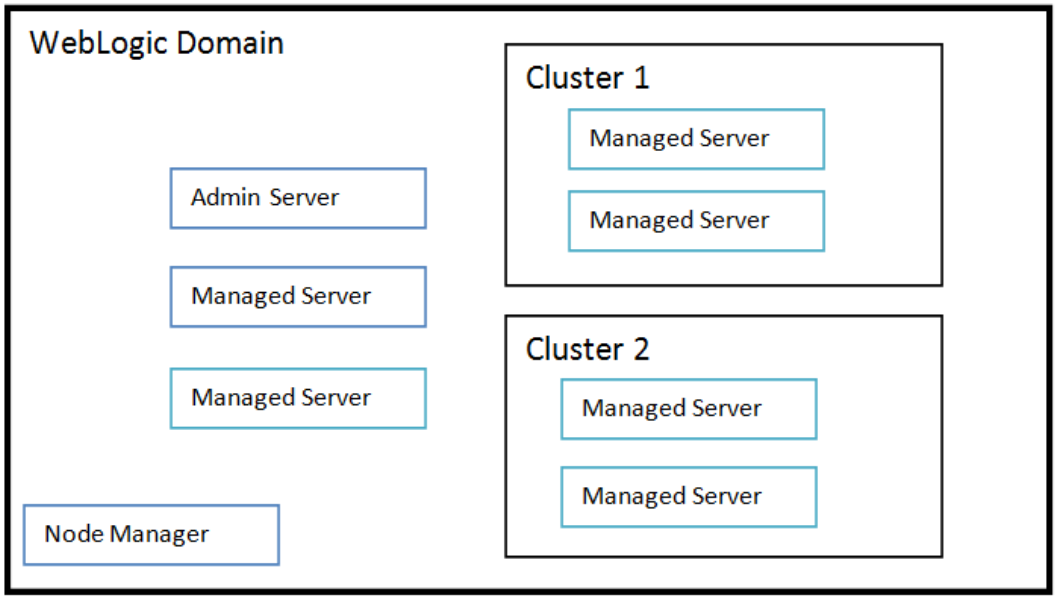


Figure 4 - WebLogic Domain

- Within Domain we may also add clusters that are group of logically related Managed Server instances. They work together to provide scalability and high availability for Products hosted on them.

2.7.2 Administrator Server,Managed Server and Clusters

- Admin Server is the main component through which we can configure and manage Domain.
- There is only one Admin Server and other instances are known as Managed Servers.
- If a domain has only one weblogic server instance, that server can work as Admin server as well as we can also deploy applications on it.
- Though you can host your applications on Admin servers,ideal way is to deploy Products on Managed Servers. So that Admin servers are dedicated to purely configure and monitor weblogic domain.
- Clusters are collection of more then one managed servers.
- As Cluster is collection of Managed Servers it will improve performance and if one or more instances of servers within cluster fails still Product will be available.
- To the clients cluster appears as a single WebLogic Server instance.

2.8 Process Flow

- For all tasks like Build, Deployment and test integration RPAS installation is mandatory. RPAS provides framework for all these tasks.
- After you install RPAS get the product and perform Build(Compile) operation as well for Deployment tasks also We first need RPAS and then Server on which we can deploy our application products.

The following figure shows the Process Flow.[4]

- Download RPAS package and Install it first. This will install RPAS Server.
- You can choose either RPAS classic client installation or RPAS Fusion client installation. Classic client provides windows based interface and Fusion client provides web based interface to product domain.

