

**Institute of Systems Science
National University of Singapore**

**GRADUATE CERTIFICATE
INTELLIGENT REASONING SYSTEMS**

Workshop Project Guide

Subject: Machine Reasoning

© 2019 National University of Singapore All Rights Reserved.

The contents contained in this document may not be reproduced in any form or by any means, without the written permission of Institute of Systems Science, National University of Singapore other than for the purpose for which it has been supplied

Institute of Systems Science, 25 Heng Mui Keng Terrace,
Singapore 119615



No description, website, or topics provided.

40 commits 1 branch 0 releases 2 contributors View license

Branch: master New pull request

This branch is 11 commits ahead of telescopeuser:master.

telescopeuser Merge pull request #14 from telescopeuser/master

| S-MR-Workshop1 | S-MR Workshop Guide Enhanced |
|----------------|---|
| S-MR-Workshop2 | S-MR Workshop Guide Enhanced |
| S-MR-Workshop3 | S-MR Workshop Guide Enhanced |
| S-MR-Workshop4 | S-MR Workshop Guide Enhanced |
| LICENSE | S-MR-Workshop1/project-io/getting-started.zip |
| README.md | uploaded S-MR Workshop Guide.pdf |

Clone with HTTPS

Use Git or checkout with SVN using the web URL.

<https://github.com/IRS-MR/S-MR-Workshop>

Open in Desktop **Download ZIP** (11 days ago)

11 days ago 3 months ago 2 months ago

README.md

Workshops & References <https://github.com/IRS-MR/S-MR-Workshop>



Virtual Machine Workstation <http://bit.ly/iss-vm>

Table of Contents

| | | |
|--------|---|-----|
| 1. | Workshop 1 – Rule/Process Reasoning System | 5 |
| 1.1. | Case Study of HDB BTO Recommender | 5 |
| 1.1.1. | Use case demo | 5 |
| 1.1.2. | System analysis & exploration | 8 |
| 1.2. | KIE BPMS/BRMS Suite Tutorial..... | 9 |
| 1.2.1. | Access/Install KIE “Knowledge Is Everything” | 9 |
| 1.2.2. | Business system: Mortgage application approval [Deploy] v2.0.0 | 12 |
| 1.2.3. | Business system: Smooth mortgage application..... | 23 |
| 1.2.4. | Business system: Erroneous mortgage application [Rule] | 36 |
| 1.2.5. | Business system: Mortgage amount calculation [Decision Table] v3.0.0 .. | 46 |
| 2. | Workshop 2 – Knowledge Modelling..... | 62 |
| 2.1. | { Optional } Knowledge Representation and Acquisition..... | 62 |
| 2.2. | KIE BPMS/BRMS Business System Enhancement..... | 63 |
| 2.2.1. | Business system enhancement [Data Objects]..... | 63 |
| 2.2.2. | Business system enhancement [Business Processes]..... | 66 |
| 2.2.3. | Business system enhancement [Forms]..... | 71 |
| 2.2.4. | Business system enhancement [Guided Rules]..... | 77 |
| 2.2.5. | Business system enhancement [Deploy] v4.0.0 | 91 |
| 2.2.6. | Business system enhancement [User Task] v5.0.0 [Optional] | 98 |
| 3. | Workshop 3 – Knowledge Discovery | 100 |
| 3.1. | Knowledge Discovery [Orange3] | 100 |
| 3.2. | KIE BPMS/BRMS Business System Enhancement..... | 106 |
| 3.2.1. | Business system enhancement [Decision Table] | 106 |
| 3.2.2. | Business system enhancement [Deploy] v6.0.0 | 145 |
| 4. | Workshop 4 – Minimum Viable Product (MVP)..... | 153 |
| 4.1. | KIE BPMS/BRMS Business System Enhancement..... | 153 |
| 4.1.1. | Access control [User/Group/Role] | 153 |
| 4.1.2. | Business system enhancement [Group]..... | 165 |
| 4.1.3. | Business system enhancement [Deploy] v7.0.0 | 168 |
| 4.1.4. | Workshop project submission [Export/Import] | 176 |

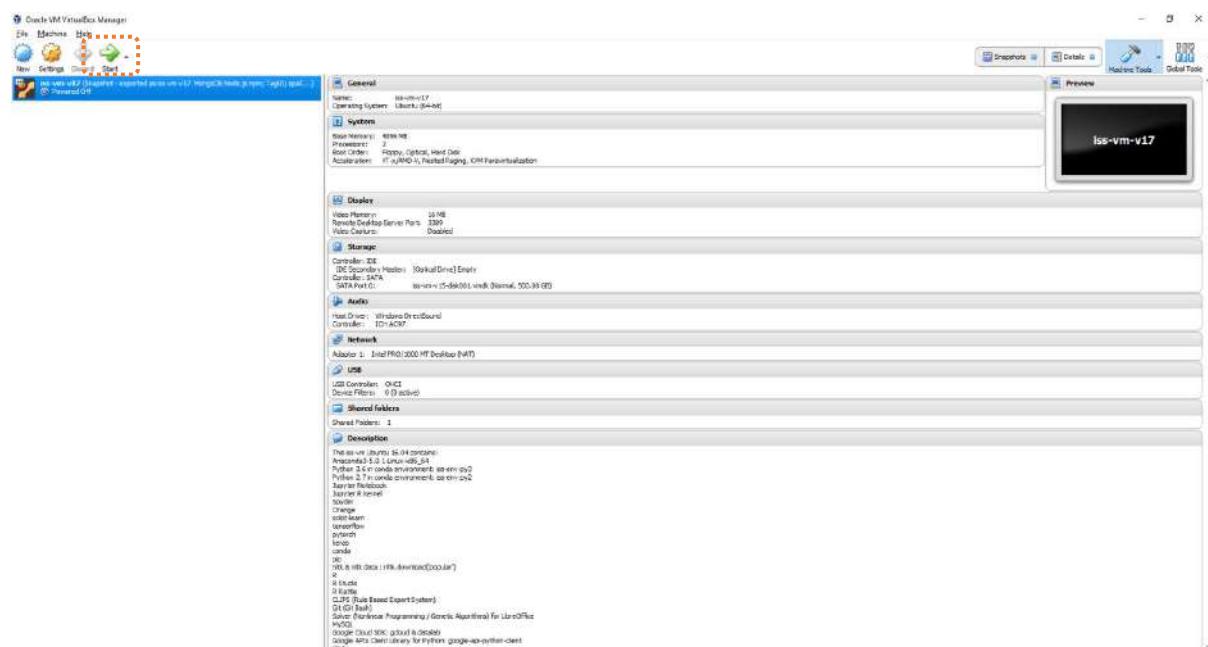
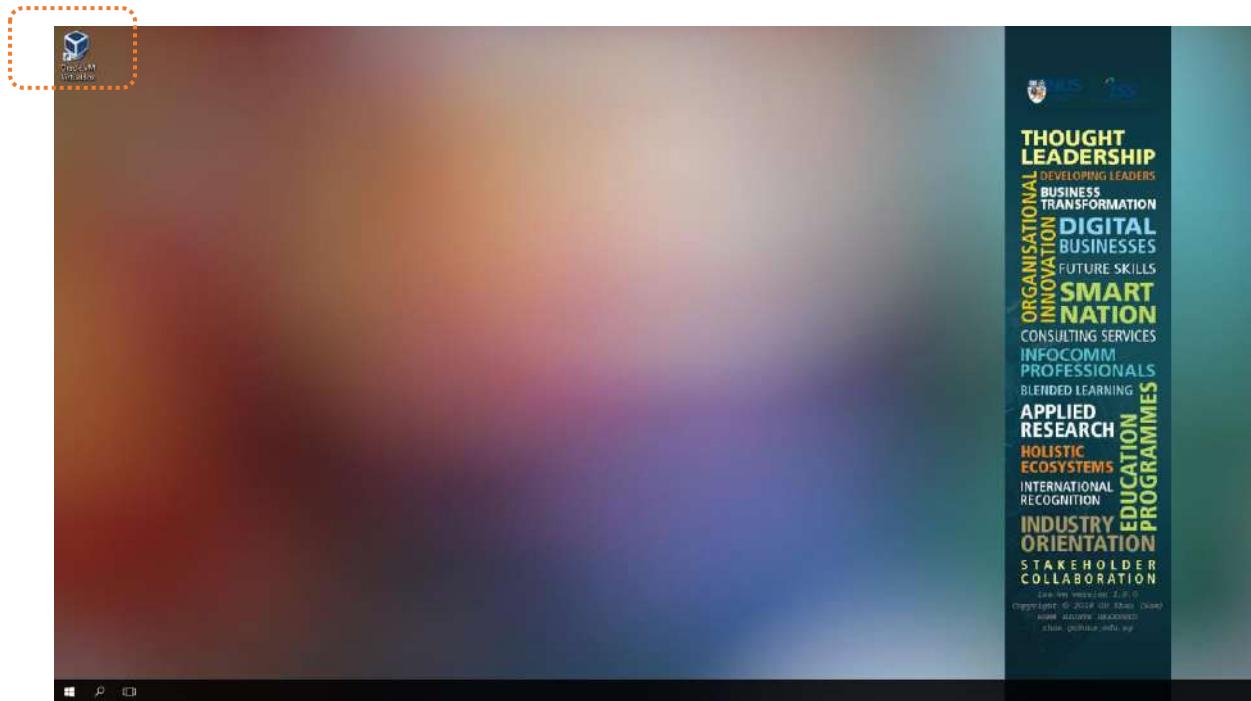
| | |
|---|-----|
| 5. ANNEX..... | 177 |
| 5.1. ANNEX 1 – Workshop Project Candidate | 177 |
| 5.1.1. Workshop Project Candidate One | 177 |
| 5.1.2. Workshop Project Candidate Two | 180 |
| 5.1.3. Workshop Project Candidate Three | 184 |
| 5.2. ANNEX 2 – Project Code Export & Import Using KIE Workbench | 185 |
| 5.2.1. Export project from KIE Workbench | 186 |
| 5.2.2. Import project into KIE Workbench | 187 |
| 5.3. ANNEX 3 – Workshop Project Submission..... | 190 |

1. Workshop 1 – Rule/Process Reasoning System

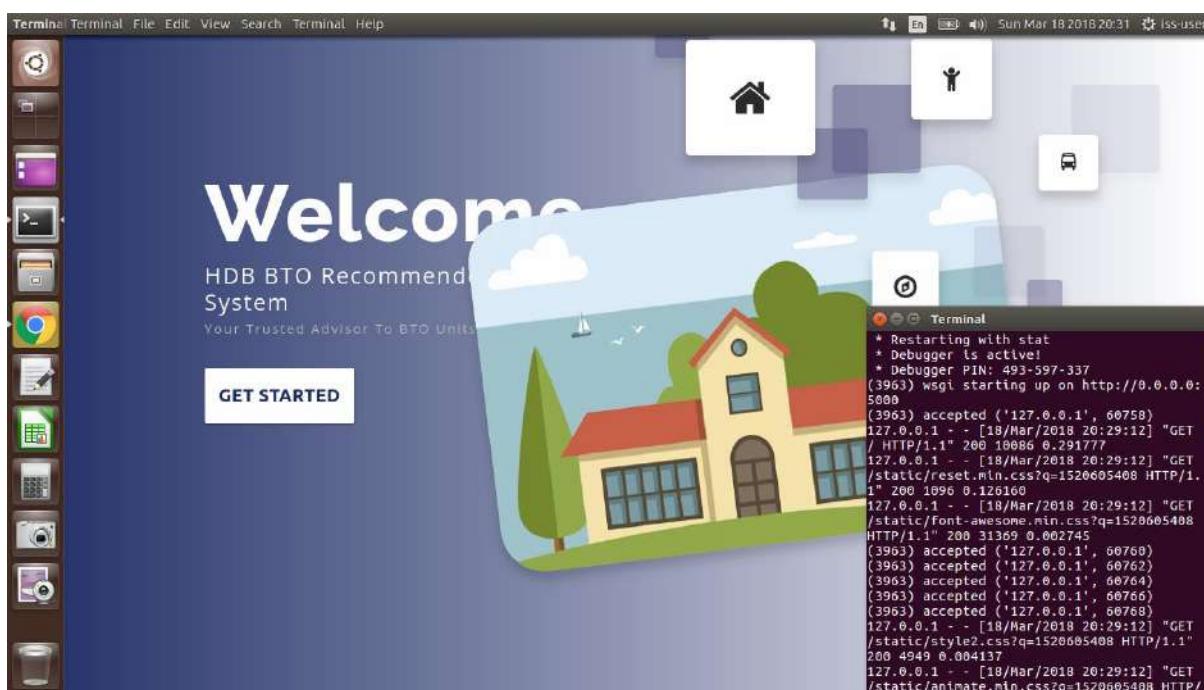
1.1. Case Study of HDB BTO Recommender

1.1.1. Use case demo

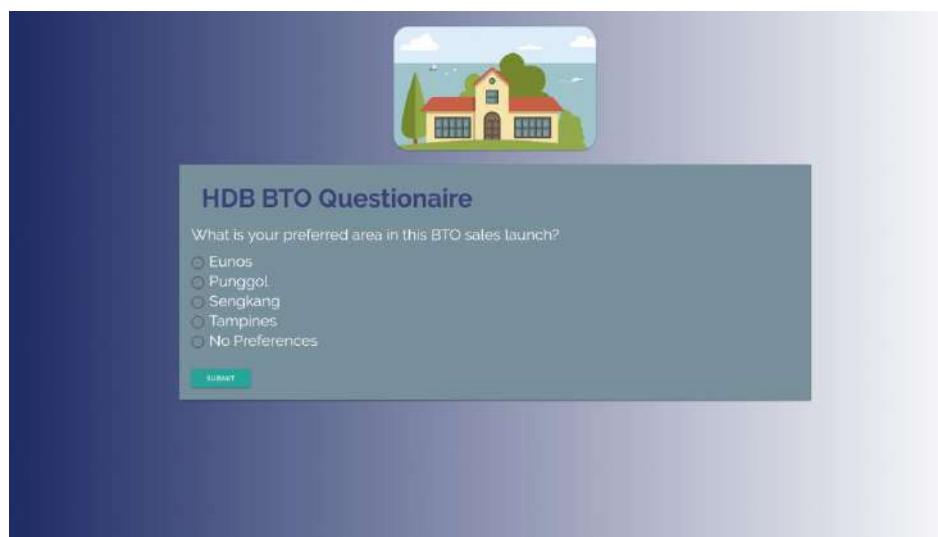
- 1) Start host computer → Oracle VM VirtualBox → iss-vm virtual machine



2) From iss-vm (Ubuntu Linux) desktop, start 'Solution HDB BTO'



- 3) Use the system by keying in user (your) preferences to receive recommendations.



HDB BTO Questionnaire

Our recommendations:
We recommend you a high level 5-room flat facing North/South near an MRT, childcare facilities and a hawker centre.
Here are the closest available units that fit your budget of \$480,000

| Project | Address | Block | Level | Unit | Price | Room Type | Direction | Floor Area | Completion Date |
|-----------------|-------------------|-------|-------|------|-----------|-----------|-----------|------------|-----------------|
| FERNVALE GLADES | SENGKANG WEST WAY | 460A | 14 | 77 | \$402,000 | 5-room | N-S | 113 Sqm | 30-Apr-21 |
| FERNVALE GLADES | SENGKANG WEST WAY | 460B | 14 | 103 | \$402,000 | 5-room | N-S | 113 Sqm | 30-Apr-21 |
| FERNVALE GLADES | SENGKANG WEST WAY | 461B | 14 | 133 | \$402,000 | 5-room | N-S | 113 Sqm | 30-Jun-21 |

Alternatives which may interest you (based on top result)
5-room Units for Block 460A in Project FERNVALE GLADES:
Available Booked

| Level / Unit | 77 | 79 | 87 | 89 |
|--------------|-----------|-----------|-----------|-----------|
| 14 | \$402,000 | \$402,000 | \$402,000 | \$402,000 |
| 13 | \$396,500 | \$396,500 | \$396,500 | \$396,500 |
| 12 | \$391,000 | \$391,000 | \$391,000 | \$391,000 |
| 11 | \$385,500 | \$385,500 | \$385,500 | \$385,500 |
| 10 | \$380,000 | \$380,000 | \$380,000 | \$380,000 |
| 9 | \$374,500 | \$374,500 | \$374,500 | \$374,500 |
| 8 | \$369,000 | \$369,000 | \$369,000 | \$369,000 |
| 7 | \$363,500 | \$363,500 | \$363,500 | \$363,500 |
| 6 | \$358,000 | \$358,000 | \$358,000 | \$358,000 |
| 5 | \$352,500 | \$352,500 | \$352,500 | \$352,500 |
| 4 | \$347,000 | \$347,000 | \$347,000 | \$347,000 |
| 3 | \$341,500 | \$341,500 | \$341,500 | \$341,500 |
| 2 | \$336,000 | \$336,000 | \$336,000 | \$336,000 |

1.1.2. System analysis & exploration

- 1) Go to website:

<https://github.com/IRS-PM/Workshop-Project-Submission-Template>

No description, website, or topics provided.

| 13 commits | 1 branch | 0 releases | 1 contributor |
|--|------------------|--|---------------|
| Branch: master | New pull request | | |
| This branch is 1 commit ahead of telescopeuser:master. | | Clone with HTTPS Use Git or checkout with SVN using the web URL. https://github.com/IRS-PM/Workshop-Proje | |
| Miscellaneous | Initial | Open in Desktop | Download ZIP |
| ProjectReport | Initial | | 23 days ago |
| SystemCode/clips | Initial | | 23 days ago |
| UserGuide | Initial | | 9 days ago |
| README.md | updated readme | | |

- 2) Read SECTION 1, 2, 3, 5, 6, 7 to understand knowledge based HDB BTO recommender system.
- 3) Sign up a GitHub account for yourself if you haven't have one.



{ Tips } Workshop Project Submission Template: Github Repository & Zip File

[Naming Convention] CourseCode-StartDate-BatchCode-Group_or_Individual-TeamName_or_PersonName-ProjectName.zip

- [MTech Group Project Naming Example] IRS-MR-2019-01-19-IS01PT-GRP-AwsomeSG-HDB_BTO_Recommender.zip
- [MTech Individual Project Naming Example] IRS-MR-2019-07-01-IS01FT-IND-SamGuZhan-HDB_BTO_Process.zip
- [EEP Group Project Naming Example] IRS-MR-2019-03-13-EEP-GRP-AwsomeSG-HDB_BTO_Recommender.zip
- [EEP Individual Project Naming Example] IRS-MR-2019-08-22-EEP-IND-SamGuZhan-HDB_BTO_Process.zip

1.2. KIE BPMS/BRMS Suite Tutorial

1.2.1. Access/Install KIE “Knowledge Is Everything”

{ Objective } Install BPMS/BRMS product suite to develop and deploy a business machine reasoning system.

The screenshot shows the KIE Group website with a dark background featuring a grid of white squares. At the top, there's a navigation bar with the KIE GROUP logo, followed by links for DROOLS, OPTAPLANNER, JBPM, APPFORMER, and a Red Hat logo. The main content area is titled "DROOLS" and contains a brief description of what Drools is: "Drools is a business rule management system with a forward-chaining and backward-chaining inference based rules engine, allowing fast and reliable evaluation of business rules and complex event processing. A rule engine is also a fundamental building block to create an expert system which, in artificial intelligence, is a computer system that emulates the decision-making ability of a human expert."

DROOLS

Drools is a business rule management system with a forward-chaining and backward-chaining inference based rules engine, allowing fast and reliable evaluation of business rules and complex event processing.

[Read more →](#)

OPTAPLANNER

OptaPlanner is a constraint solver that optimizes use cases such as employee rostering, vehicle routing, task assignment and cloud optimization.

[Read more →](#)

JBPM

jBPM is a flexible Business Process Management suite allowing you to model your business goals by describing the steps that need to be executed to achieve those goals.

[Read more →](#)

APPFORMER

AppFormer is a low code platform to develop modern applications. It's a powerful tool for developers that can easily build applications by mashing up components and connect them to other Red Hat modules and software.

We make building apps looks easy.