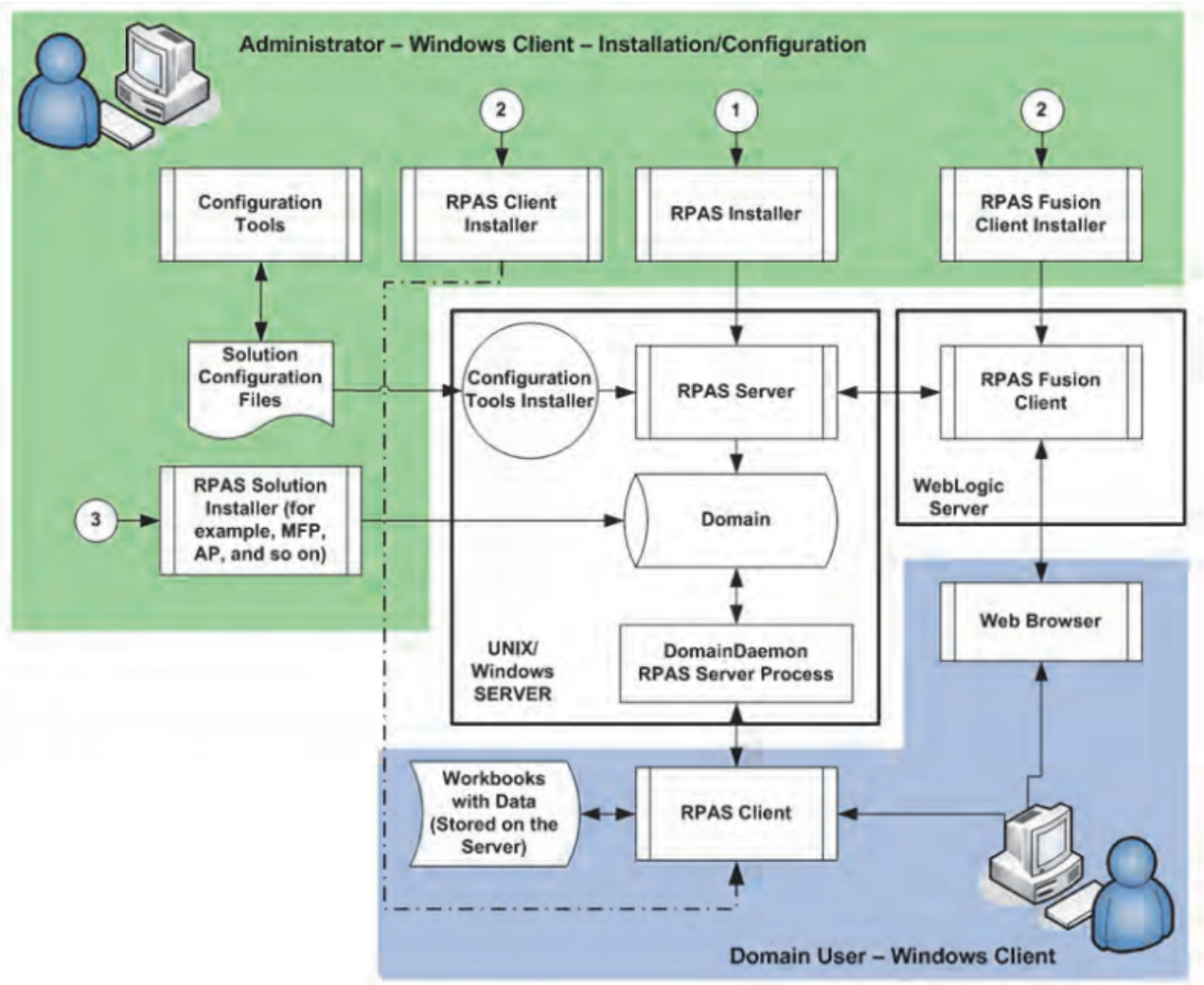


Figure 5 - Process Flow

- In order to install RPAS classic client or RPAS Fusion client you have to first run Domain Daemon process on server side so that you can establish communication channel between Server and Client. Domain Daemon listens on one particular port that port number will be used while configuring Client.

- In order to install fusion client you need Weblogic server and WebLogic Domain to be installed. After installing WebLogic Server and creating WebLogic Domain you will have one Admin Servers and optional Managed servers. Fusion client will be deployed as an application on Admin server or Managed Server.

- Next Deploy the product or application on one WebLogic Server instance.

- After installation of Fusion client or Classic client you can access and manipulate

data of RPAS product.

- RPAS stores those data in form of Multi Dimensional database which is more efficient for planning and forecasting.
- Configuration Tools provides additional functionality to configure your RPAS server based on users specifications.

2.9 Hudson

- Hudson is a continuous integration system, through which we can execute jobs which are repetitive in nature.[5]
- Build of Product is one of the job which can be configured to be executed periodically on Hudson.[5]
- Hudson provides an continuous integration system, making it easier for developers to integrate changes to the project and making it easier for users to obtain a fresh builds.