[Read more →](#)

KIE / Business Central

<http://www.kiegroup.org/>

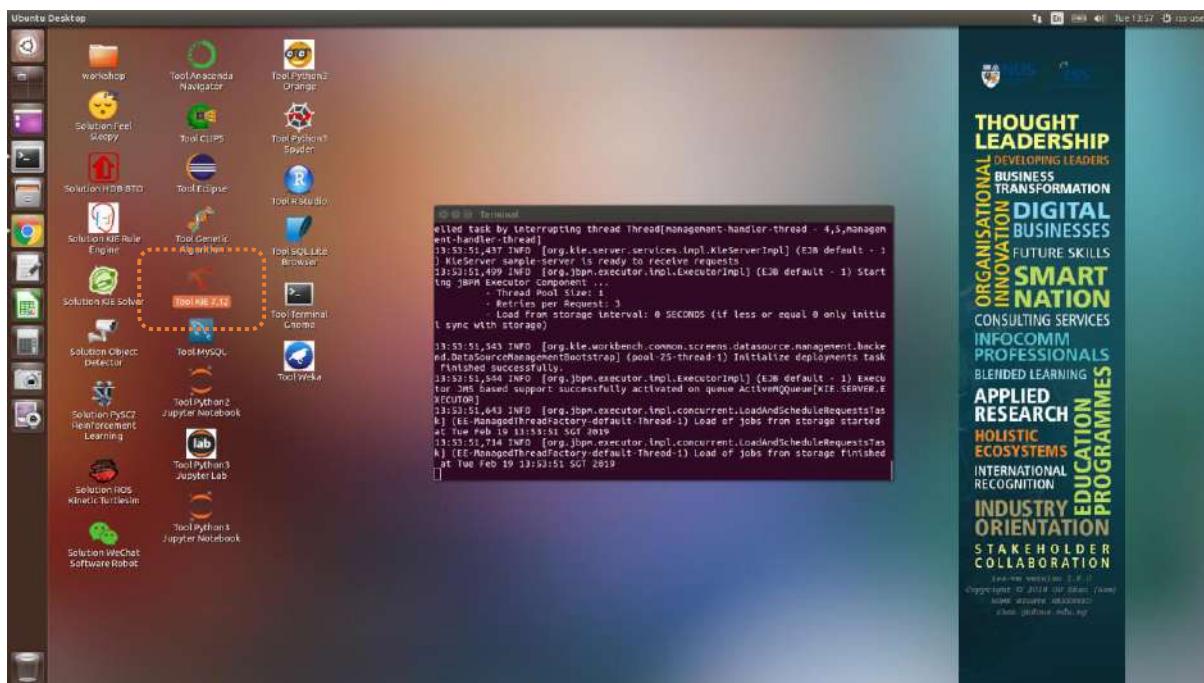
KIE BRMS: Drools

<http://www.drools.org/>

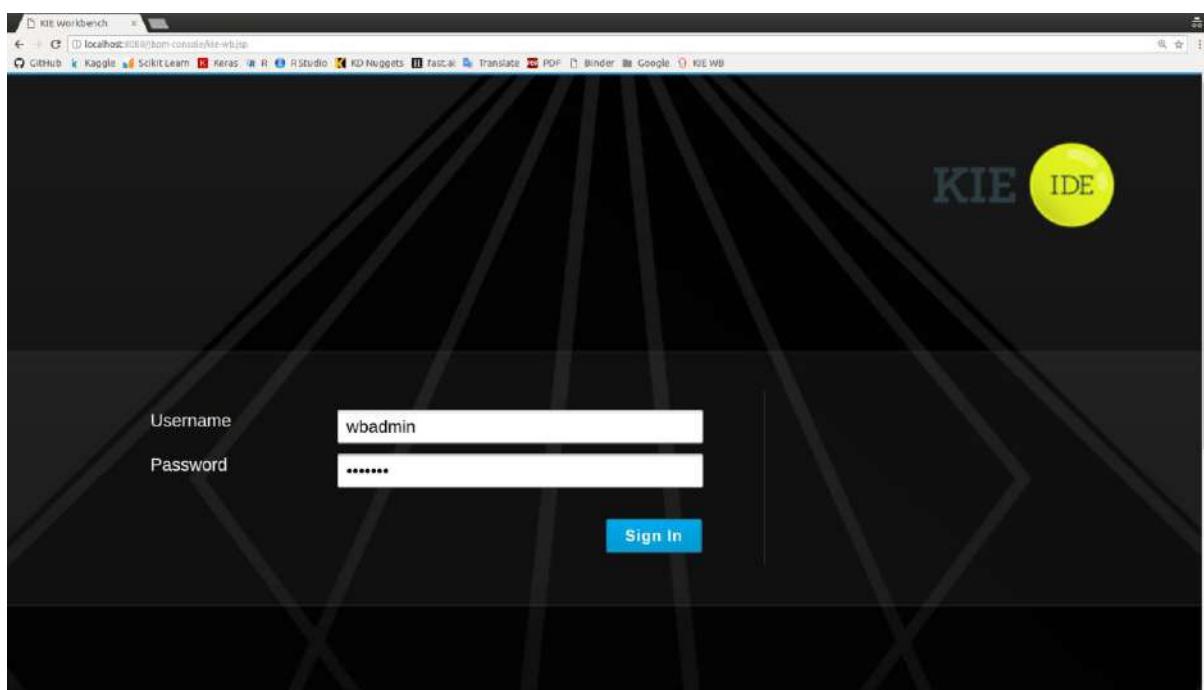
KIE BPMS: jBPM

<http://www.jbpm.org/>

- From desktop, start 'Tool KIE' (It takes several minutes to start KIE server).



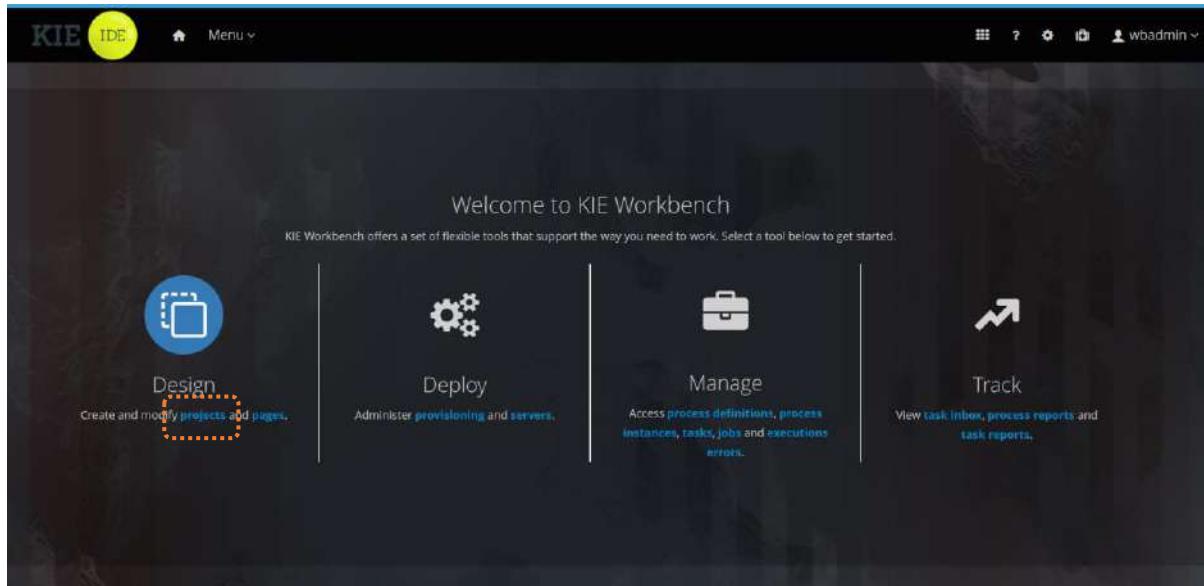
- Start 'Chrome' web browser; Go to web link:
<http://localhost:8080/jbp-console>



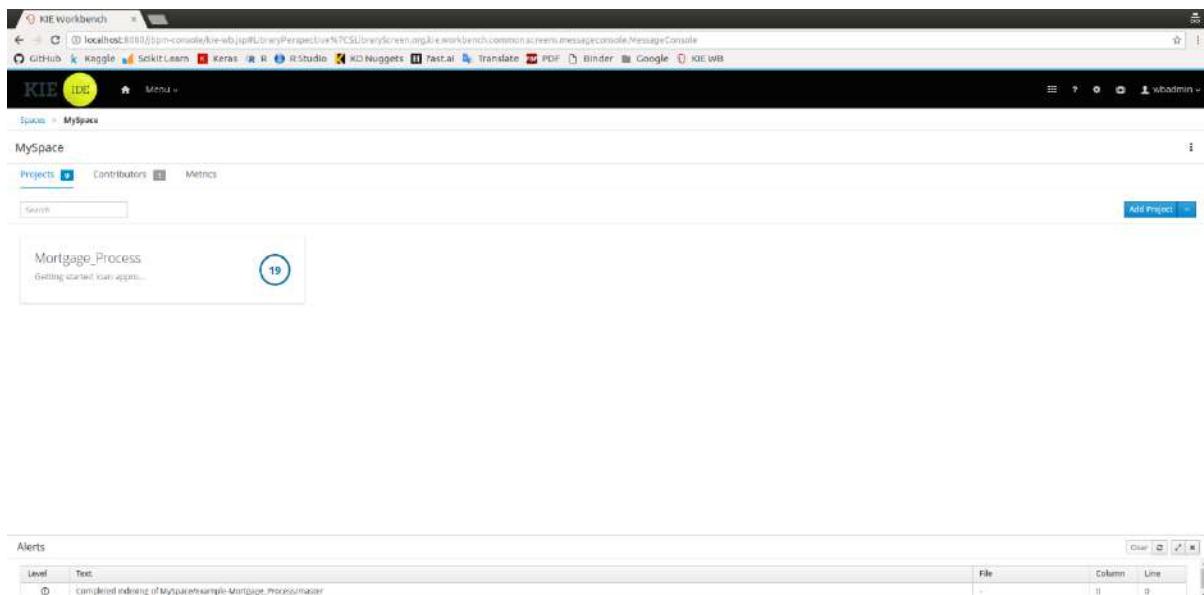
- Login using:

Username : **wbadmin**
Password : **wbadmin**

4) Below KIE Workbench should be displayed in web browser:



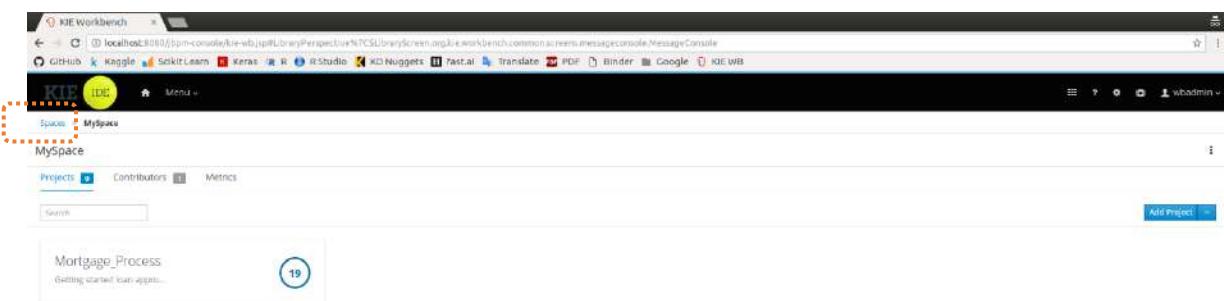
5) Click **projects** under Design



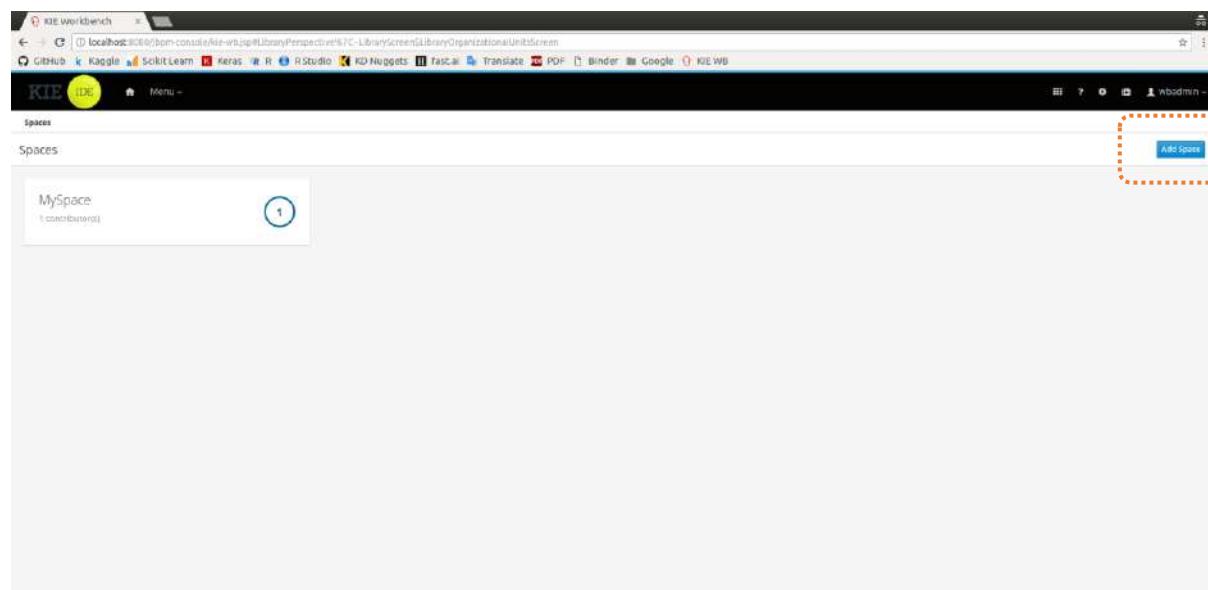
1.2.2. Business system: Mortgage application approval [Deploy] v2.0.0

{ Objective } Deploy a mortgage application BPMS/BRMS system for business use.

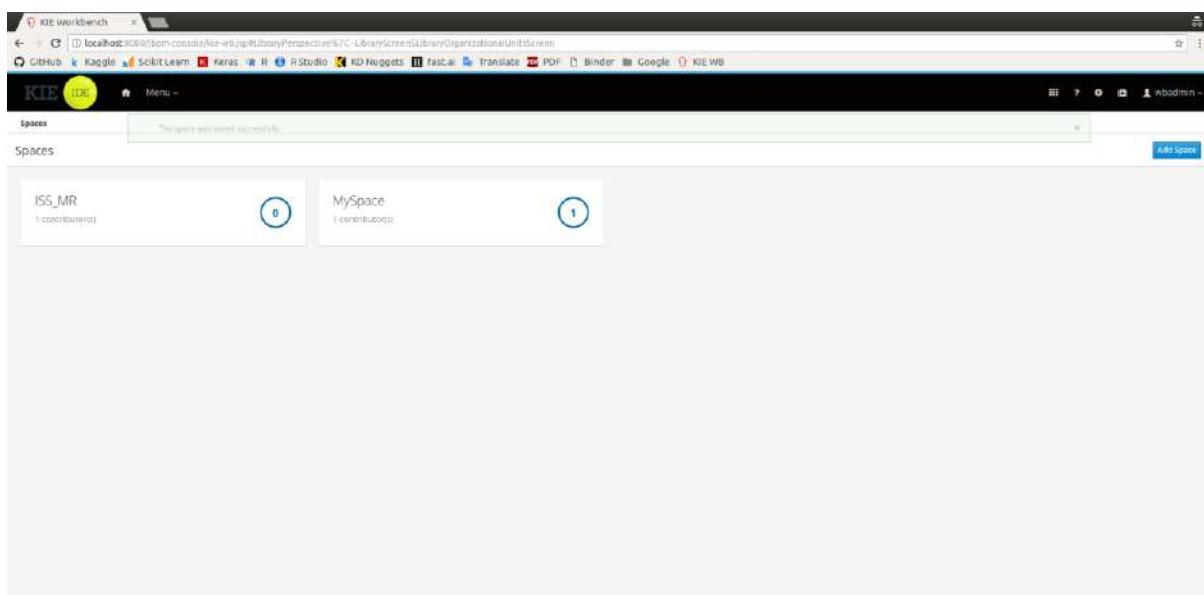
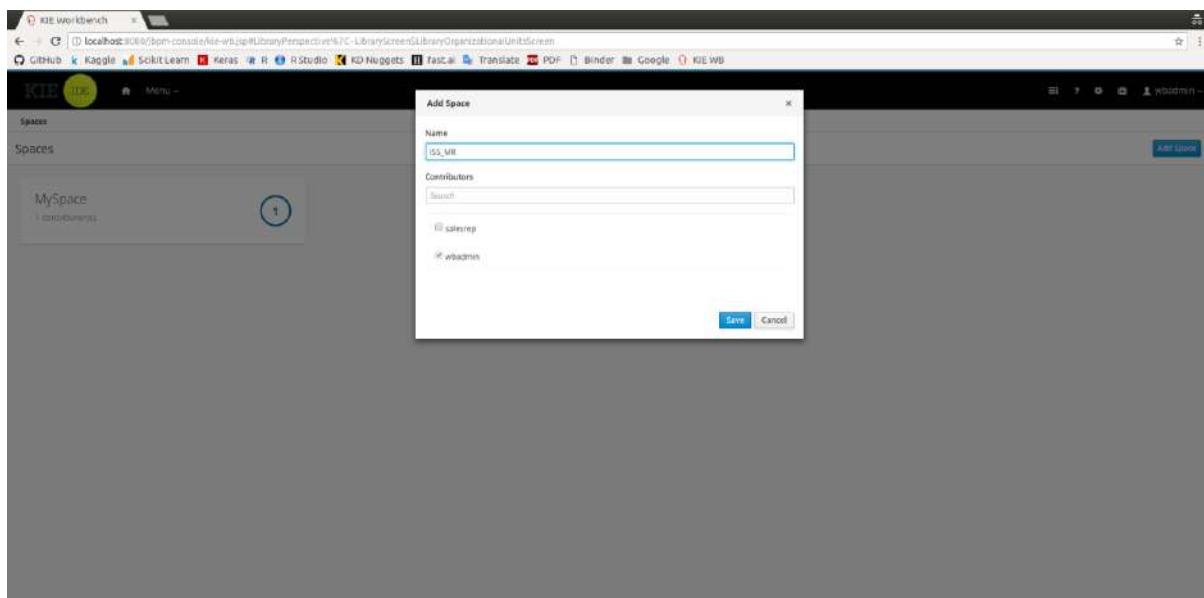
1) Click Spaces



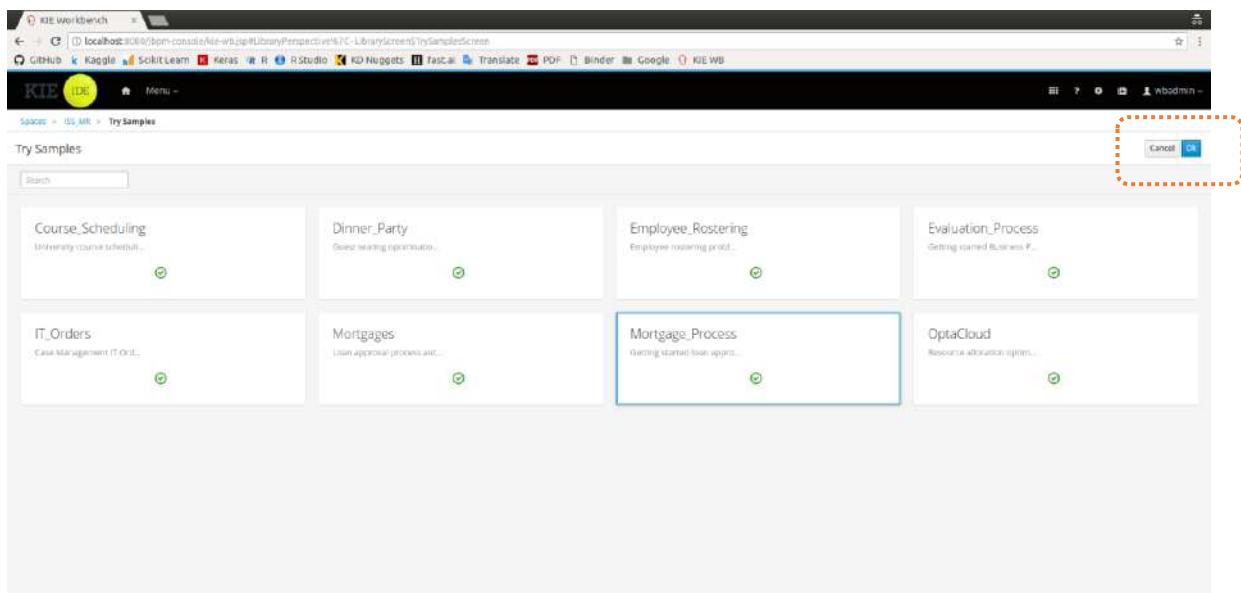
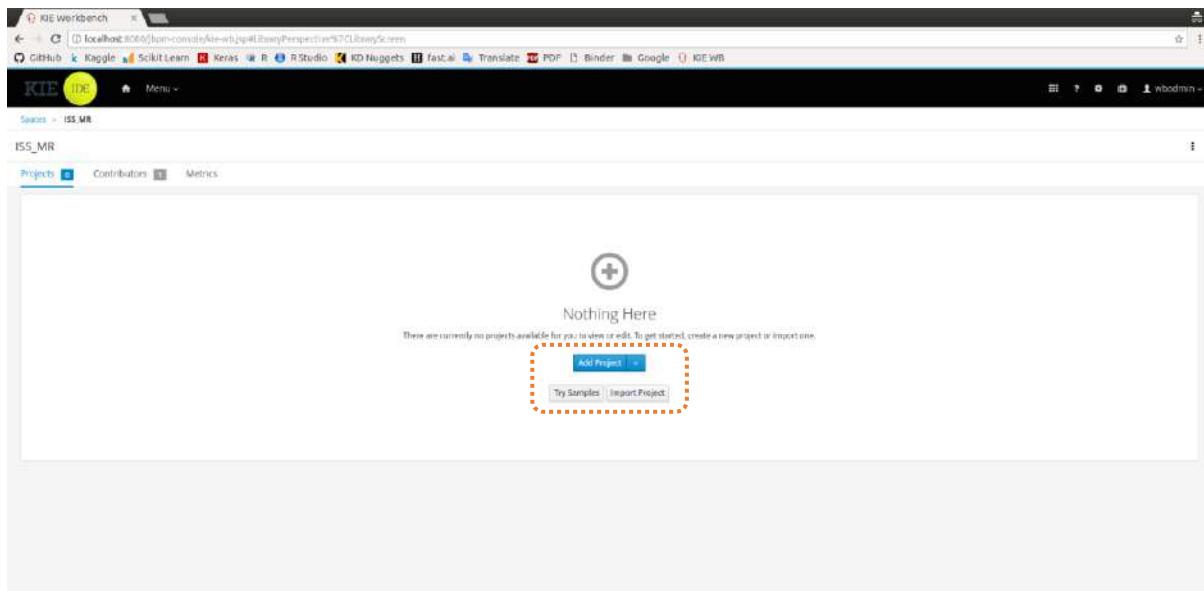
2) Create a new space: Click blue button: **Add Space**; Key in field Name: **ISS_MR**