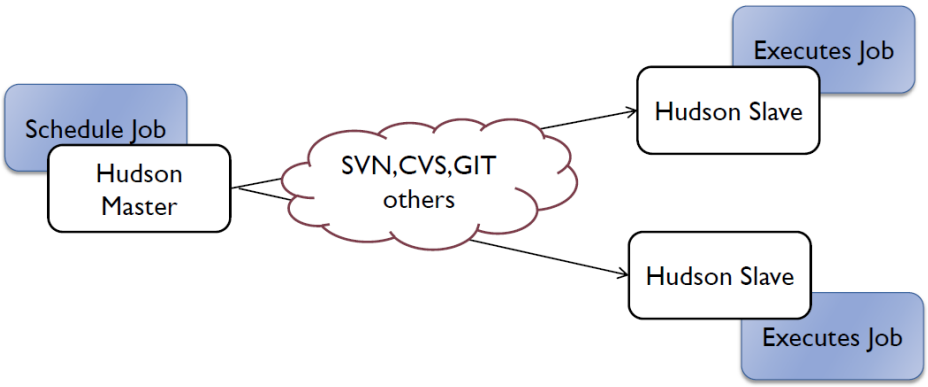


Figure 6 - Hudson Components

2.9.1 Hudson Components

- Hudson Master :
  - Hudson server running on its own job or requests a slave to do the build. It also provides Dashboard user interface. Through which users can configure the job that they want to perform.
- Hudson Slave :
  - Slave is agent which can be installed on same or different node and performs the tasks assigned by the master.
- Executor :
  - A thread on slave that does the actual run of the build. Master and slave can have multiple executors(expected to equivalent of number of cores of CPU).

Chapter 3

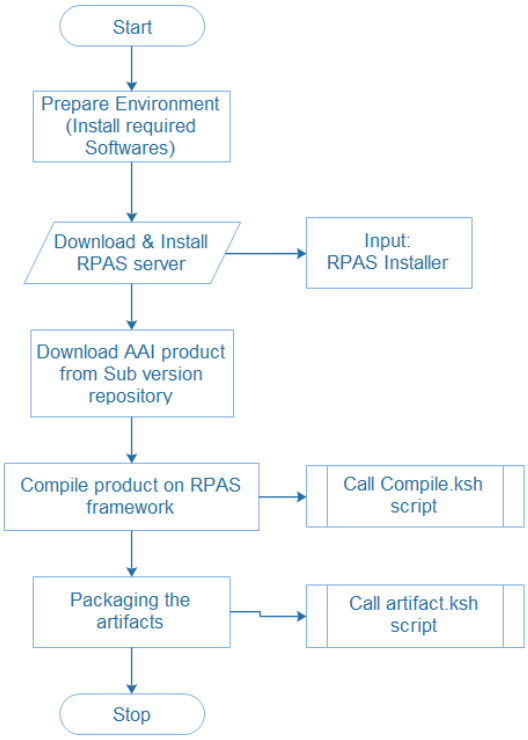
Project Task Completed

This chapter specifies Tasks that have been completed.

3.1 AAI Compilation Script

Below are the steps to perform AAI Build task

- Prepare proper environment (Check whether the required softwares are installed or not).
- Downloads RPAS from repository.
- Download Configuration tools from repository.
- Install RPAS and Configuration tools.
- Set Environmental variables.
- Get the AAI product code from sub version checkout repository.
- Compile product on RPAS framework.
- Generate the Artifacts and copy them to repository.



- AAI product contains c++ as well as Java files.
- 'gcc' is used for compiling c++ files.
- 'ANT' and 'Gradle' have been used to compile Java files.
- The following table shows comparison of ANT vs Gradle for AAI java file compilation on same machine.

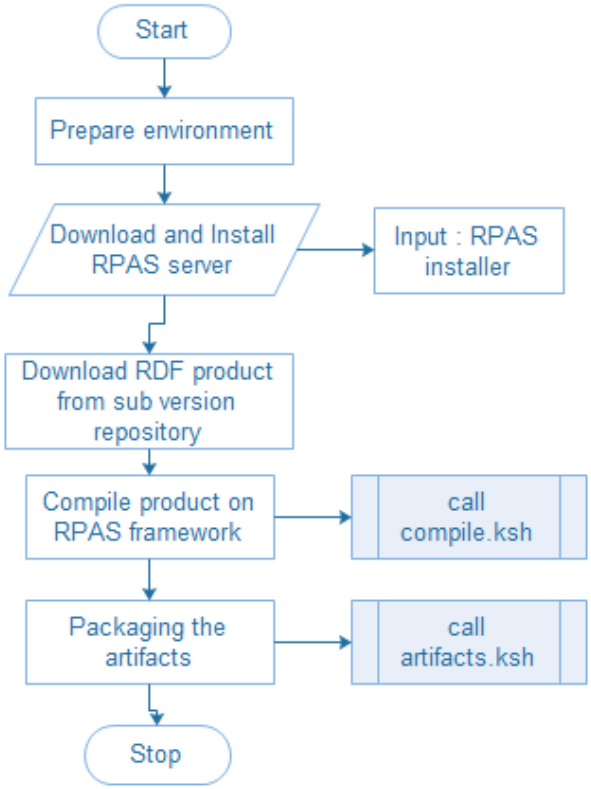
3.1.1 Comparison of ANT and Gradle

Product	ANT	Gradle
AAI	3.33 sec	3.53 sec

Table 3.1: ANT vs Gradle

3.2 RDF(Product) Compilation script

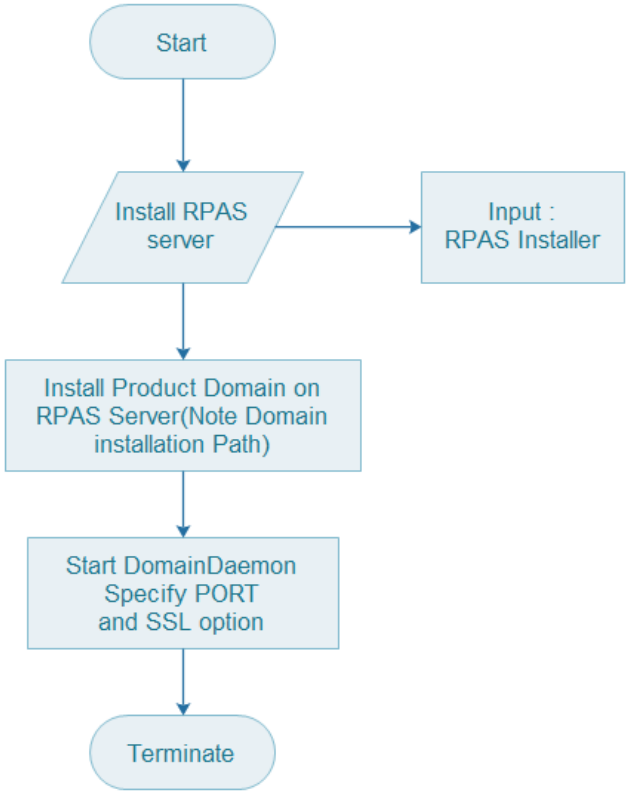
- Prepare proper environment (Check whether the required softwares are installed or not).
- Downloads RPAS from repository.
- Download Configuration tools from repository.
- Install RPAS and Configuration tools.
- Set Environmental variables.
- Get the RDF product code from sub version checkout repository.
- Compile product on RPAS framework.
- Generate the Artifacts and copy them to repository.



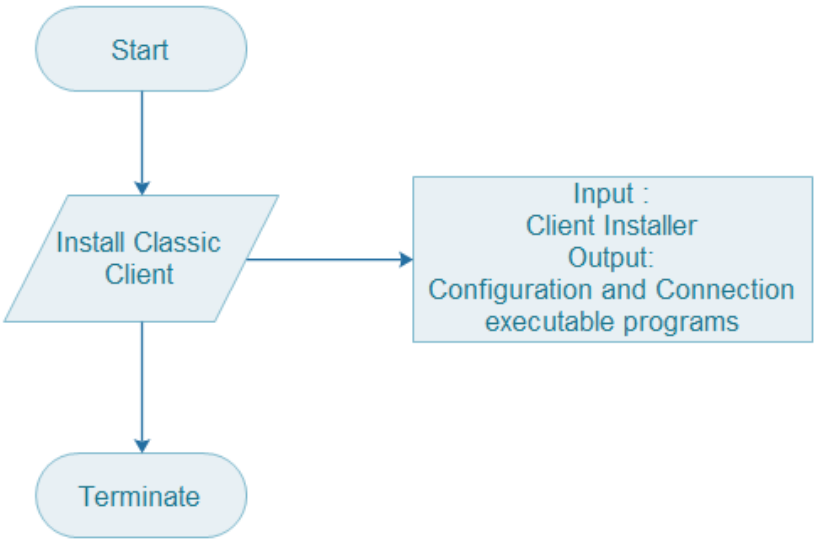
3.3 Automated Tests

- Scripts to ensure product security and threat assessment.
- Two RPAS utilities RPAC(RPAS Plug-gable Automation Component) and RSC(RPAS Simulated Client) allow rapid development of tests scripts.
- RPAC utility enables the creation of highly customizable automated test suites for the RPAS server
- RPAS Simulated Client (RSC) is a testing utility that will help to create a set of tests that would be performed by a client connecting to the domain.