3) Enter Space Name: **ISS_MR**



- 4) Click button: **Try Samples**, Select ‘**Mortgage_Process**’, Click blue button: **OK**



The screenshot shows the KIE Workbench interface with the following details:

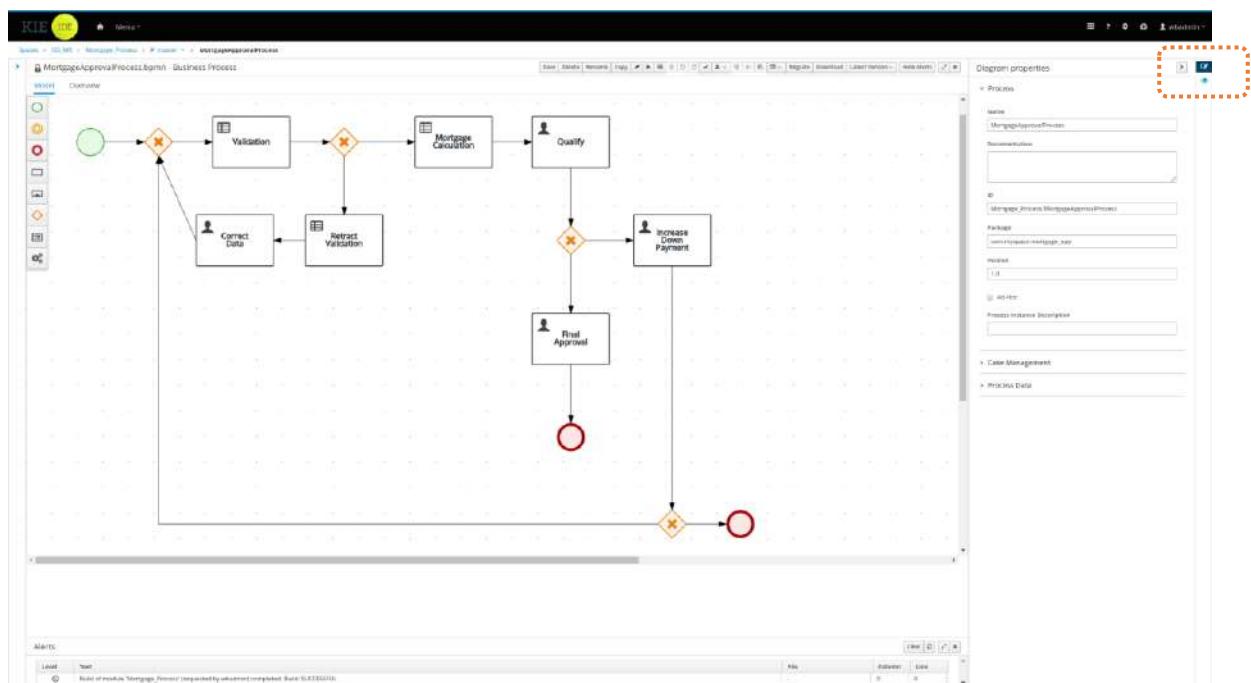
- Toolbar:** Contains icons for GitHub, Kaggle, Scikit-Learn, Keras, R, RStudio, KD Nuggets, Translate, PDF, Binder, Google, and KIE WB.
- Header:** Shows "KIE Workbench" and "localhost:8080/bom-console/kie-wb.jsp?libraryPerspective%7C-LibraryScreen&ProjectScreen".
- Navigation:** "Space" > "ISS ML" > "Mortgage_Process" > "Y master".
- Buttons:** "Build", "Deploy", "View Alerts", and "Import Asset".
- Section:** "Assets" (selected), "Contributors", "Metrics", "Settings".
- Table:** Lists assets with the following columns:
 - Icon:** Various icons representing different asset types (e.g., Applicant, Application, ApplicationError, ApplicationMortgage).
 - Name:** The asset name (e.g., Applicant, Data Objects, Form, Data objects, Forms, ApplicationMortgage).
 - Type:** The type of asset (e.g., Forms, Data Objects, Form, Data objects, Forms).
 - Last modified:** Last modified today.
 - Created:** Created today.
- Pagination:** "1-15 of 22" with page numbers 1, 2, and "of 2".
- Buttons:** "Import Asset" and "Add Asset".

5) Scroll down Assets list; Click to edit **Business Processes: MortgageApprovalProcess**

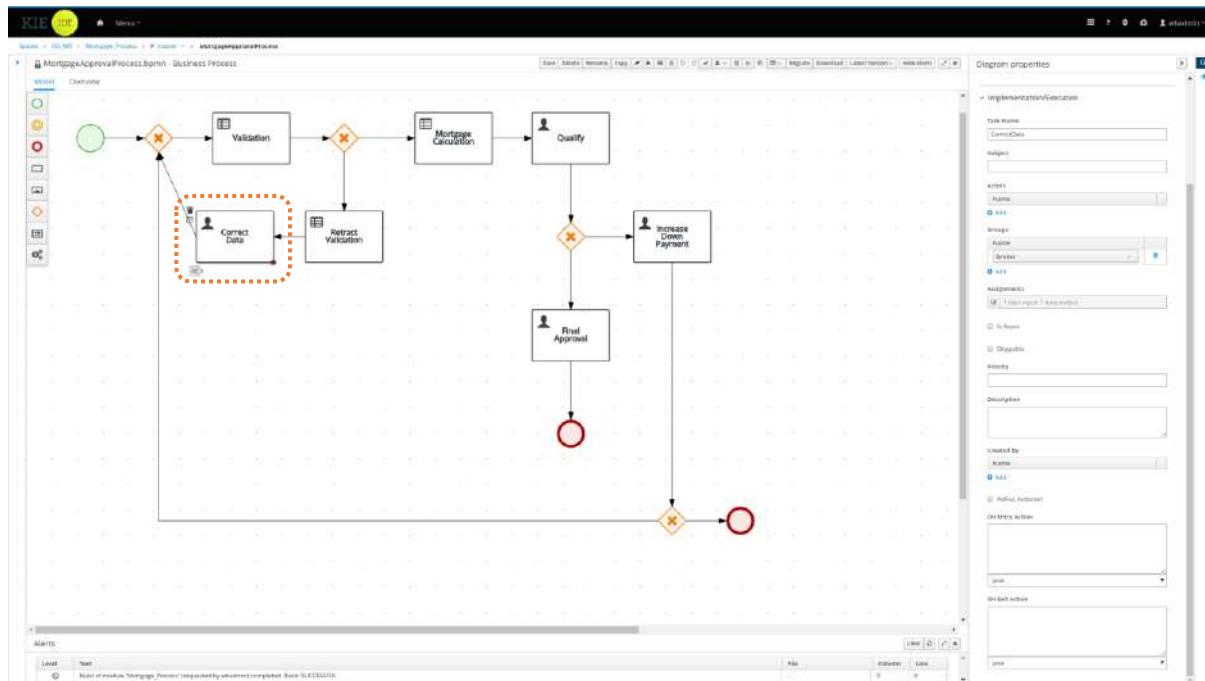
The screenshot shows the KIE Workbench interface with the title bar "KIE IDE". Below it, the URL is "localhost:8080/kie-console/#/edit-wb/libraryPerspective%2FlibraryScreen%2FProjectScreen". The main area displays a list of assets under the "Assets" tab. One asset, "MortgageApprovalProcess", is highlighted with a red dashed border.

| Name | Type | Last modified | Created |
|---|------------------------|---------------|---------|
| ApplicationMortgage | Forms | Today | Today |
| CorrectData-taskform | Forms | Today | Today |
| FinalApproval-taskform | Forms | Today | Today |
| IncreaseDownPayment-taskform | Forms | Today | Today |
| mortgage-app.MortgageApprovalProcess-taskform | Forms | Today | Today |
| Mortgage_Process.MortgageApprovalProcess-taskform | Forms | Today | Today |
| MortgageApprovalProcess | Business Process | Today | Today |
| MortgageDecisionTable | Guided Decision Tables | Today | Today |
| Property | Forms | Today | Today |

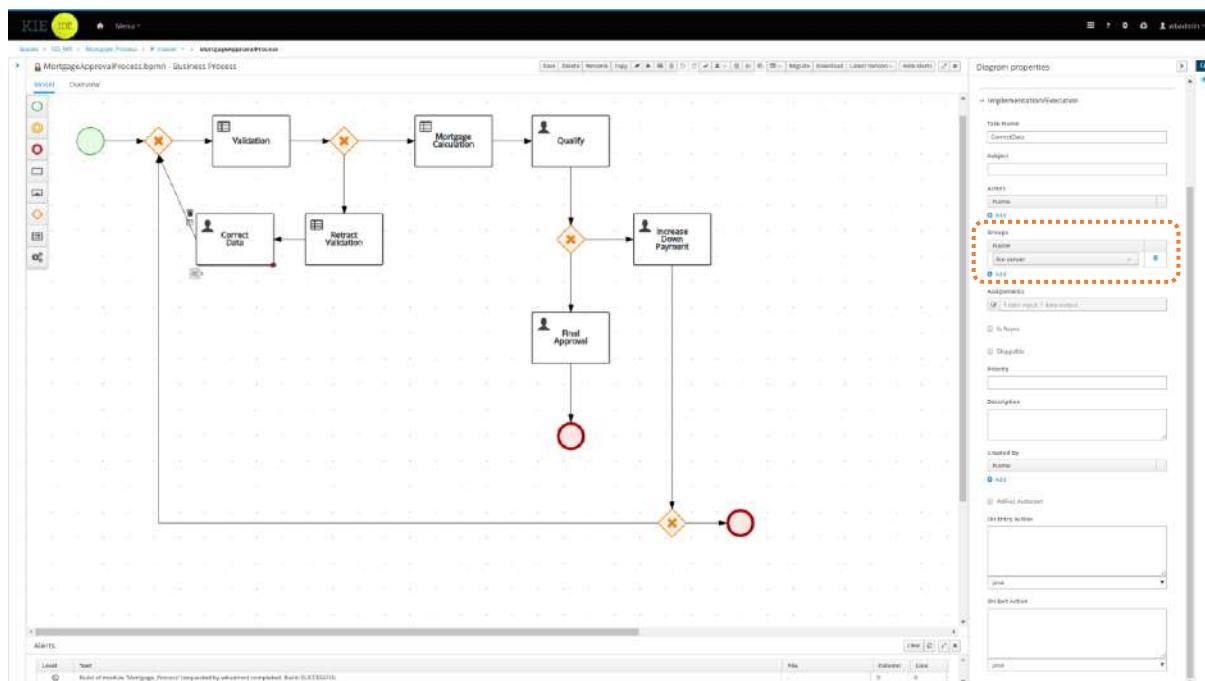
6) Click upper right corner icon: **Diagram properties**



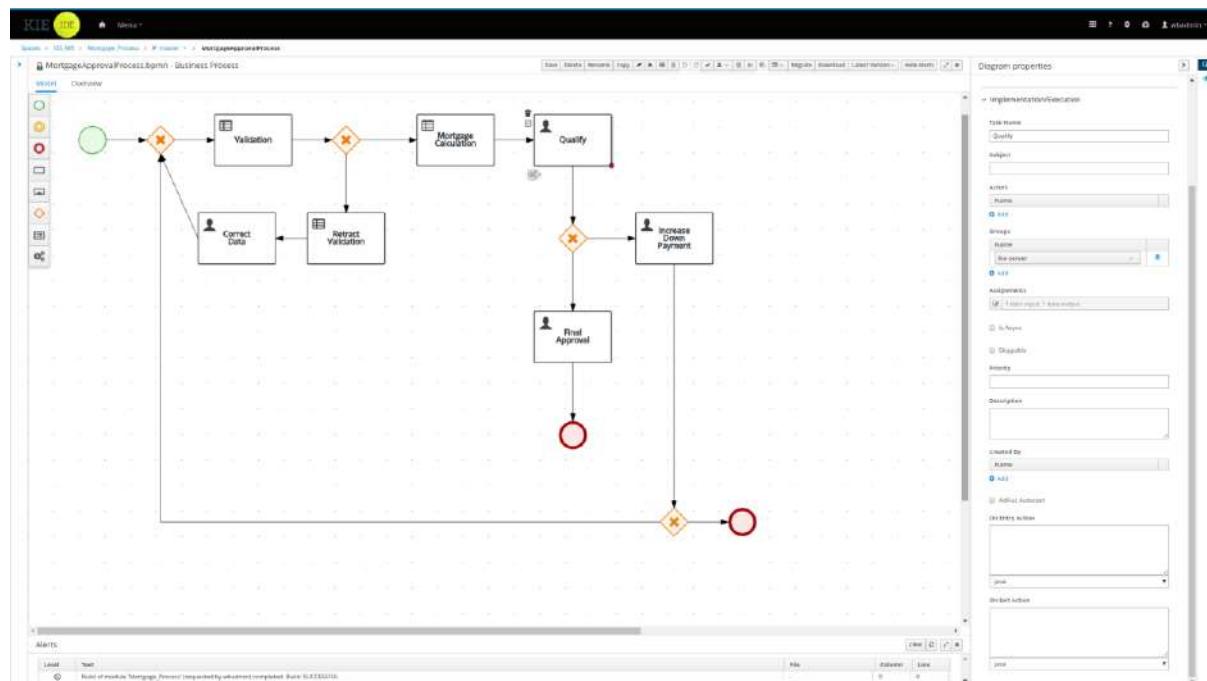
- 7) Click **Business User Task: Correct Data**; then expand **Implementation/Execution** at the right **Diagram properties** panel.



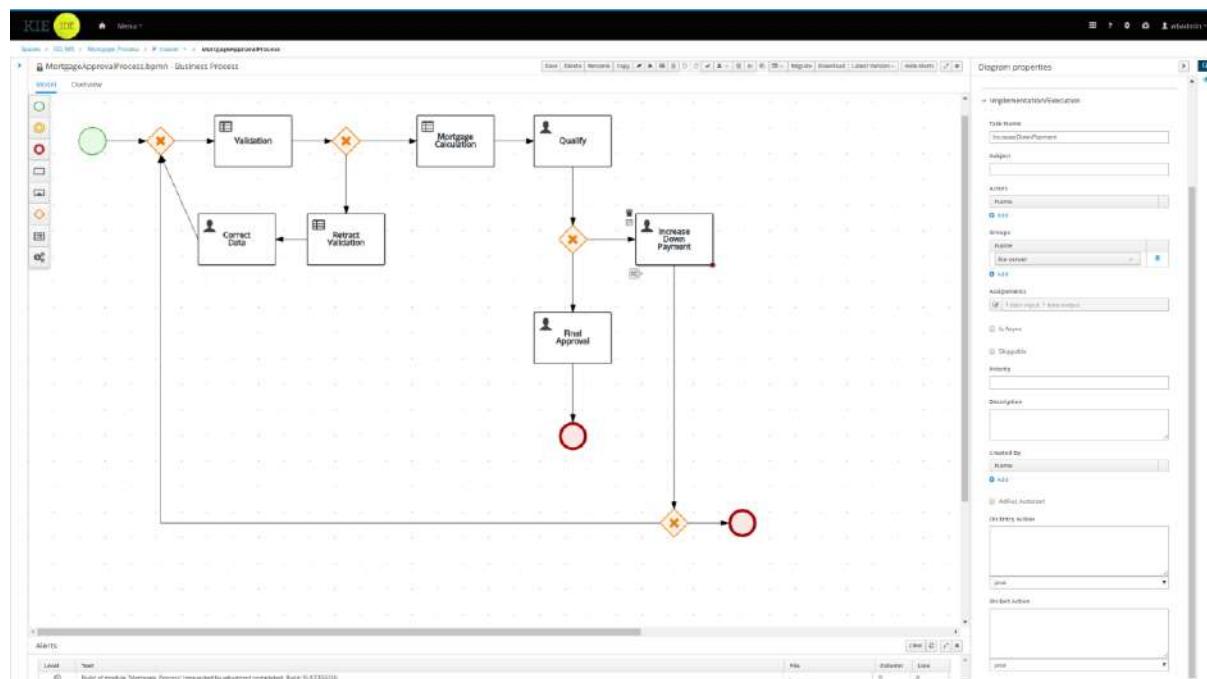
- 8) Update **Groups: Name** field value from: **broker** to: **kie-server**



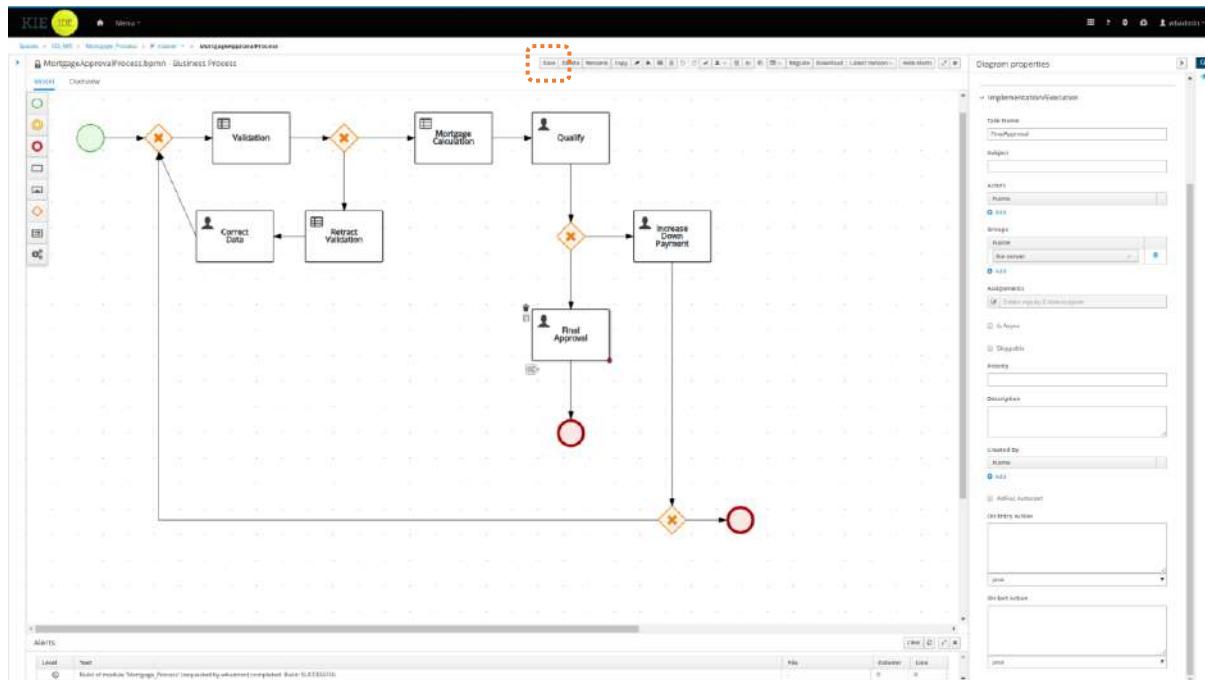
9) Repeat the Groups: Name update for Business User Task: *Quality*