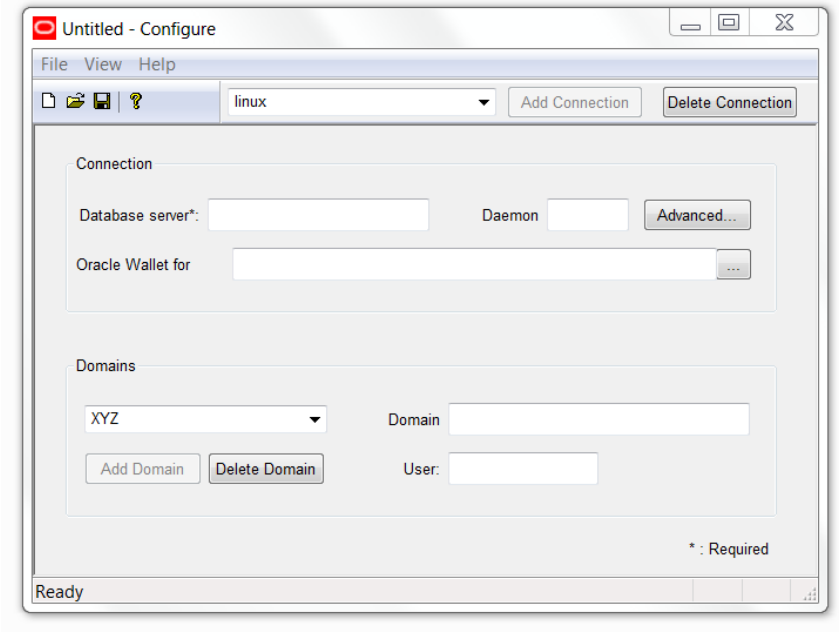
Following are the prerequisites to perform product security and threat assessment tests.
Server Side :

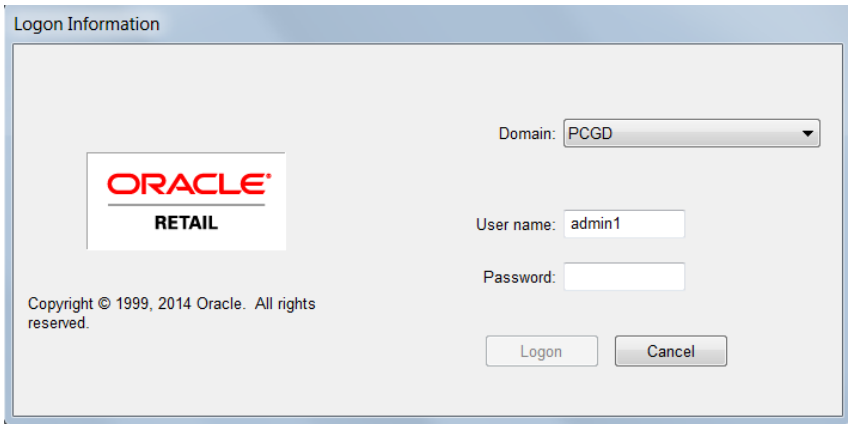


Client Side :



Connecting Client and Server




Logon Information
Domain:
PCGD
ORACLE
RETAIL
User name:
admin1
Password:
Copyright © 1999, 2014 Oracle. All rights reserved.
Logon
Cancel