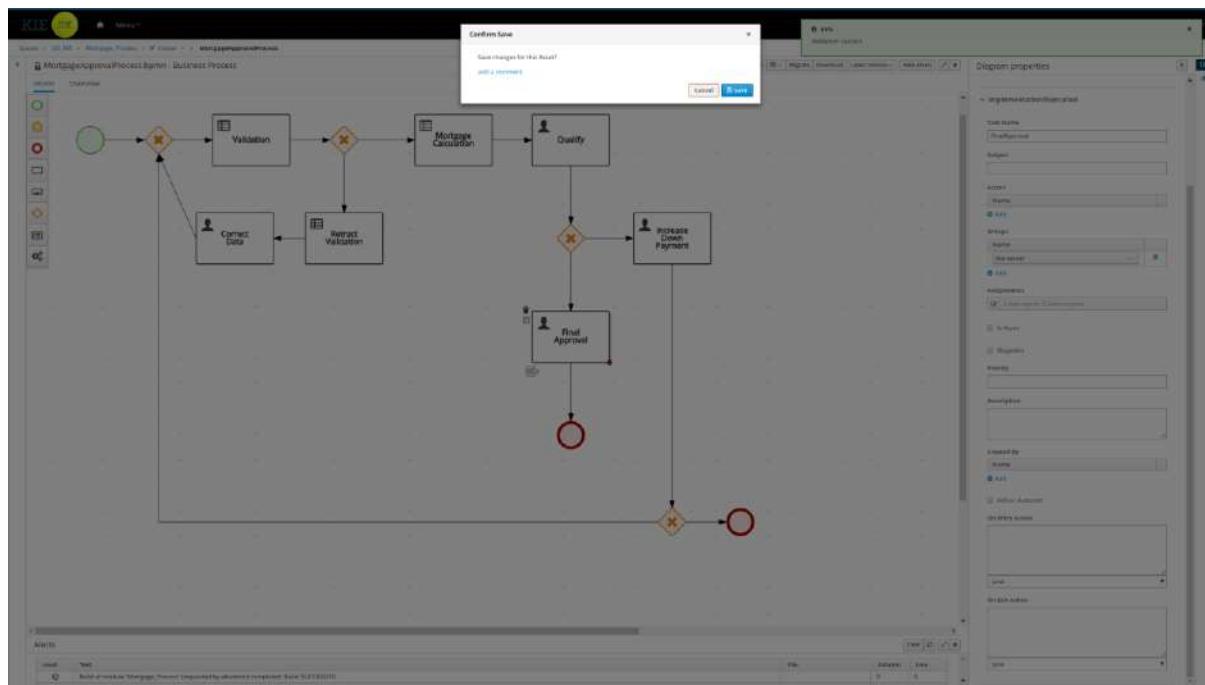
10) Repeat the Groups: Name update for Business User Task: *Increase Down Payment*

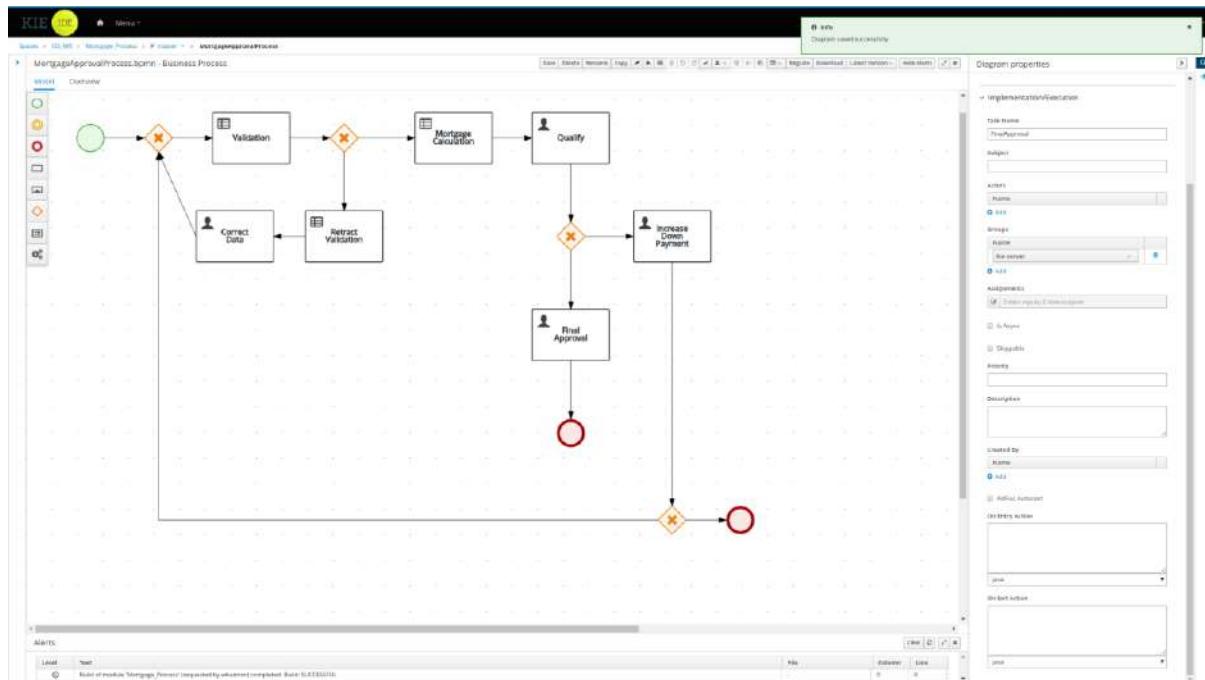


11) Repeat the Groups: Name update for Business User Task: *Final Approval*

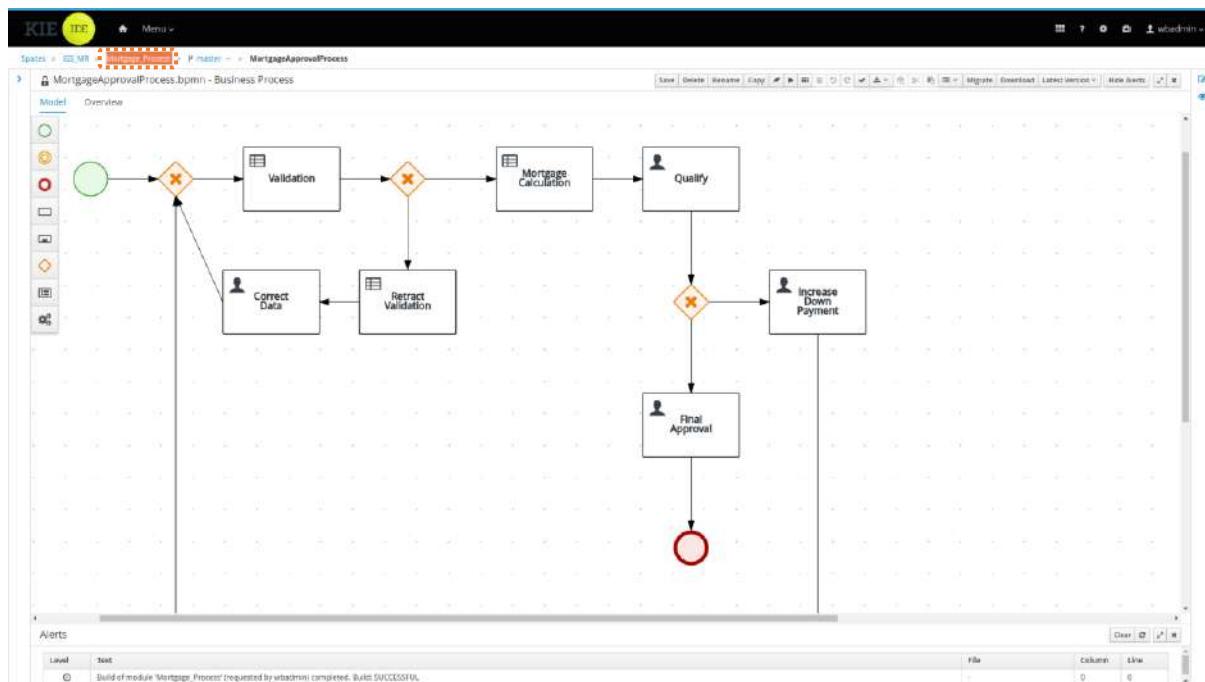


12) Click button: **Save**; Followed by clicking confirmation blue button: **Save**

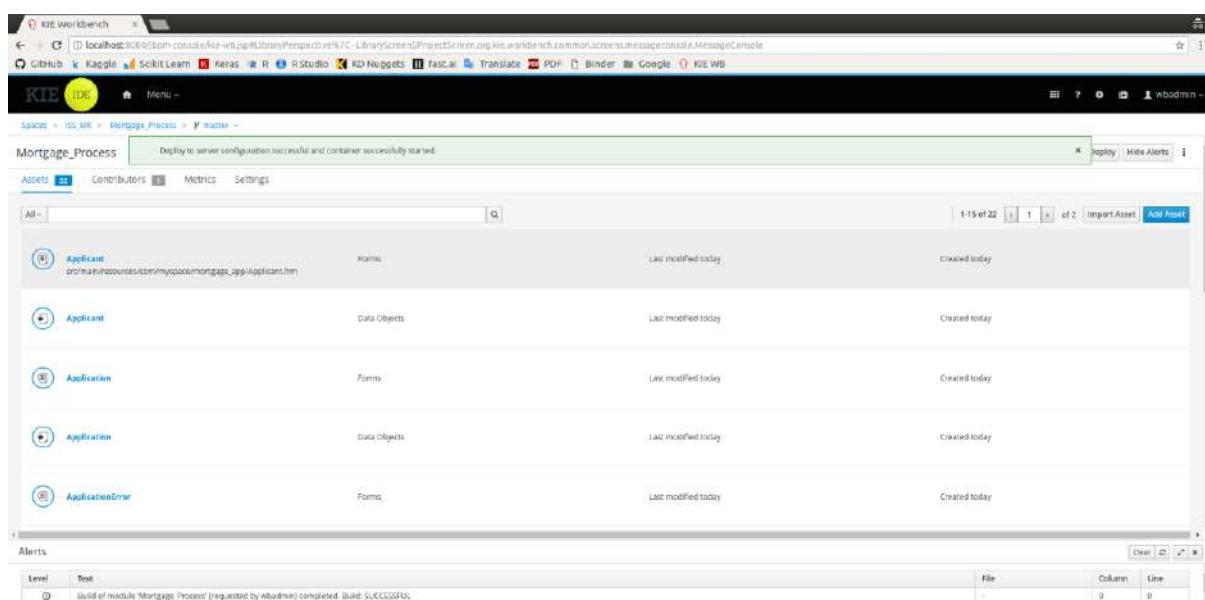
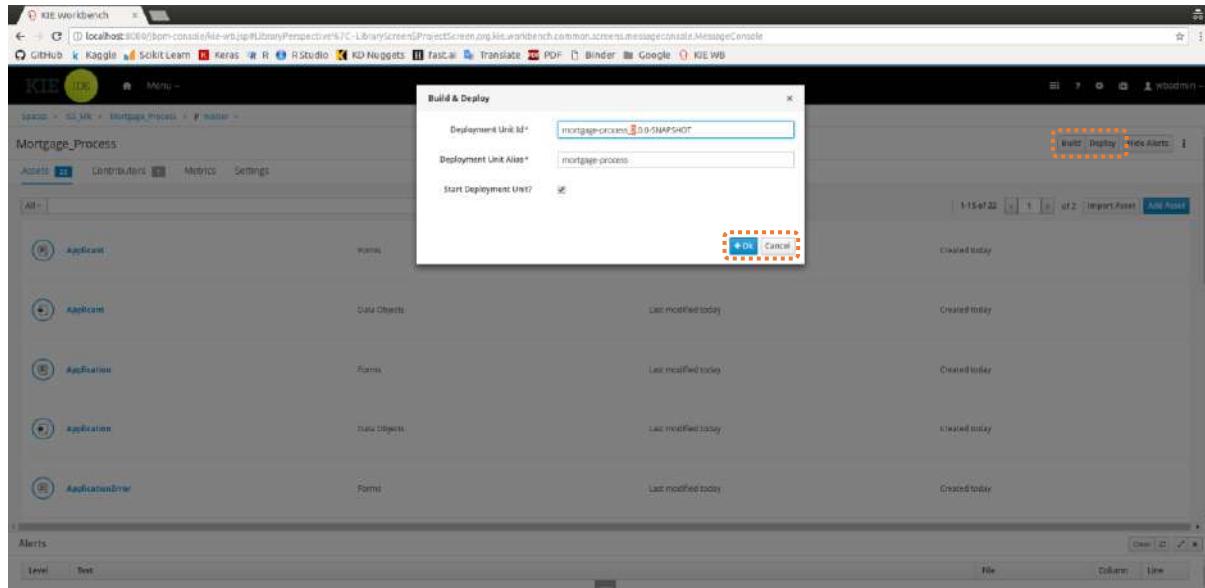




13) Click **Mortgage_Process** link to go back to **Assets** list view.



14) Click button: **Deploy**; Update Deployment Unit Id*: **mortgage-process_2.0.0-SNAPSHOT**; Click blue button **OK**



15) To verify successfully deployed **Mortgage_Process** business application, click: **Menu → Execution Servers**

The screenshot shows the KIE Workbench interface. In the top navigation bar, the URL is localhost:8080/kie-console/kie-wb/applicationsManagement/rest/services/restServerManagementBrowse. The main area has a title "Deploy" with a dashed orange border. Below it is a sub-section titled "Provisioning Document Servers". On the right side, there are three columns: "Manage" (Process Definitions, Process instances, Tasks, Jobs, Execution Orders), "Track" (Task Index, Process Reports, Task Report), and "Alerts" (Level: Text, showing a log entry: "Build of module 'mortgage_process' requested by wbadmin completed, result: SUCCESSFUL"). Below the main title, there is a table listing four applications:

| Icon | Application | Data Objects | Last modified today | Created today |
|------|------------------|--------------|---------------------|---------------|
| | Applicant | Data Objects | Last modified today | Created today |
| | Application | Forms | Last modified today | Created today |
| | Application | Data Objects | Last modified today | Created today |
| | ApplicationError | Forms | Last modified today | Created today |

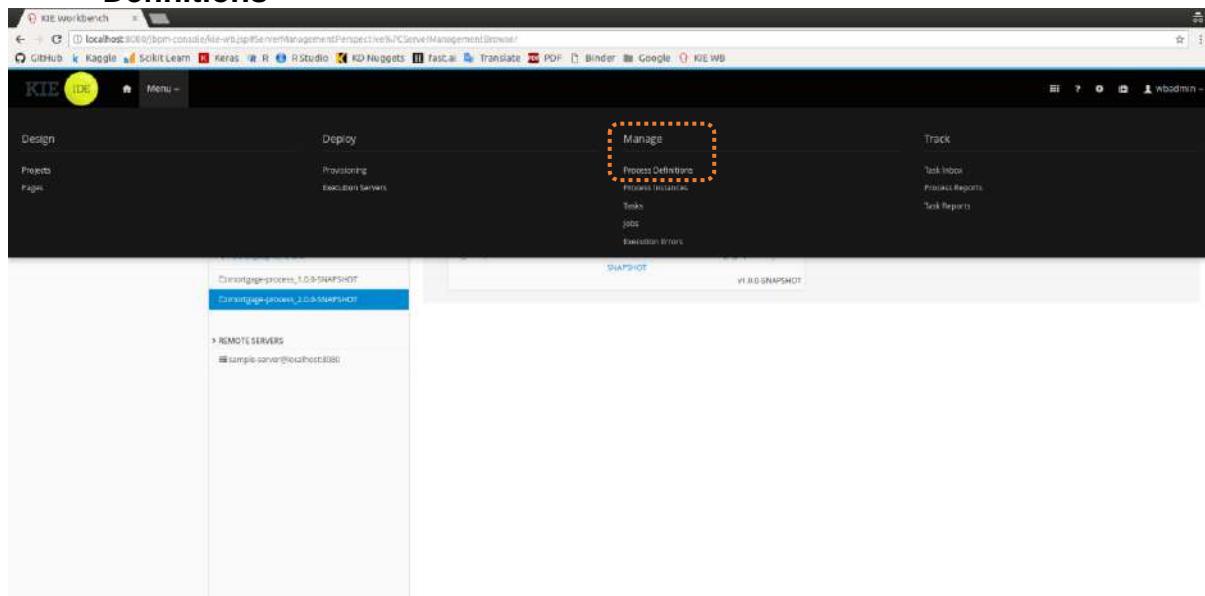
The screenshot shows the KIE Workbench interface with a different URL: localhost:8080/bpm-console/kie-wb/applicationsManagement/restServerManagementBrowse. The left sidebar has a "SERVER CONFIGURATIONS" section with a "sample-server" configuration selected. This configuration has "Capabilities" (Decision, Process, Planner) and "DEPLOYMENT UNITS" (Add Deployment Unit). A deployment unit named "mortgage-process_2.0.0-SNAPSHOT" is highlighted with a dashed orange border. The main panel shows the "mortgage-PROCESS" application with a "Status" tab. It displays a deployment entry for "sample-server@localhost:8080" with a link to its status page: http://localhost:8080/kie-server/services/rest/server/containers/mortgage-process_2.0.0-SNAPSHOT. The status page shows a "V1.0.0 SNAPSHOT" message.

{ Tips } Above shows: **mortgage-process_2.0.0-SNAPSHOT** is successfully deployed onto KIE web server: http://localhost:8080/kie-server/services/rest/server/containers/mortgage-process_2.0.0-SNAPSHOT

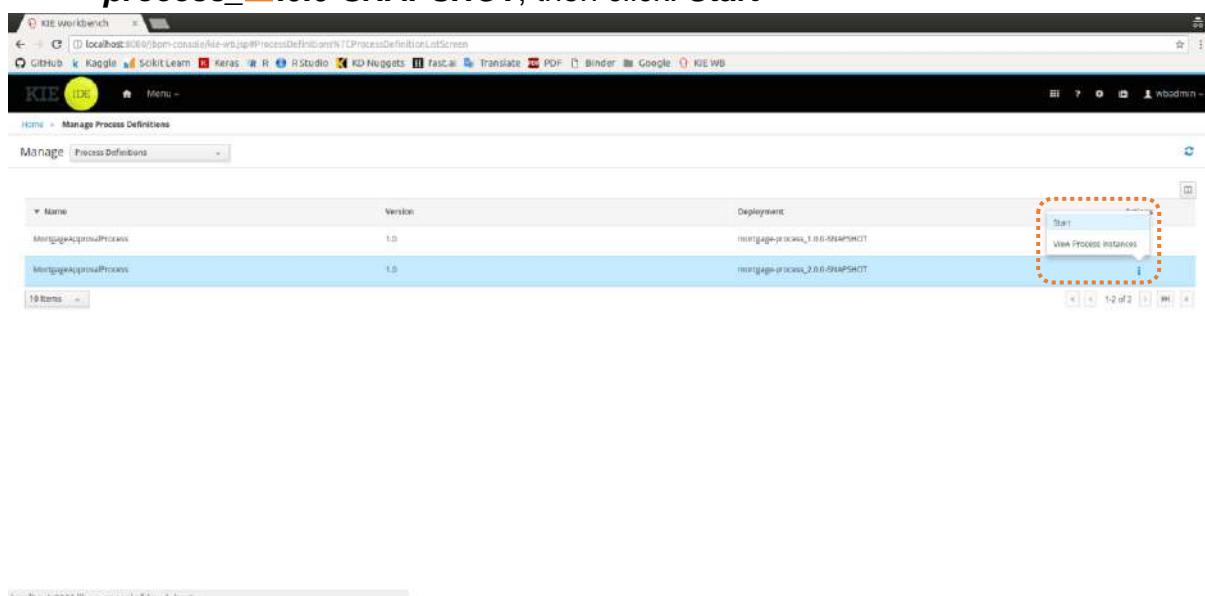
1.2.3. Business system: Smooth mortgage application

{ Objective } Create a mortgage application: Start a new mortgage application, fill in application form to trigger business process. Observe the business flow.