3.3.1 Product Security and Threat Assessment

There are mainly two domains for Security and Threat Assessment

1) Password Policy Administration

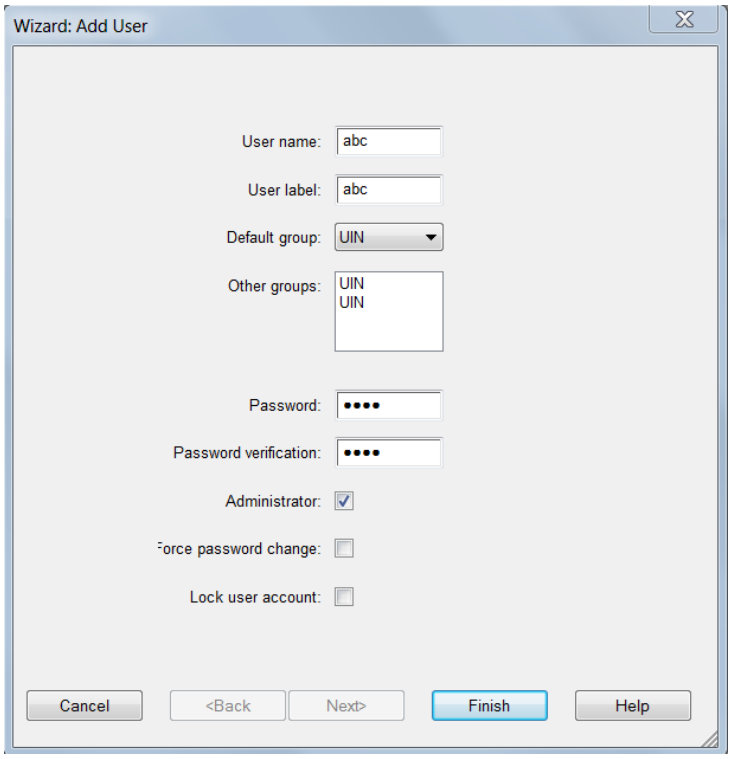
2) Secure Socket Layer

Password Policy Administration

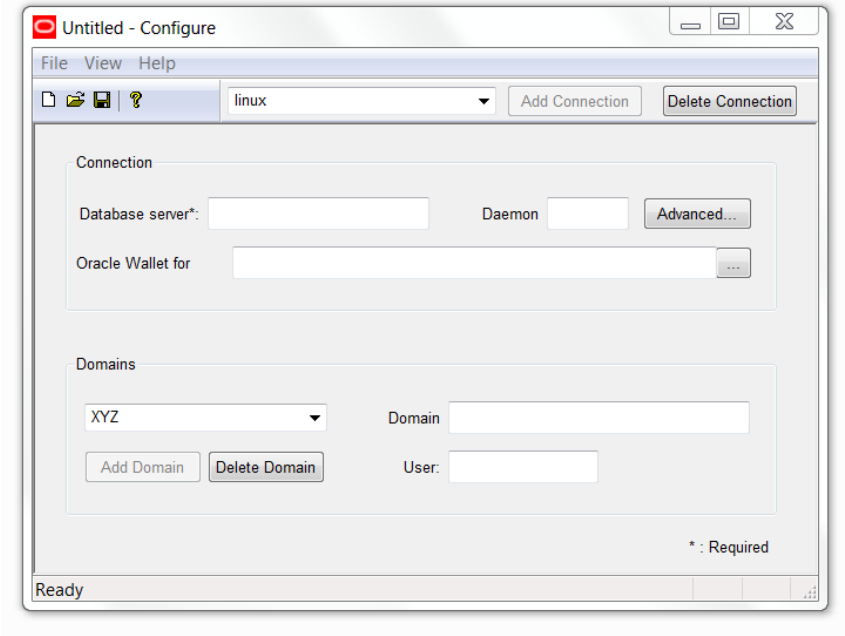
* These test cases can be automated using both RPAC and RSC

* Check whether Password we are providing for the user matches the requirements or not.

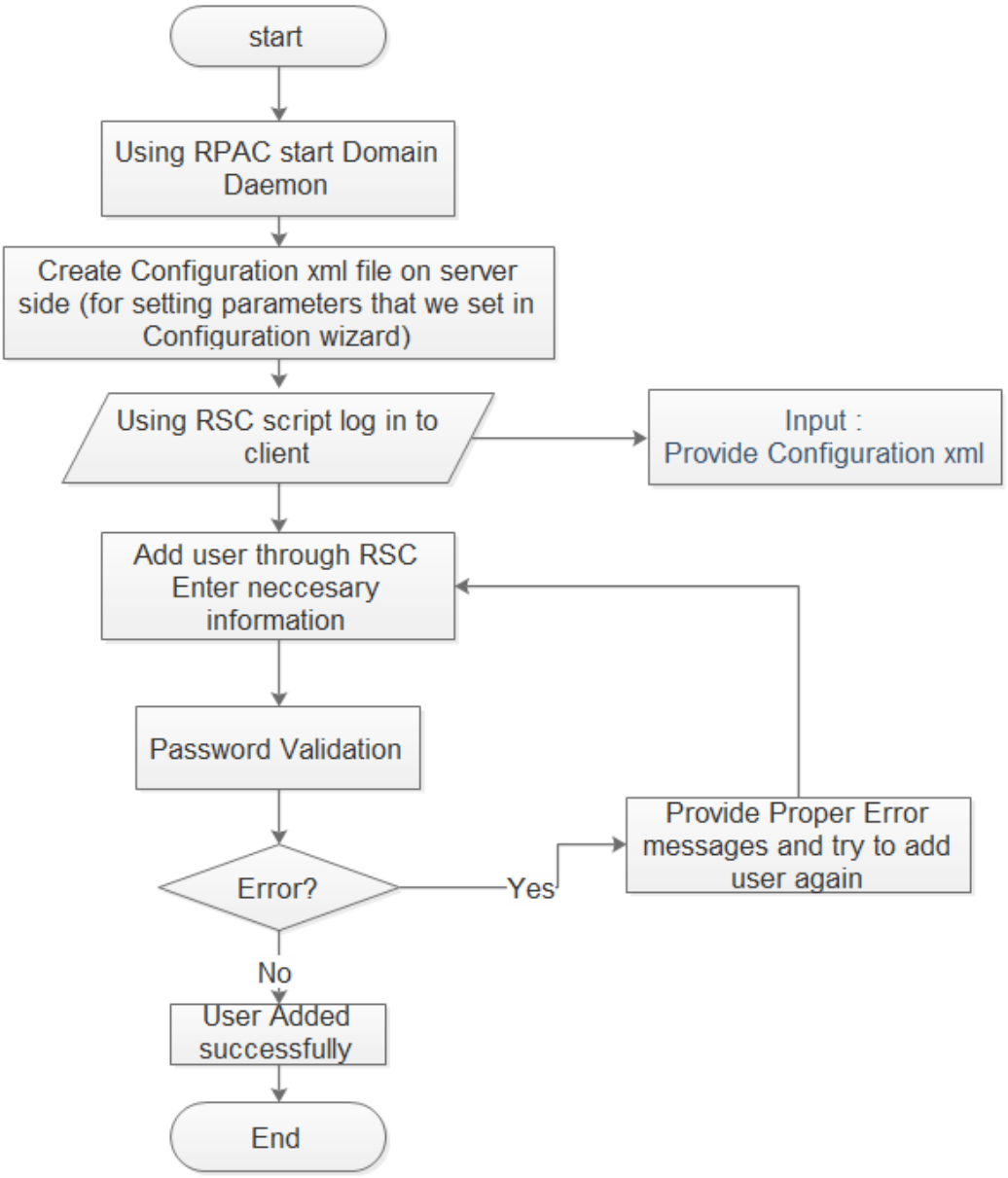
* Consider the following scenario We are Adding one user, from front end we will see the following screen