- 1) To use the system by filling in a new mortgage application form (start new process instance under process definition, click: **Menu → Process Definitions**



- 2) Select the mortgage system with intended version, e.g., **mortgage-process_2.0.0-SNAPSHOT**, then click: **Start**



MortgageApprovalProcess

Down Payment: \$10000

Years of amortization: 20

Name: Dr. Li

Annual Income: \$15456

Address of property: 35 Houghton Singapore

Submit

3) Fill in the mortgage form as shown below; Then click blue button: **Submit**

MortgageApprovalProcess

Down Payment: \$10000

Years of amortization: 20

Name: Dr. Li

Annual Income: \$15456

Address of property: 35 Houghton Singapore

Submit

Process Instance: 1

Instance Details (highlighted with a red box)

Process Variables **Documents** **Logs** **Diagram**

Definition Id: Mortgage_Process.MortgageApprovalProcess

Instance State: Active

Deployment: mortgage-process_2.0.0-MAPSTRUCT

Definition Version: 1.0

SLA Compliance: N/A

Correlation key: 1

Parent Process Instance: No Parent Process instance

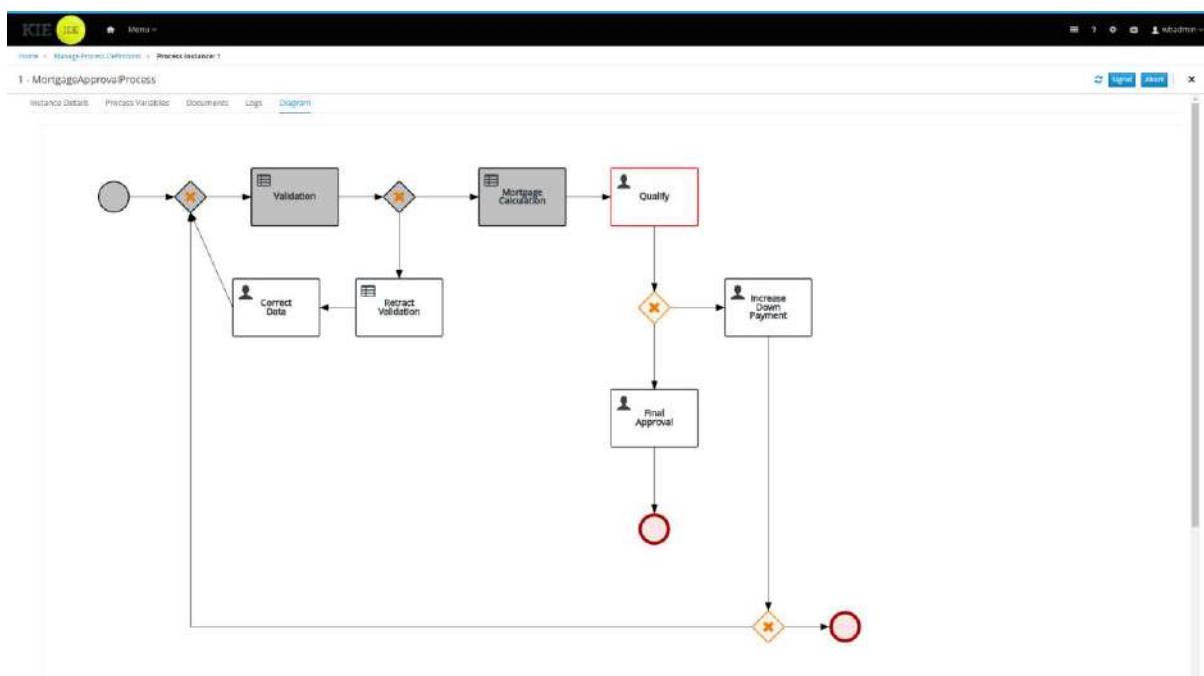
Active user tasks: Quality (Ready) owner: —

Current Activities: Task No. 19 (10:28:32 SGT 2019-5 - Quality [MortgageCode])

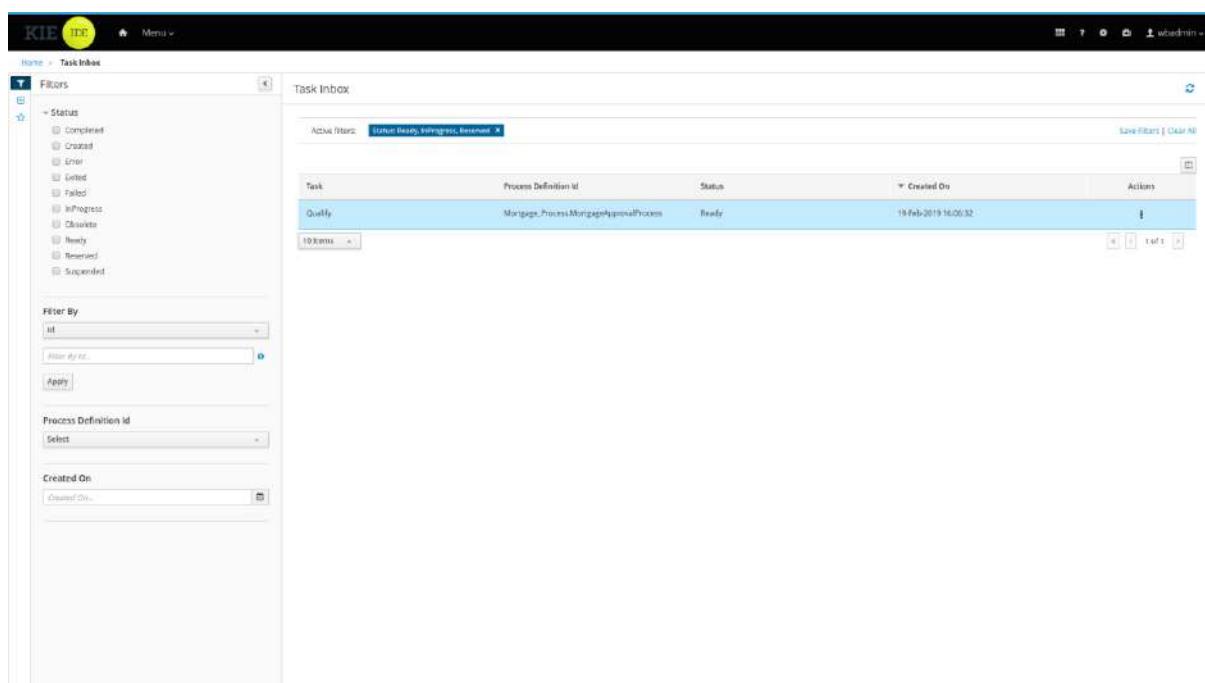
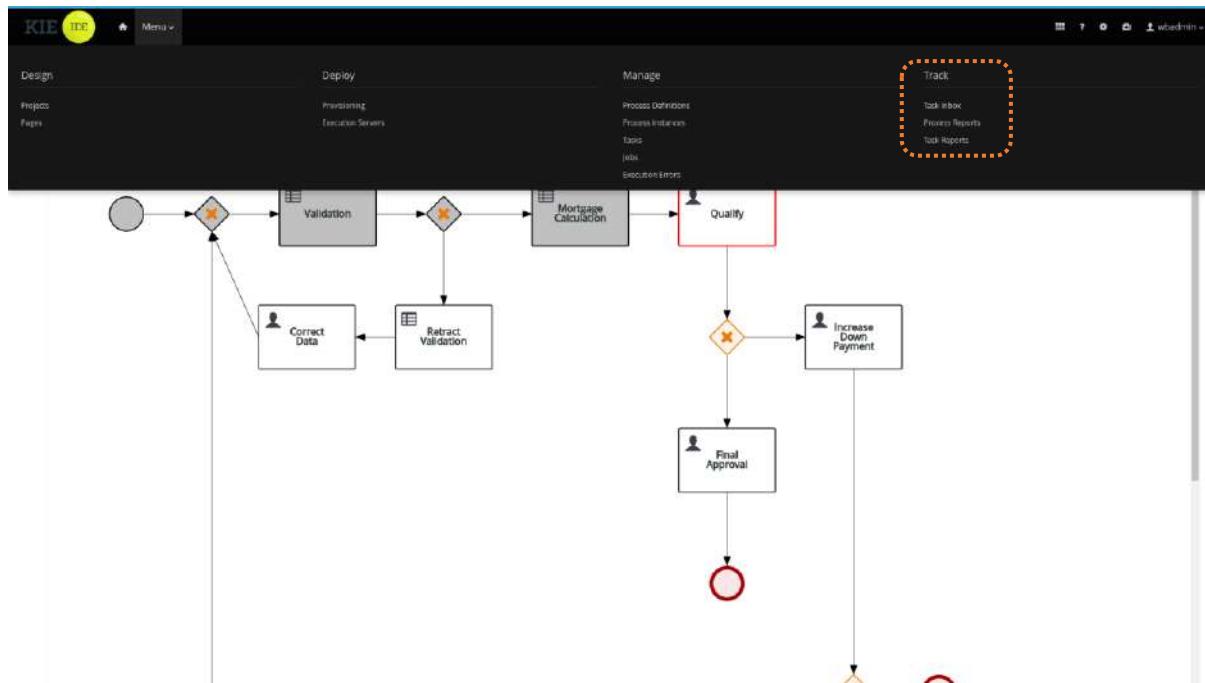
Process Variables (highlighted with a red box)

| Name | Value | Type | Last Modification | Actions |
|---------------|--|--------------------------------------|----------------------|----------------|
| holder | Abdullah | String | 19-Feb-2019 16:05:37 | Edit History |
| application | com.myspace.mortgage_app.Application@71762aa | com.myspace.mortgage_app.Application | 19-Feb-2019 16:05:32 | Edit History |
| initial | Boolean | Boolean | 19-Feb-2019 16:05:34 | Edit History |
| isdownpayment | Boolean | Boolean | 19-Feb-2019 16:05:34 | Edit History |

10 items ...



- 4) To review (pending user task: ***Qualify***) the mortgage application, click: **Menu** → **Task Inbox**



- 5) [Task Inbox: **Qualify**] Click to view the task details. The purpose of this business task is for credit risk controller to manually verify: **Is mortgage application in limit?** (Property Sale Price – Down Payment \leq Mortgage amount?)

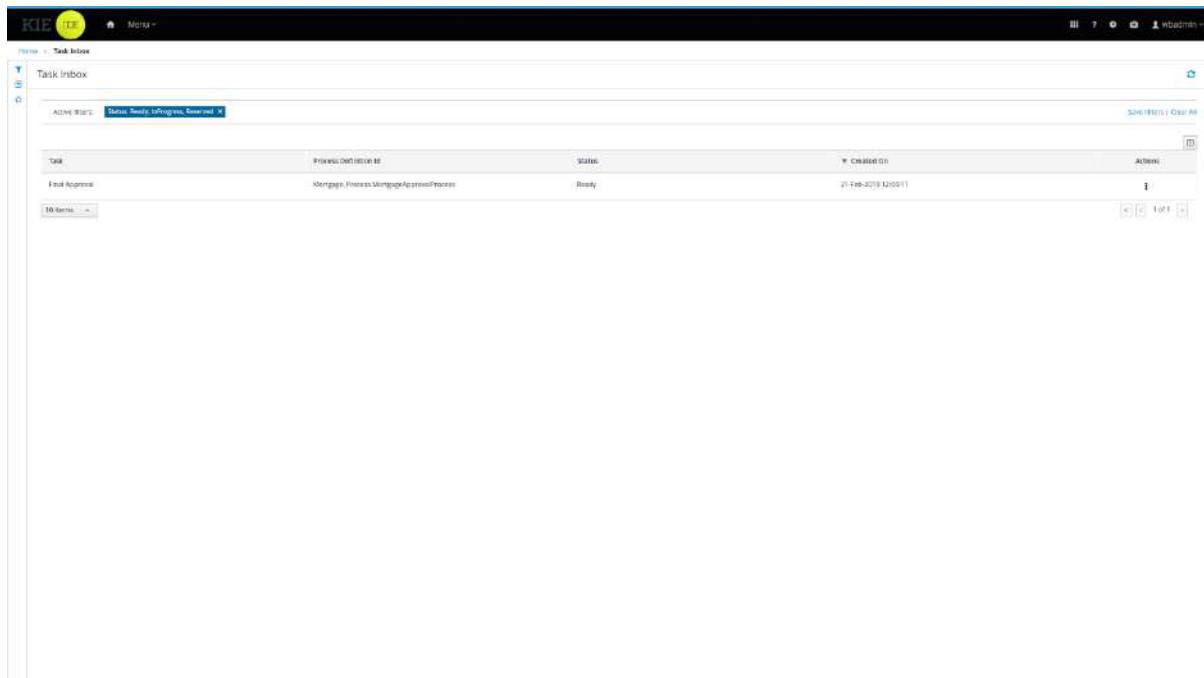
The screenshot shows a web-based application interface for a task inbox. At the top, there's a header with the KIE logo and a menu bar. Below the header, the title '1 - Qualify' is displayed. A navigation bar below the title includes tabs for 'Work', 'Details', 'Assignments', 'Comments', 'Admin', and 'Logs'. The main area is divided into sections for 'Inputs' and 'Outputs'. The 'Inputs' section contains fields for 'Mortgage amount' (set to \$200000), 'Down Payment' (set to \$50000), and 'Annual Income' (set to \$250000). The 'Outputs' section contains a single field labeled 'Is mortgage application in limit?' with a dropdown menu. The dropdown menu has two options: 'No' and 'Yes', with 'Yes' being the selected option. The entire 'Outputs' section is highlighted with an orange rectangular border.

{ Quiz } Check whether: $\$250,000 - \$50,000 \leq \$200,000$?

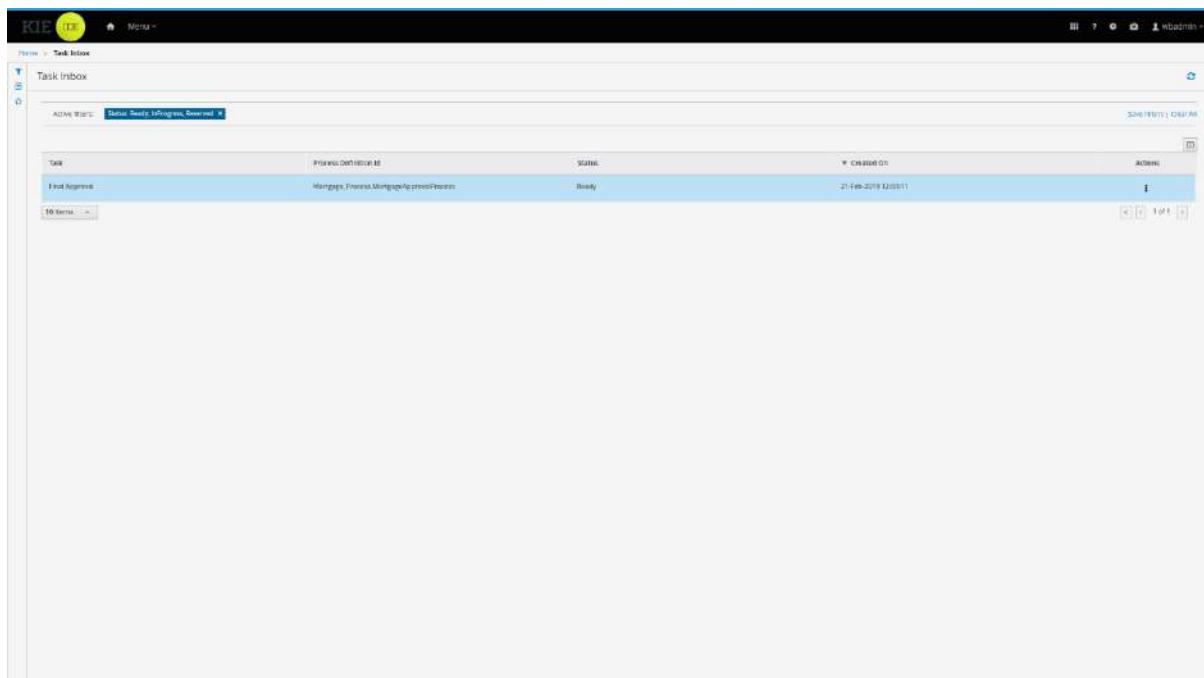
The answer is: **TRUE / FALSE** (Please select the correct answer)

- 6) [Task Inbox: **Qualify**] Let's accept/claim the task to update the ***Inlimit (Is mortgage application in limit?)*** control/check; Firstly click blue button: **Claim**

- 7) [Task Inbox: **Qualify**] Click blue button: **Start**; Check checkbox '***Is mortgage application in limit?***'; Click blue button: **Complete**;



- 8) [Task Inbox: **Final Approval**



- 9) [Task Inbox: **Final Approval**] Click blue button: **Claim**; Click blue button: **Start**; Click blue button: **Complete**;

KIE Task Inbox - Task 2

2 - Final Approval

Work Details Assignments Comments Admin Logs

Inputs:

Application

Mortgage amount:

Down Payment: Years of amortization:

Applicant

Name:

Annual income:

SSN:

Property

Age of property:

Address of property:

Locate:

Sale Price:

Action:

KIE Task Inbox - Task 2

2 - Final Approval

Work Details Assignments Comments Admin Logs

Inputs:

Application

Mortgage amount:

Down Payment: Years of amortization:

Applicant

Name:

Annual income:

SSN:

Property

Age of property:

Address of property:

Locate:

Sale Price:

Action:

KIE TS

Home > Task Inbox > Task 2

2 - Final Approval

Work Details Assignments Comments Admin Logs

Inputs:

Application

Mortgage amount: \$80000

Down Payment: \$20000

Years of amortization: 30

Applicant

Name: John Doe

Annual income: \$75000

SIN: 123456789

Property

Age of property: 10 years

Address of property: 123 Main, Singapore

Locate:

Sale Price: \$100000

Comments:

Action: Save | Estimate | Calculate

KIE TS

Home > Task Inbox

Task Inbox

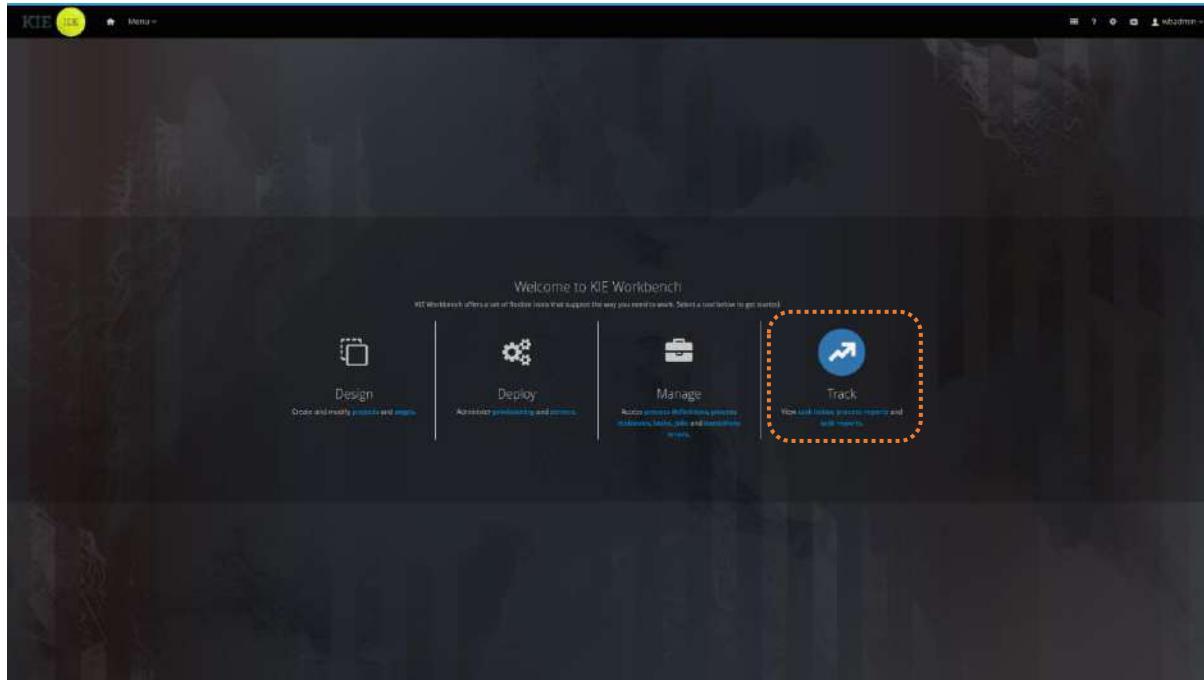
ADVICE: Status: Review In Progress, Reserved

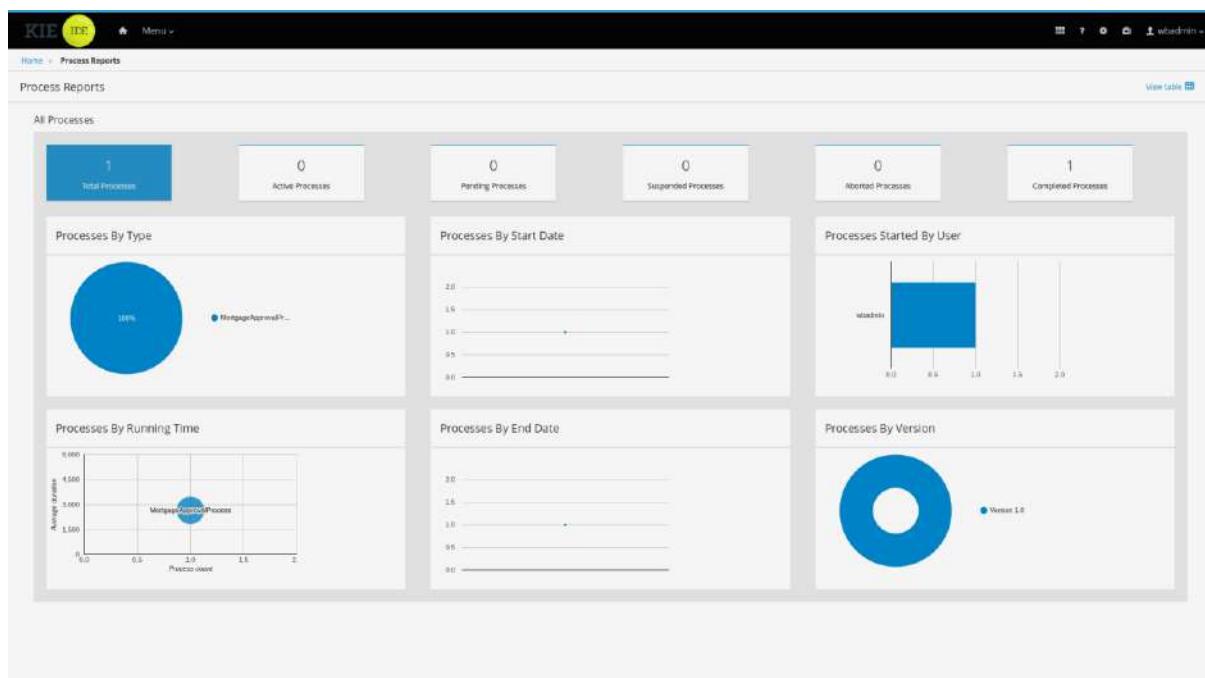
SEARCH FILTERS: SEARCH

| ID | Title | Priority/Criticality | Status | W. Created On | Action |
|----|--------|----------------------|-------------|---------------------|---|
| 1 | Task 2 | Normal | In Progress | 2019-07-02 10:00:00 | <input type="button" value="View Details"/> |

10 items - 0 of 0

10) Go back to main menu; Let's look at: **Track**

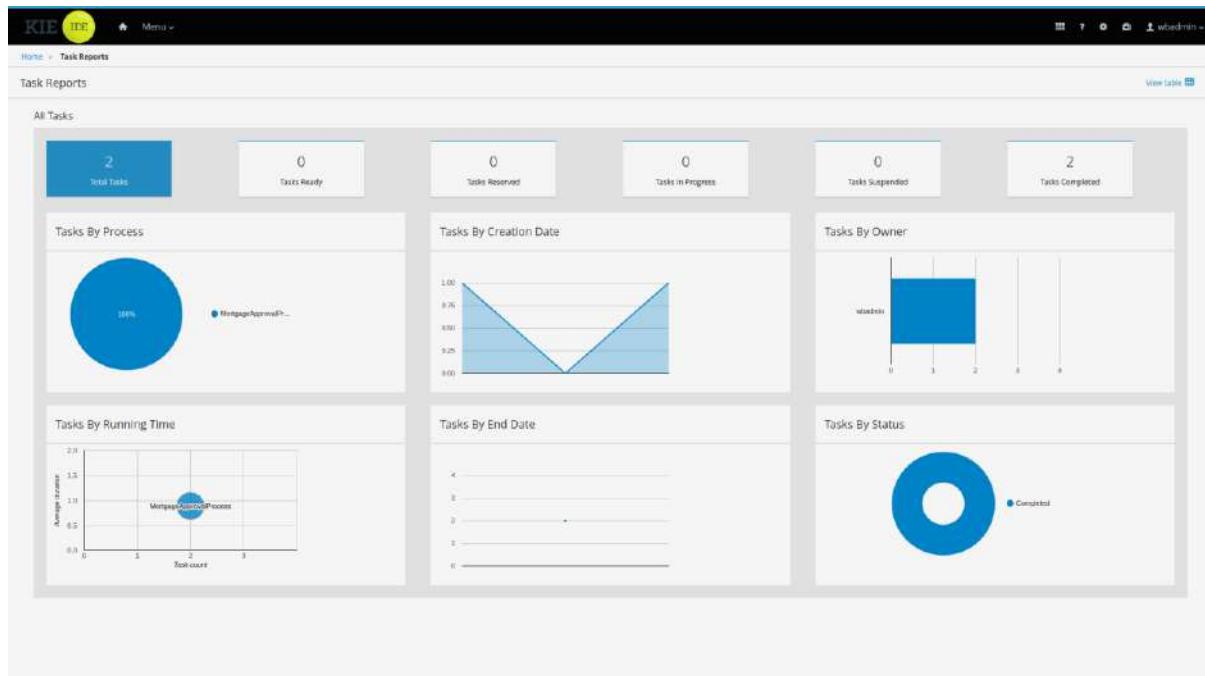


11)[Process Reports] Click **Process Reports under **Track**.**

The screenshot shows the KIE Process Reports dashboard with a table titled 'All Processes'. The table has columns for Id, Deployment Id, Process id, Process name, Initiator, Status, Version, Start, End, and Duration. There is one entry: Id 1, Deployment Id mortgage_process_1, Process id Mortgage_Process..., Process name MortgageApproval..., Initiator wbadmin, Status Completed, Version 1.0, Start 19-Feb-2019 10:06:22, End 21-Feb-2019 12:11:00, Duration 1d 20h 4m 52s.

| ID | Deployment ID | Process ID | Process Name | Initiator | Status | Version | Start | End | Duration |
|----|--------------------|---------------------|---------------------|-----------|-----------|---------|----------------------|----------------------|---------------|
| 1 | mortgage_process_1 | Mortgage_Process... | MortgageApproval... | wbadmin | Completed | 1.0 | 19-Feb-2019 10:06:22 | 21-Feb-2019 12:11:00 | 1d 20h 4m 52s |

12)[Task Reports] Click **Task Reports** under Track.



The screenshot shows the KIE Task Reports table with the following data:

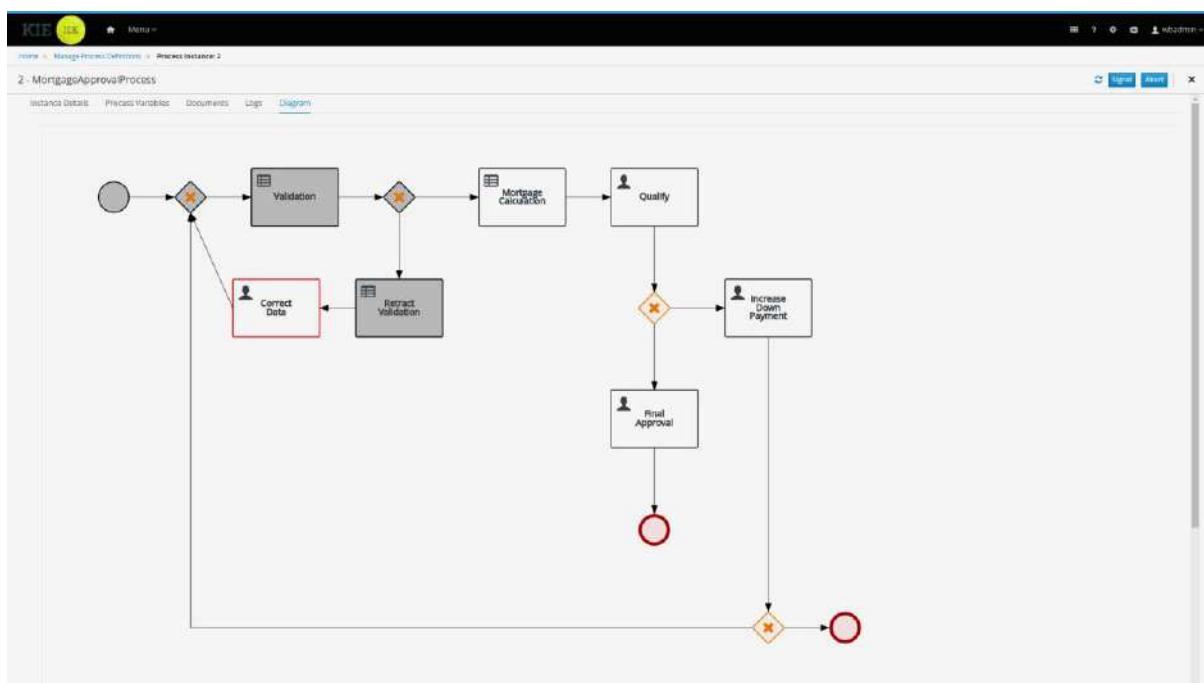
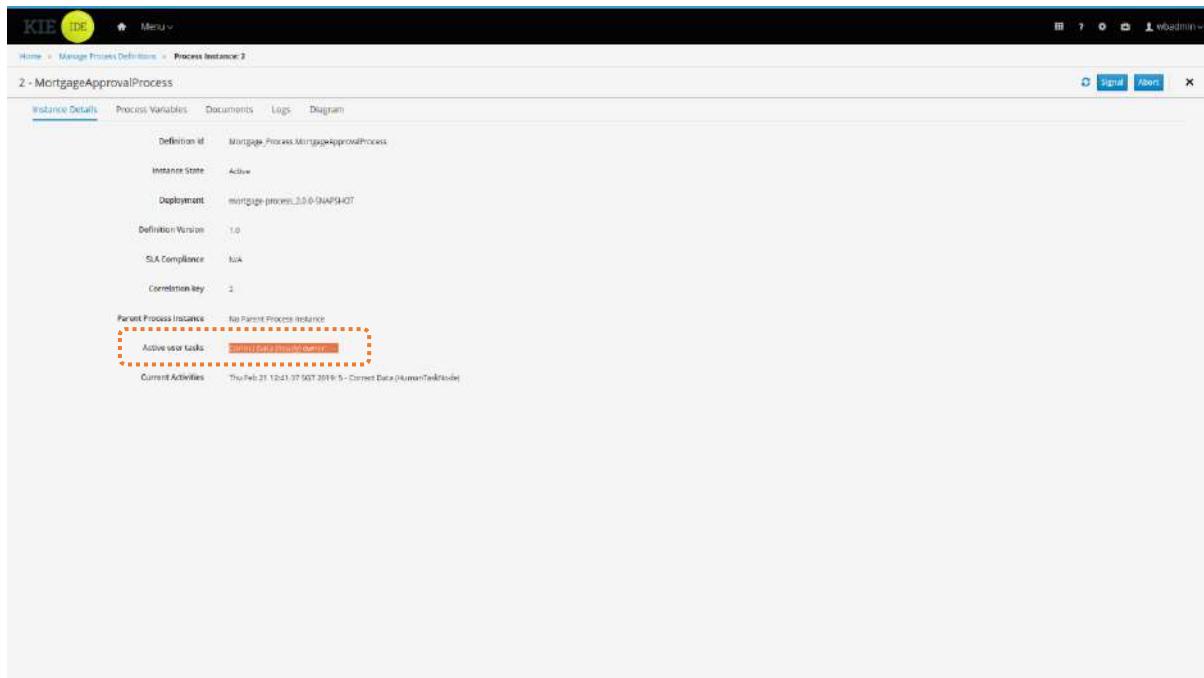
| ID | Process | Process Instance ID | Task | Owner | Status | Start | End | Duration | Deployment ID |
|----|---------------------|---------------------|----------------|---------|-----------|----------------------|----------------------|---------------|---------------------|
| 2 | MortgageApproval... | 1 | Final Approval | wbadmin | Completed | 21-Feb-2019 12:00... | 21-Feb-2019 12:11... | 11m 1s | mortgage-process... |
| 1 | MortgageApproval... | 1 | Quality | wbadmin | Completed | 19-Feb-2019 10:00... | 21-Feb-2019 12:00... | 1d 19h 59m 0s | mortgage-process... |

1.2.4. Business system: Erroneous mortgage application [Rule]

Create an erroneous mortgage application: Start a new mortgage application, fill in form with **Down Payment \$0**, keep remaining fields same values as before. Observe the business flow change.

- 1) Fill in the mortgage form as shown below (**Down Payment \$0**); Then click blue button: **Submit**

The screenshot shows the 'MortgageApprovalProcess' form in the KIE Workbench. The 'Down Payment' field is highlighted with a red dashed box and contains the value '0'. The 'Years of amortization' field contains '20'. The 'Submit' button at the bottom right is blue.



2) [Task Inbox: **Correct Data**]

The screenshot shows the KIE Task Inbox interface. On the left, there is a sidebar with a 'Filters' section containing a tree view of status categories: Completed, Created, Error, Failed, In Progress, Ok, Ready, Resolved, and Suspended. Below this are sections for 'Filter By' (id, Filter by id, Apply), 'Process Definition Id' (Select), and 'Created On' (Created On...). The main area is titled 'Task Inbox' and shows a table with one row. The columns are 'Task', 'Process Definition Id', 'Status', and 'Created On'. The single row contains 'Correct Data', 'Mortgage_Process.MortgageApprovalProcess', 'Ready', and '21-Feb-2019 12:41:37'. There is also an 'Actions' column with a small icon.

3) [Task Inbox: **Correct Data**] Click blue button: **Claim**; Click blue button: **Start**;

The screenshot shows the KIE Task details interface for the 'Correct Data' task. At the top, it says '3 - Correct Data' and has tabs for Work, Details, Assignments, Comments, Admin, and Logs. The 'Work' tab is selected. The page is divided into sections: 'Outputs' (Application), 'Error details' (Error and cause: 'Input payment cannot be 0, greater than or equal to the amount of 1000'), 'Applicant' (Name, Annual Income, SSSN), and 'Property' (Age of property, Address of property, Location, Sale Price). A large orange dashed box highlights the 'Error and cause' field. At the bottom right, there are two blue buttons: 'Claim' and 'Start'.

The screenshot shows a software interface titled "3 - Correct Data". The top navigation bar includes "Home", "Task Issues", "Task 1", "Work", "Details", "Assignments", "Comments", "Admin", and "Logs". The main content area is divided into several sections:

- Outputs:** Application
- Error details:** Error and cause: Down payment cannot be greater than or equal to the property tax price.
- Applicant:** Name: [Redacted], Annual Income: [Redacted], SSN: [Redacted]
- Property:** Age of property: [Redacted], Address of property: 24-#1000, Esplanade, Locality: [Redacted], Sale Price: \$20000.00

At the bottom right of the form are two buttons: "Submit" and "Exit".

- 4) [Task Inbox: **Correct Data**] Review the error message; Update **Down Payment** to **\$60,000**; Click blue button: **Complete**;

KIE [DF] Menu > Home > Task List > Task 3

3 - Correct Data

Work Details Assignments Comments Admin Logs

Outputs:
Application

Error details

Error and cause
Input validation error: Input is required and is not yet provided.

Down Payment:

Years of amortization:

Applicant

Name:

Annual income:

SSN:

Property

Age of property:

Address of property:

Locate:

Sale Price:

KIE [OK] Menu -

Forms > Sale Price > Task 3

3 - Correct Data

Work Details Assignment Comments Admin Logs

Outputs:

Application

Error details

Error and cause

Down payment cannot be greater than, or equal to the property sale price.

Down Payment: Years of amortization:

Applicant

Name:

ID:

Annual Income:

SSN:

Property

Age of property:

Address of property:

Locate:

Sale Price:

5) Continue to complete Task: **Qualify** and Task: **Final Approval**;

The screenshot shows the KIE IDE Task Inbox interface. The title bar says "KIE IDE". The left sidebar has "Task Inbox" selected. The main area shows a table with one row:

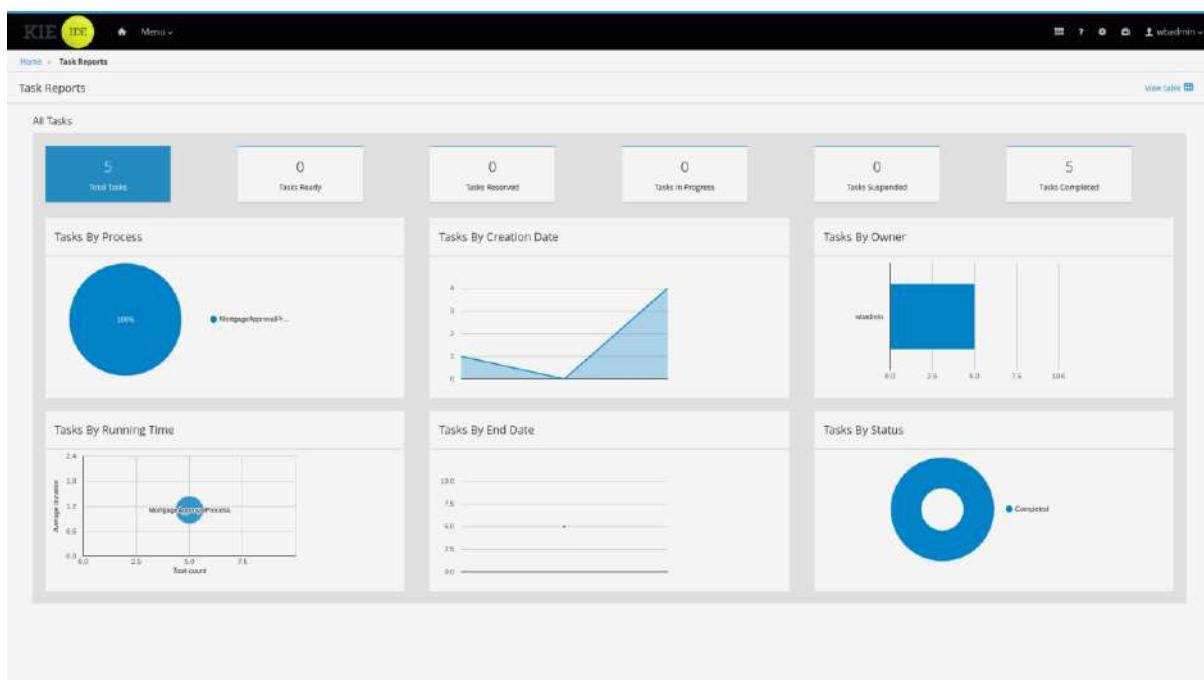
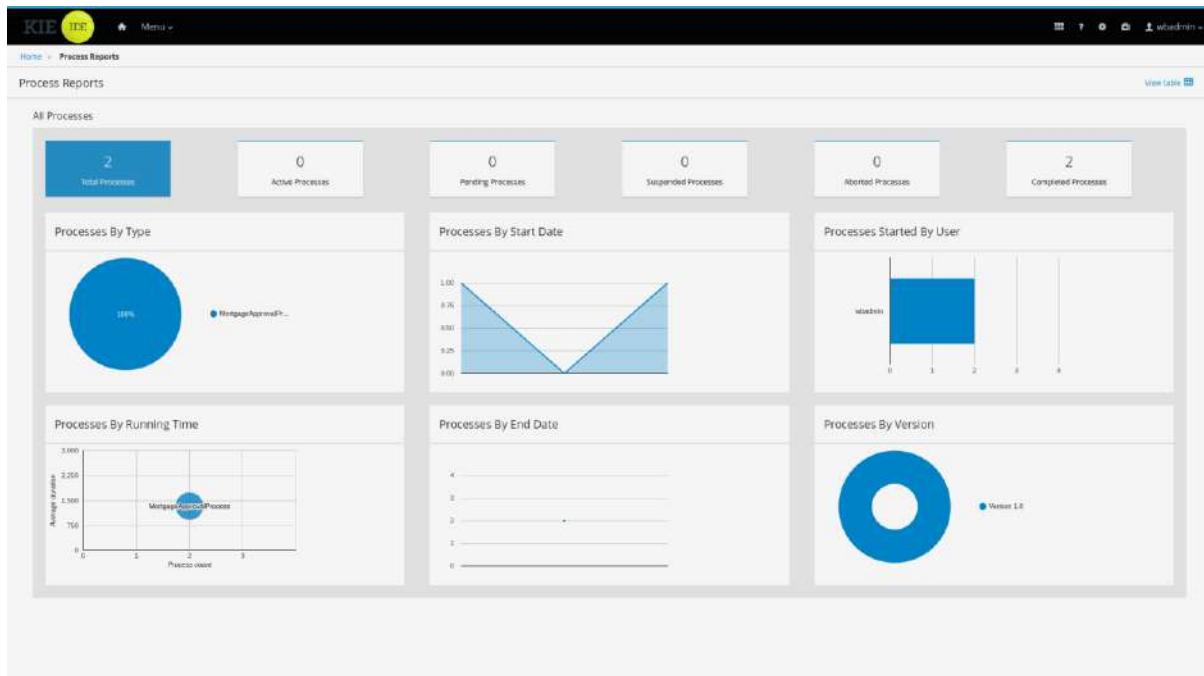
| Task | Process Definition Id | Status | Created On | Action |
|---------|--|--------|----------------------|--------|
| Qualify | Mortgage_Process.MortgageApprovalProcess | Ready | 21-Feb-2019 12:09:03 | [View] |

At the bottom, it says "100 items" and "1 of 1".