Manually setting parameters in Client through GUI,



Now if we want to automate this step,



Test case examples for Password Policy Admin

1) Password Minimum and Maximum length

2) Password Requires Number

3) Password Requires Mixed Characters

4) Password Match

5) Password Expiry

6) Password Attempts

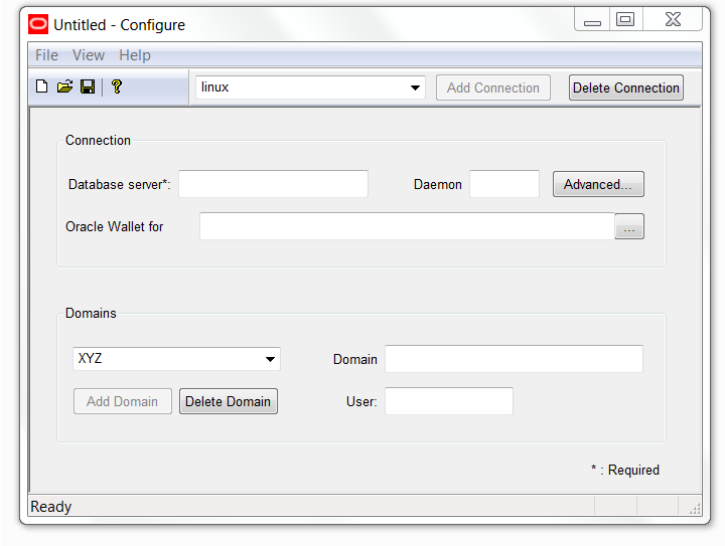
Secure Socket Layer

* SSL is used for establishing an encrypted link between server and client.

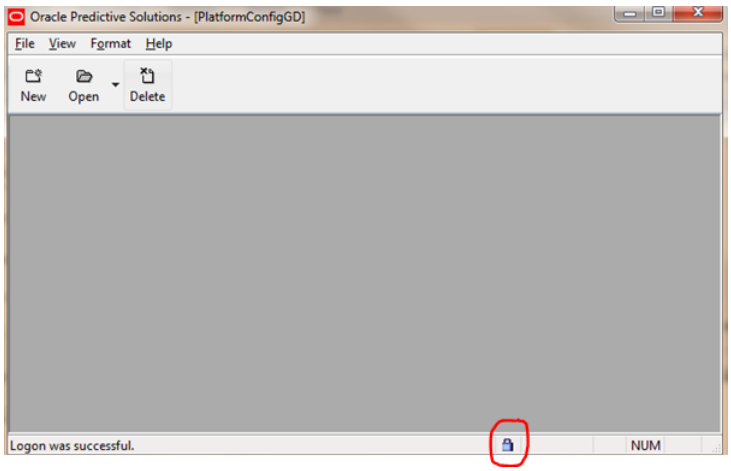
* SSL automation uses RPAC and RSC

* For secure connection between RPAS server and Classic client using RPAC and Oracle Public Key Infrastructure create oracle wallet.

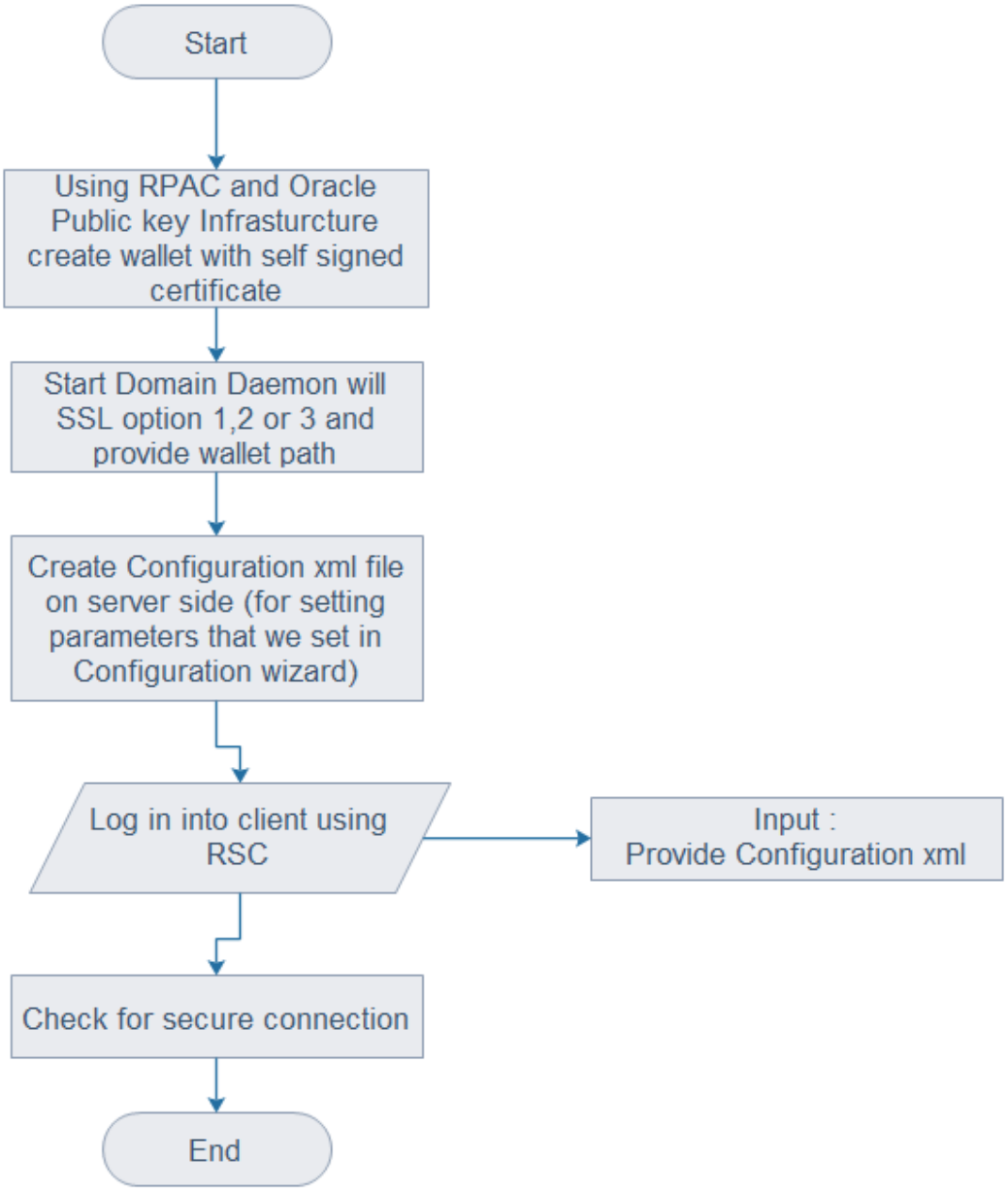
Manually setting wallet file in Client through GUI,



Open Classic Client



For automation purpose



Test case examples for SSL

1) Self Signed Certificate missing

2) Self Signed Certificate expired

3) Valid Self Signed Certificate

4) No SSL in Domain Daemon

5) No wallet path in Domain Daemon

6) Wrong wallet path in Domain Daemon

Chapter 4

Conclusion

Automation of various tasks like build, packaging, deployment, testing increases the effectiveness, efficiency and coverage of your software production and thus increasing the final quality of product.

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