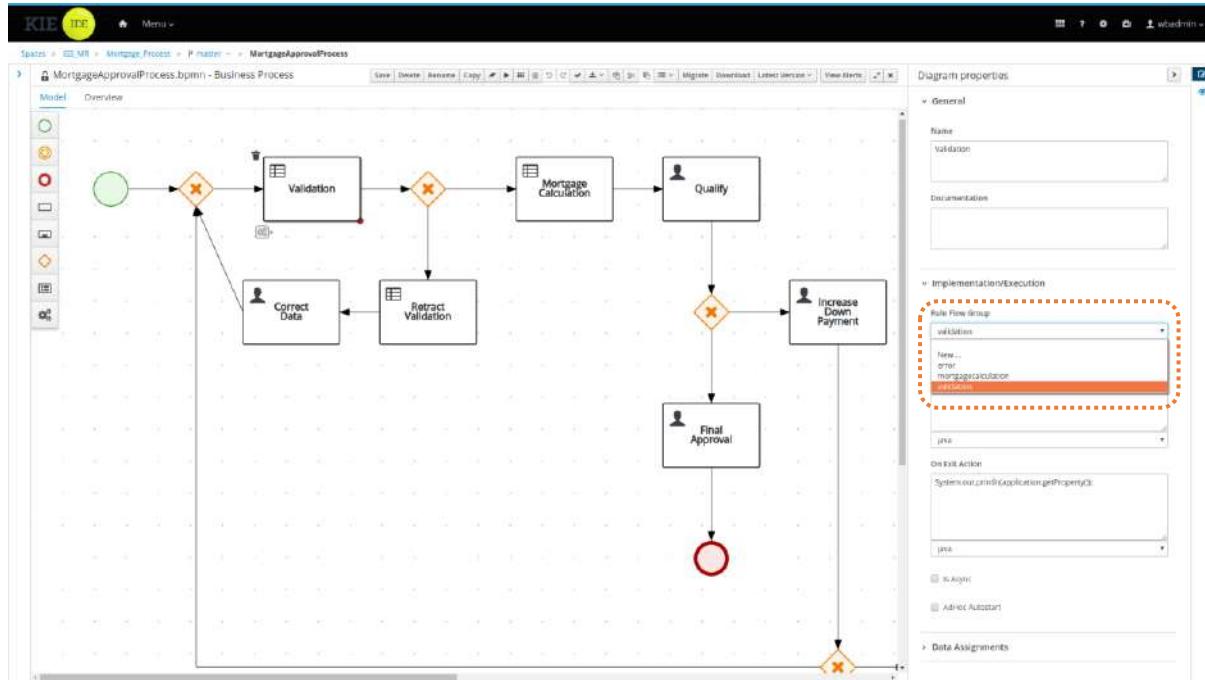
The screenshot shows the KIE IDE Task Inbox interface. The title bar says "KIE IDE". The left sidebar has "Task Inbox" selected. The main area shows a table with one row:

| Task | Process Definition Id | Status | Created On | Action |
|----------------|--|--------|----------------------|--------|
| Final Approval | Mortgage_Process.MortgageApprovalProcess | Ready | 21-Feb-2019 12:02:04 | [View] |

At the bottom, it says "100 items" and "1 of 1".



- 6) Let's dive deep into **User Task: Correct Data**: What has happened during automatic data validation (**Business Rule Task: Validation**)?



- 7) It is **Rule Flow Group**: **validation**, that did decision automation to validate data on all mortgage application form;

{ Tips } **Rule Flow Group** is the bridge linking jBPM **Business Rule Task** and Drools **Rule Set**; The (guided) rule file name is '**Validate Down Payment.rdrf**';

```

1 package com.myspace.mortgage_app;
2
3 import java.lang.Number;
4
5 rule "Validate Down Payment"
6 dialect "mvel"
7 ruleflow-group "validation"
8 when
9   app : Application( downpayment == 0 || downpayment >= app.property.saleprice )
10 then
11   ValidationExceptionDO fact0 = new ValidationExceptionDO();
12   fact0.setError("Down payment cannot be 0, greater than, or equal to the property sale price.");
13   insert( fact0 );
14   System.out.println("Executed Rule: " + drools.getRule().getName() );
15   app.setErrors( fact0 );
16 end
17

```

The screenshot shows the KIE IDE interface with the 'Data Objects' tab selected for the 'Validate Down Payment' rule. The table lists the following data objects:

| Type | | Remove |
|---|--|--------|
| com.myspace.mortgage_app.Applicant | | |
| com.myspace.mortgage_app.Application | | |
| com.myspace.mortgage_app.Property | | |
| com.myspace.mortgage_app.ValidationErrorsDO | | |
| java.lang.Number | | |

The screenshot shows the KIE IDE interface with the 'Overview' tab selected for the 'Validate Down Payment' rule. The rule is identified as a 'Guided Rules' type. The 'Description' field contains the placeholder text 'No description yet - what does this asset do?'. Other details include:

- Used in projects: Mortgage_Process
- Last modified: By system on 2019-02-19 15:35
- Created on: By system on 2019-02-19 15:35
- Version history: Metadata
- Tags: Add new tag(s)
- Note: (/src/test/resources/com/myspace/mortgage_app/gitkeep)
- URI: [git://master@ISS_MR:/example/Mortgage_Process/src/main/resources/com/myspace/mortgage_app/ValidateDownPayment.rdr](#)
- Subject:
- Type:
- External link:

{ Quiz } Convert the Drools **Validate Down Payment** rule into two rules:

Rule 1: WHEN

 THEN

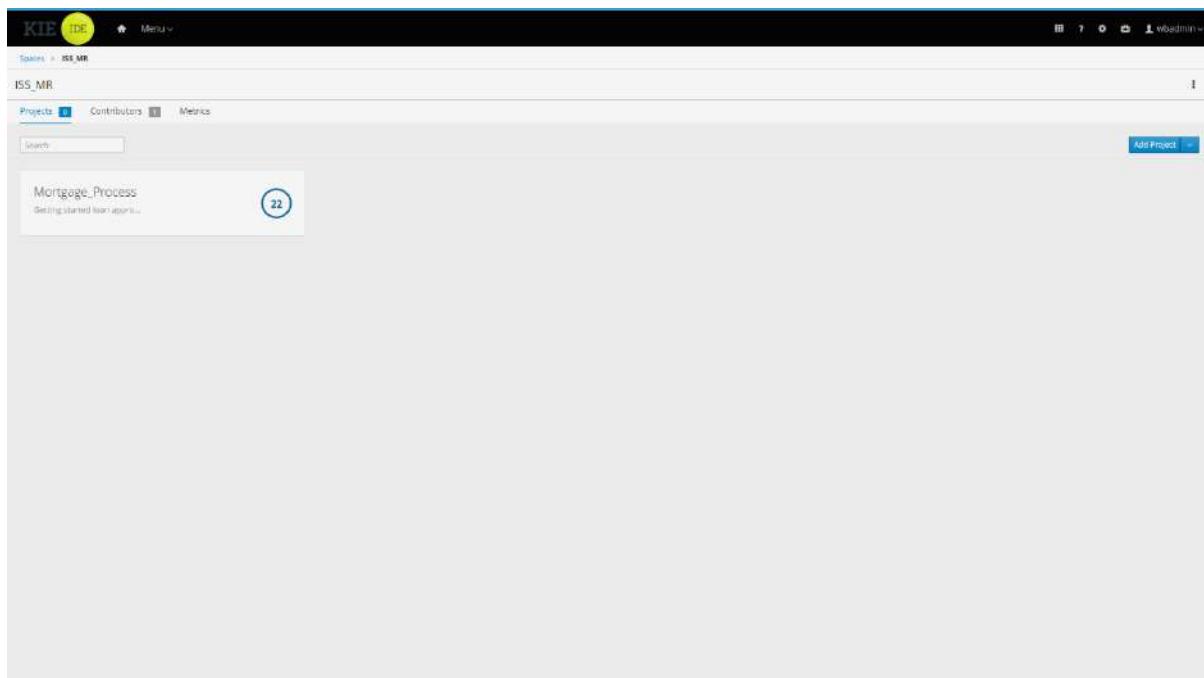
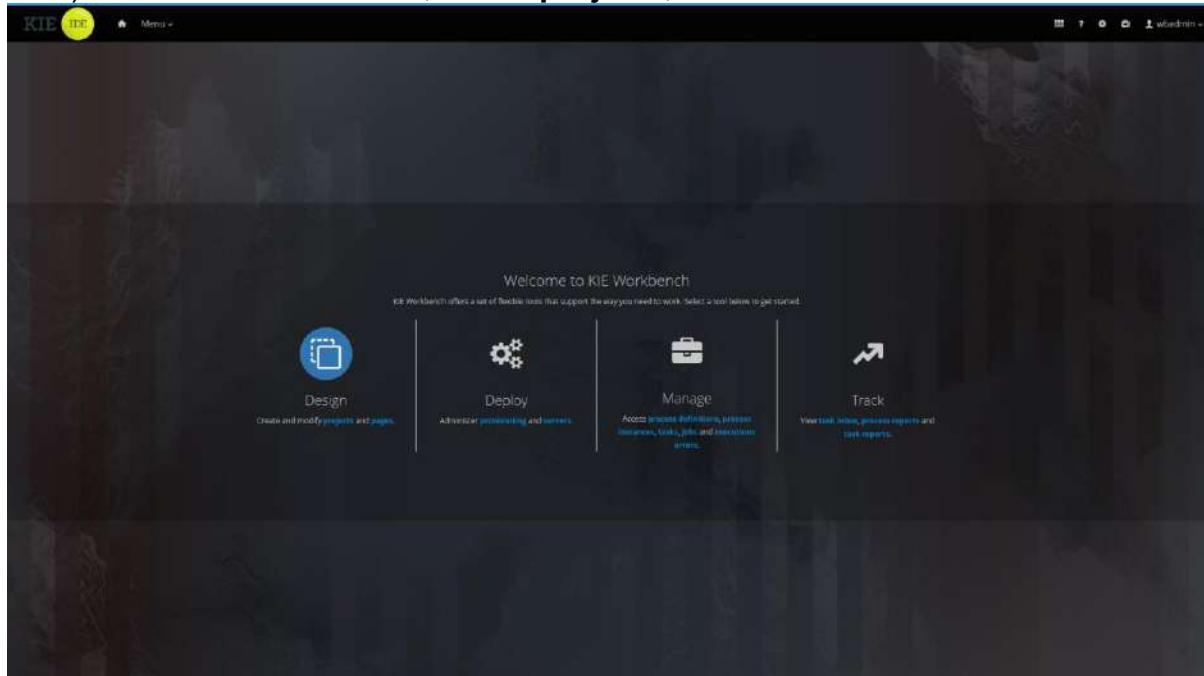
Rule 2: WHEN

 THEN

1.2.5. Business system: Mortgage amount calculation [Decision Table] v3.0.0

{ Objective } Verify how the mortgage amount is calculated automatically under machine reasoning. Enhance business rules in guided decision table. Observe changed mortgage amount calculation due to enhanced business rule set.

- 1) Go back to main menu; Select **projects**;



2) [Assets: **Mortgage_Process**] Select **Guided Decision Tables:**
MortgageDecisionTable;

Screenshots of the KIE IDE interface showing the list of assets and the detailed view of the MortgageDecisionTable.

The list of assets shows the following entries:

- ApplicationMortgage
- ApplicationMortgage
- CorrectData-taskform
- FinalApproval-taskform
- IncreaseDownPayment-taskform
- mortgage-app.MortgageApprovalProcess-taskform
- Mortgage_Process MortgageApprovalProcess-taskform
- MortgageApprovalProcess
- MortgageDecisionTable** (highlighted)
- Property

The MortgageDecisionTable entry details:

- Type: Guided Decision Tables
- Last modified: 1 day ago
- Created: 1 day ago

Detailed view of the MortgageDecisionTable.gdst:

Model tab selected. The table structure is as follows:

| # | Description | ruleflow-group | Applicant Annual Income | | Property | | application |
|---|---------------------|----------------|-------------------------|-----------------|------------------|------------|-------------|
| | | | \$greater | \$less_or_equal | \$saleprice_less | \$age_less | |
| 1 | mortgagecalculation | 100000 | 200000 | 300000 | 5 | Urban | 200000 |
| 2 | mortgagecalculation | 50000 | 99999 | 100000 | 10 | Rural | 100000 |

{ Quiz } In previous mortgage applications, which of the two rules was used for mortgage amount calculation?

The answer is: **Rule 1 / Rule 2** (Please select the correct answer)

- 3) [Guided Decision Tables: **MortgageDecisionTable**] Click 2nd rule's sequence number # 2, right click to select **Insert row below**; Close **Analysis** tab window;

| # | Description | ruleflow-group | Applicant Annual Income | Property |
|---|---------------------|-----------------|----------------------------|---|
| 1 | mortgagecalculation | \$greater | 100000 200000 300000 | \$saleprice_less |
| 2 | mortgagecalculation | \$less_or_equal | 50000 99999 100000 | \$age_less \$location Mortgage Amount |
| 3 | mortgagecalculation | \$less_or_equal | | \$age_less \$location Mortgage Amount |

| # | Description | ruleflow-group | Applicant Annual Income | Property | application |
|---|---------------------|-----------------|----------------------------|--------------------------|-----------------|
| 1 | mortgagecalculation | \$greater | 100000 200000 300000 | \$age_less \$location | Mortgage Amount |
| 2 | mortgagecalculation | \$less_or_equal | 50000 99999 100000 | \$age_less \$location | Mortgage Amount |

- 4) [Guided Decision Tables: **MortgageDecisionTable**] Double click 3rd rule's relevant field (decision rule's conditions/actions), key in field values;

{ Tips } This is to introduce a new business rule: For any mortgage application, if his/her annual income is in-between **\$10,000** and **\$49,999**, regardless of other conditions, the bank ought to approve loan amount of **\$50,000**.

| # | Description | ruleflow-group | Applicant Annual Income | | Property | | application | |
|---|---------------------|----------------|-------------------------|-----------------|------------------|------------|-------------|-----------------|
| | | | \$greater | \$less_or_equal | \$saleprice_less | \$age_less | \$location | Mortgage Amount |
| 1 | mortgagecalculation | | 100000 | 200000 | 300000 | | | |
| 2 | mortgagecalculation | | 50000 | 99999 | 100000 | | | |
| 3 | mortgagecalculation | | 10000 | 49999 | | | | 50000 |

| # | Description | ruleflow-group | Applicant Annual Income | | Property | | application | |
|---|---------------------|----------------|-------------------------|-----------------|------------------|------------|-------------|-----------------|
| | | | \$greater | \$less_or_equal | \$saleprice_less | \$age_less | \$location | Mortgage Amount |
| 1 | mortgagecalculation | | 100000 | 200000 | 300000 | 5 | Urban | 200000 |
| 2 | mortgagecalculation | | 50000 | 99999 | 100000 | 10 | Rural | 100000 |
| 3 | mortgagecalculation | | 10000 | 49999 | | | | 50000 |

- 5) [Guided Decision Tables: **MortgageDecisionTable**] Save the rule in decision table;

The screenshot shows the KIE IDE interface with a 'Confirm Save' dialog box overlaid on a decision table grid. The dialog asks 'Save changes for this Asset?' with options to 'Cancel' or 'Save'. The grid below contains three rows of data:

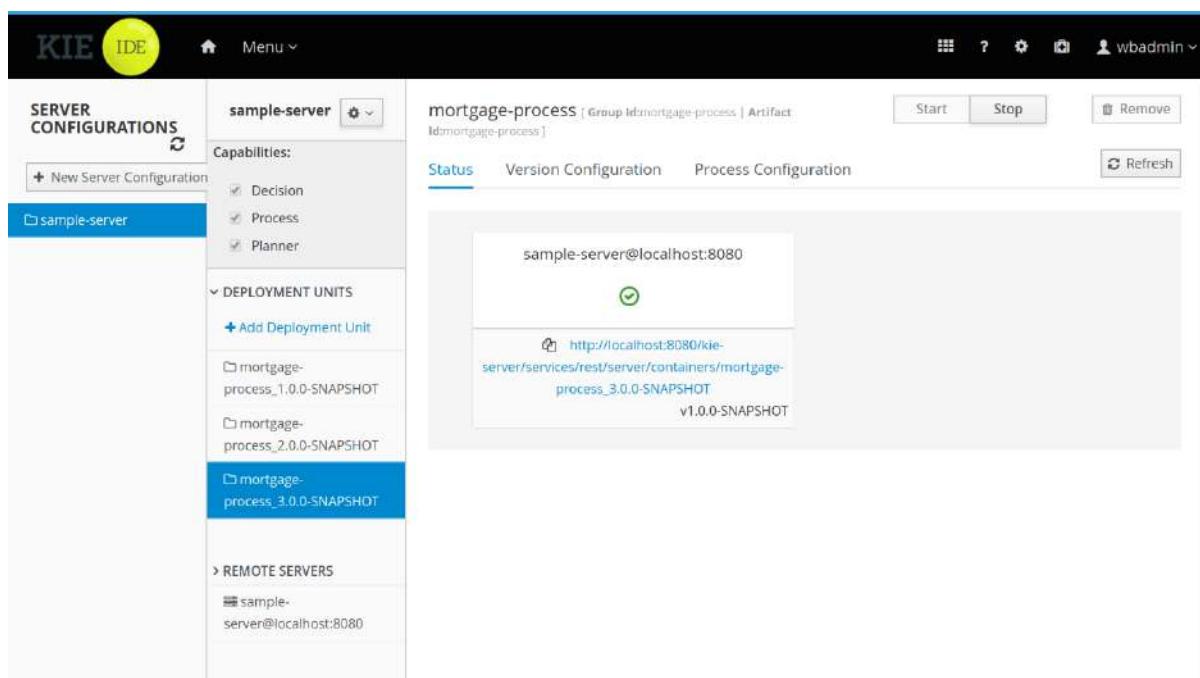
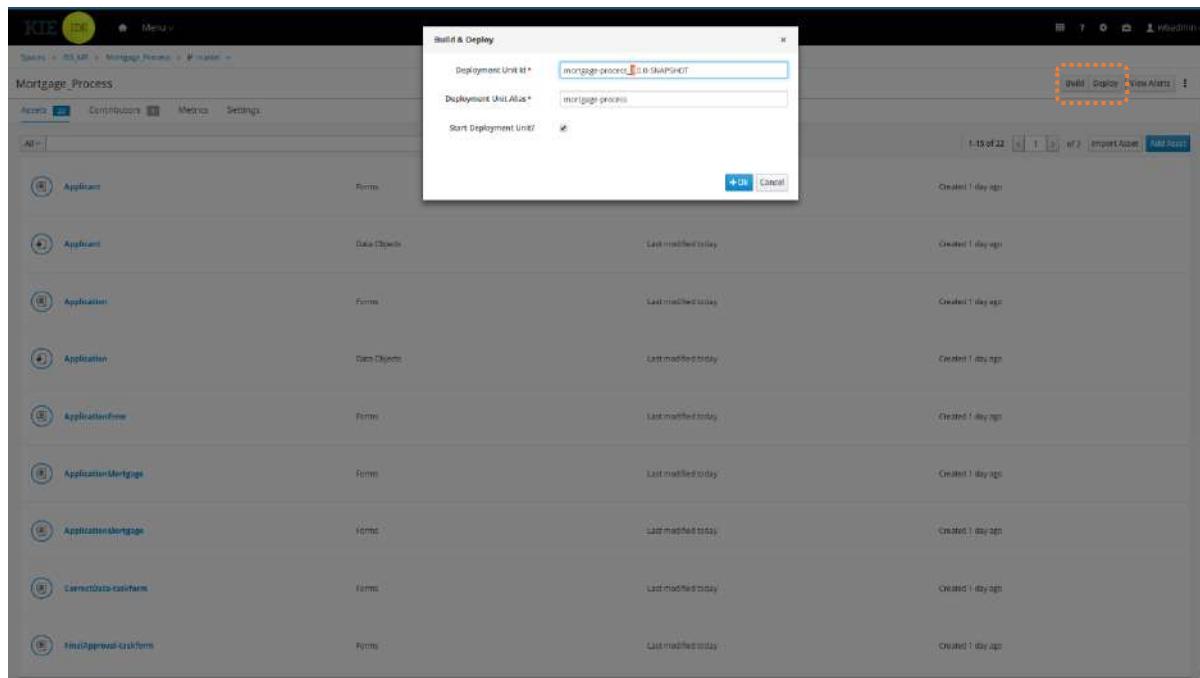
| # | Description | ruleflow-group | Applicant Annual Income | | Property | | application |
|---|---------------------|----------------|-------------------------|-----------------|------------------|------------|-------------|
| | | | \$greater | \$less_or_equal | \$saleprice_less | \$age_less | \$location |
| 1 | mortgagecalculation | 100000 | 200000 | 300000 | 5 | Urban | 200000 |
| 2 | mortgagecalculation | 50000 | 99999 | 100000 | 10 | Rural | 100000 |
| 3 | mortgagecalculation | 10000 | 49999 | | | | 50000 |

The screenshot shows the KIE IDE interface with the MortgageDecisionTable grid highlighted by a green border. Below the grid is an 'Alerts' section containing one message:

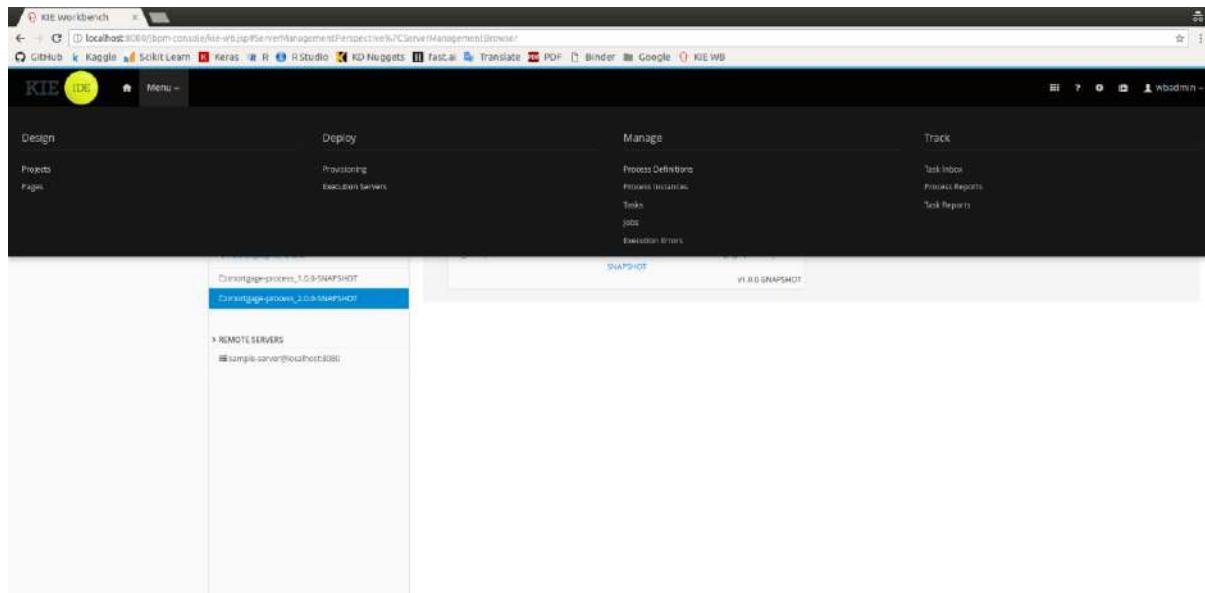
| Level | Text | File | Column | Line |
|-------|---|------|--------|------|
| Info | Build of module 'Mortgage_Process' (requested by wbadmin) completed. Build: SUCCESSFUL. | - | 0 | 0 |

6) Go back to asset list view; Click button: **Deploy**; Update Deployment Unit

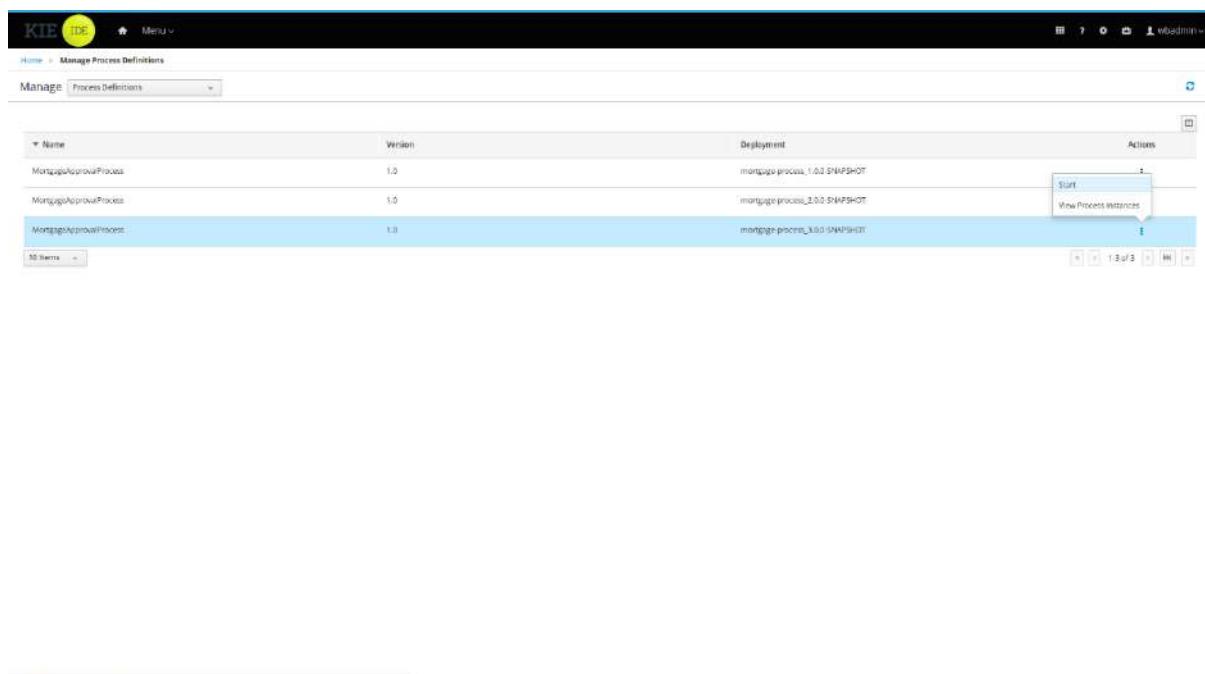
Id*: mortgage-process_3.0.0-SNAPSHOT; Click blue button **OK**



- 7) To use the updated system by filling in a new mortgage application form (start new process instance under process definition, click: **Menu → Process Definitions**



- 8) Select the mortgage system with intended version, e.g., ***mortgage-process_3.0.0-SNAPSHOT***, then click: **Start**



The screenshot shows the 'Mortgage-ApprovalProcess' form. Key input fields include:

- Dawn Payment:** \$20000
- Years of amortization:** 20
- Annual Income:** 20000
- Sale Price:** 250000

- 9) Fill in the mortgage form as shown below, with **Annual Income: \$20,000**; Then click blue button: **Submit**

The screenshot shows the 'Mortgage-ApprovalProcess' form with updated values. Key input fields include:

- Dawn Payment:** \$20000
- Years of amortization:** 20
- Annual Income:** 20000
- Sale Price:** 250000

KIE IDE

Home > Manage Process Definitions > Process Instance: 3

3 - MortgageApprovalProcess

Instance Details Process Variables Documents Logs Diagram

Definition ID: Mortgage_Process.MortgageApprovalProcess
Instance State: Active
Deployment: mortgage-process.3.0.0-SNAPSHOT
Definition Version: 1.0
SLA Compliance: N/A
Correlation Key: 3
Parent Process Instance: No Parent Process Instance
Active user tasks: Qualify (Qualify user: --)
Current Activities: Thru Feb 21 15:30:09 09:50T 2019-5 - Qualify (UserTaskNode)

KIE IDE

Home > Manage Process Definitions > Process Instance: 3

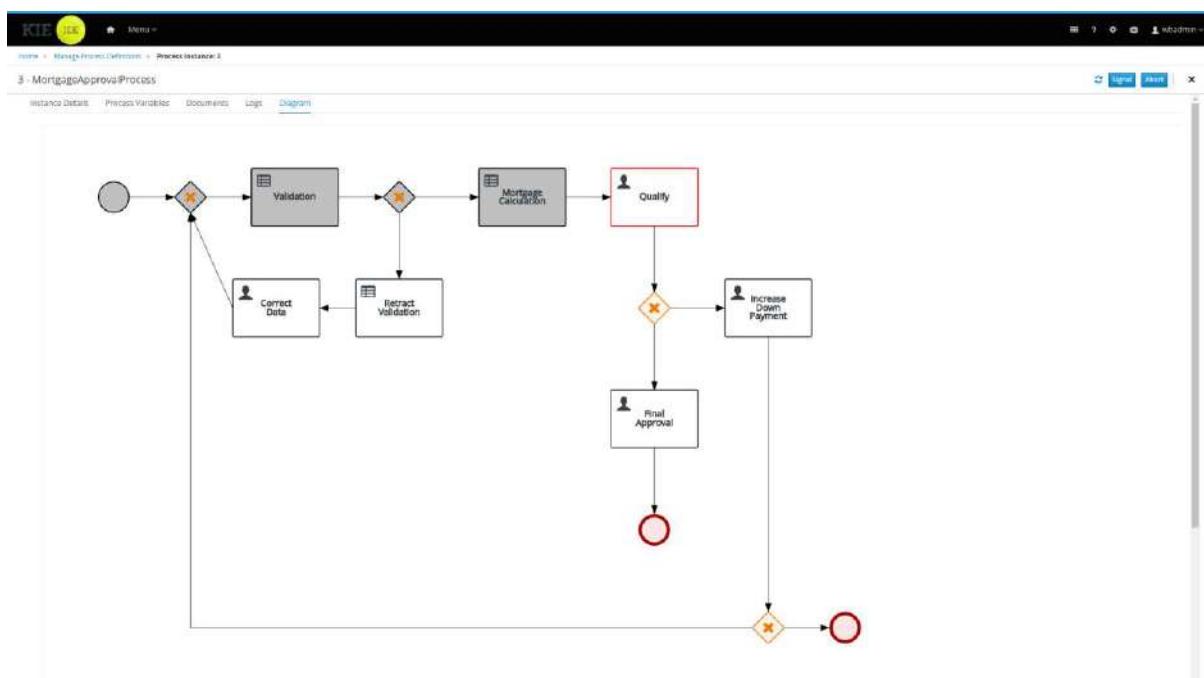
3 - MortgageApprovalProcess

Instance Details Process Variables Documents Logs Diagram

Process Variables

| Name | Value | Type | Last Modification | Actions |
|----------------|---|--------------------------------------|----------------------|----------------|
| initiator | whadmin | | 21-Feb-2019 15:30:09 | Edit History |
| application | com.nuspace/mortgage_app.Application@13e30006 | com.nuspace/mortgage_app.Application | 21-Feb-2019 15:30:09 | Edit History |
| initial | Boolean | | 21-Feb-2019 15:30:23 | Edit History |
| Incdownpayment | Boolean | | 21-Feb-2019 15:30:23 | Edit History |

10 items



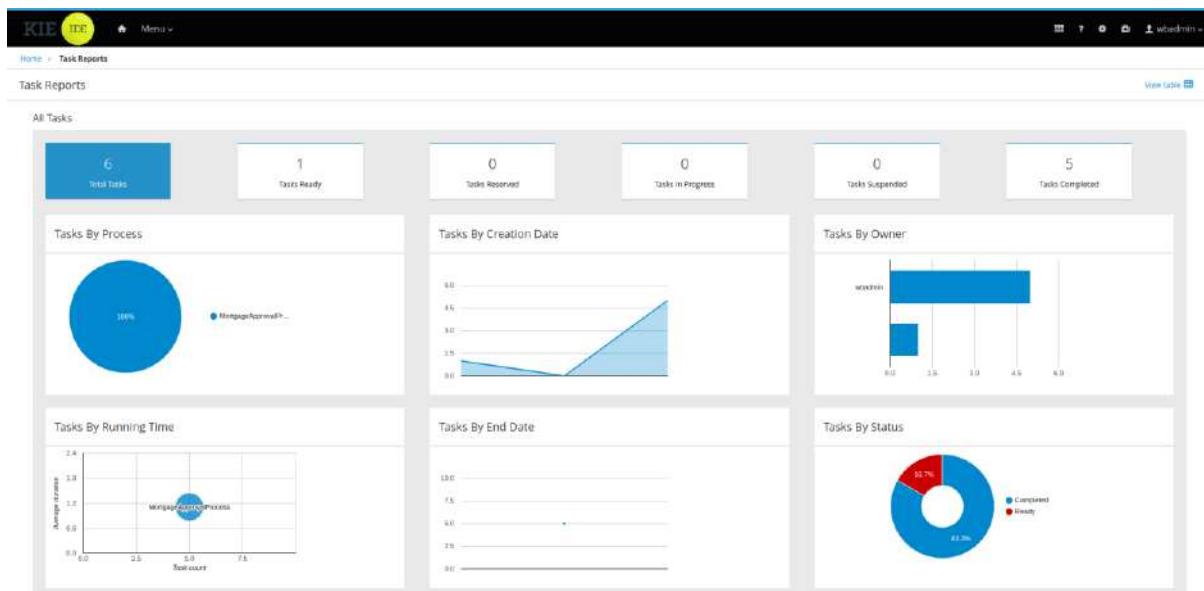
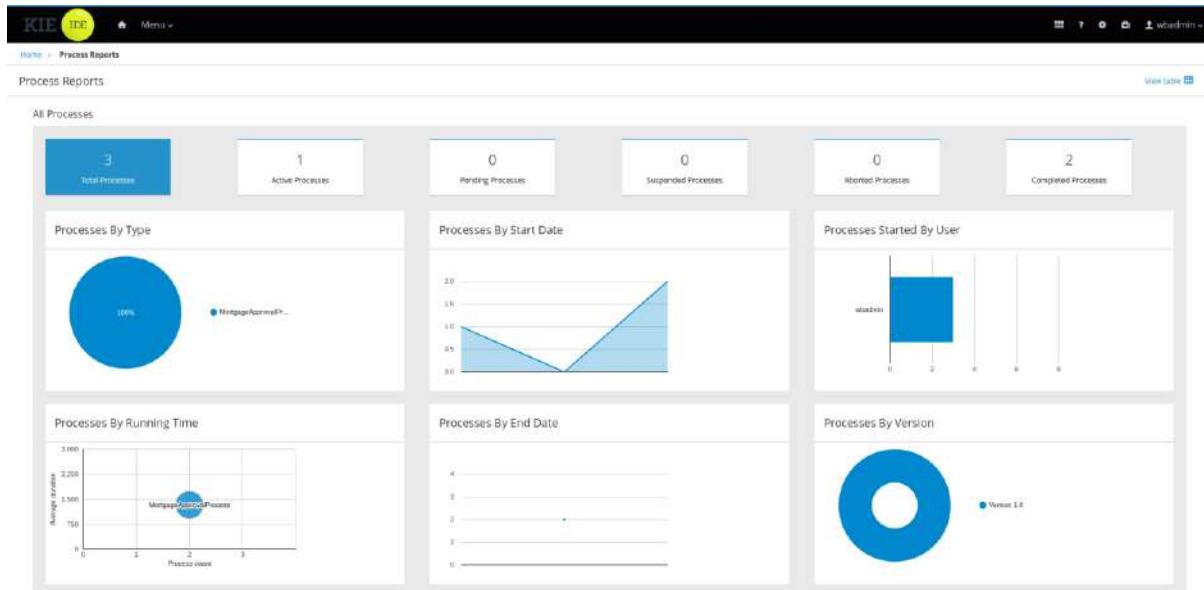
10) To review (pending user task: ***Qualify***) the mortgage application, click: **Menu** → **Task Inbox**

The screenshot shows the KIE Task Inbox interface. On the left, there is a sidebar with a 'Filters' section containing a dropdown for 'Status' with options like 'Completed', 'Created', 'Error', etc., and a 'Process Definition ID' dropdown set to 'Select...'. Below these are 'Created On' and 'Filter by' fields. The main area is titled 'Task Inbox' and shows a table with one row. The table columns are 'Task', 'Process Definition ID', 'Status', and 'Created On'. The single row contains the value 'Qualify', 'Mortgage.Process.MortgageApprovalProcess', 'Ready', and '21-Feb-2019 11:08:00'. At the bottom right of the table, there are buttons for 'New' (green), 'Edit' (blue), and 'Delete' (red).

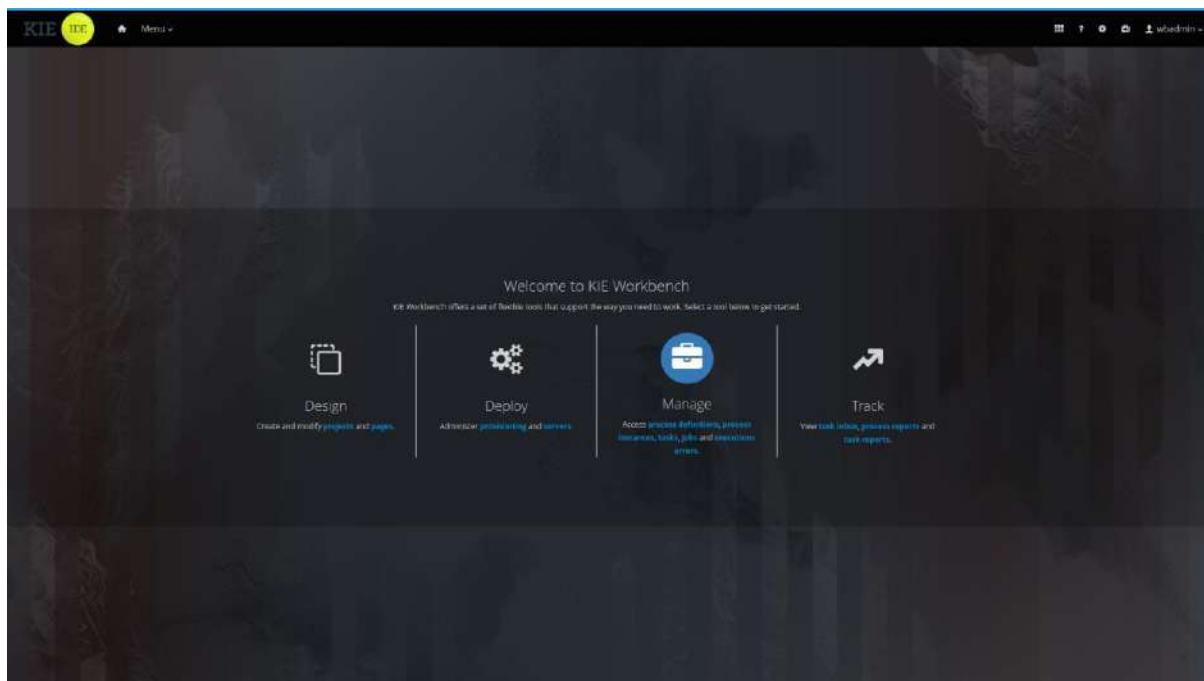
11)[Task Inbox: ***Qualify***] Click to view the task details. Notice the **Mortgage amount** is now calculated as **\$50,000**.

The screenshot shows the 'Qualify' task details page. At the top, there are tabs for 'Work', 'Details', 'Assignments', 'Comments', 'Admin', and 'Logs', with 'Work' being the active tab. The page is divided into sections: 'Inputs', 'Outputs', and 'Logs'. In the 'Inputs' section, there are fields for 'Mortgage amount' (set to '\$50,000') and 'Down Payment' (set to '\$0'). There are also sections for 'Applicant' (Name: 'John Doe', Annual Income: '\$50,000', SSN: '123-45-6789'), 'Property' (Age of property: '10 years', Address of property: '25 VERSO, Singapore', Location: 'Singapore', Sale Price: '\$500,000'), and 'Outputs' (a message: 'A mortgage application is ready').

12) Have a look at Process Reports and Task Reports

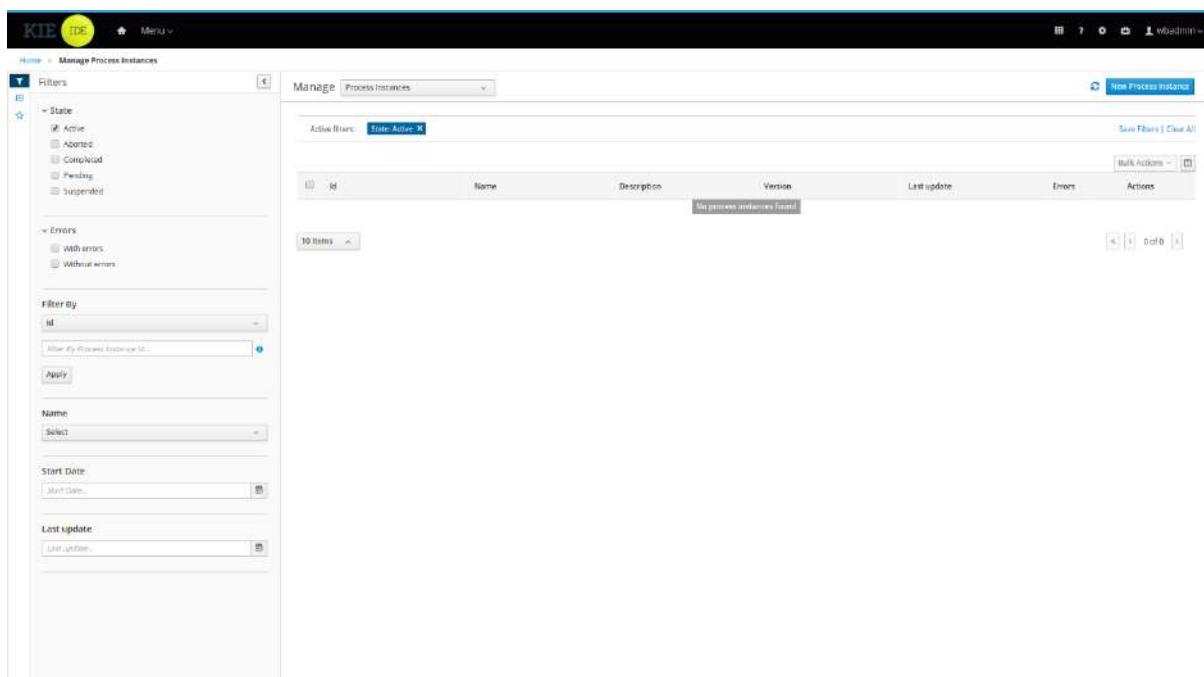
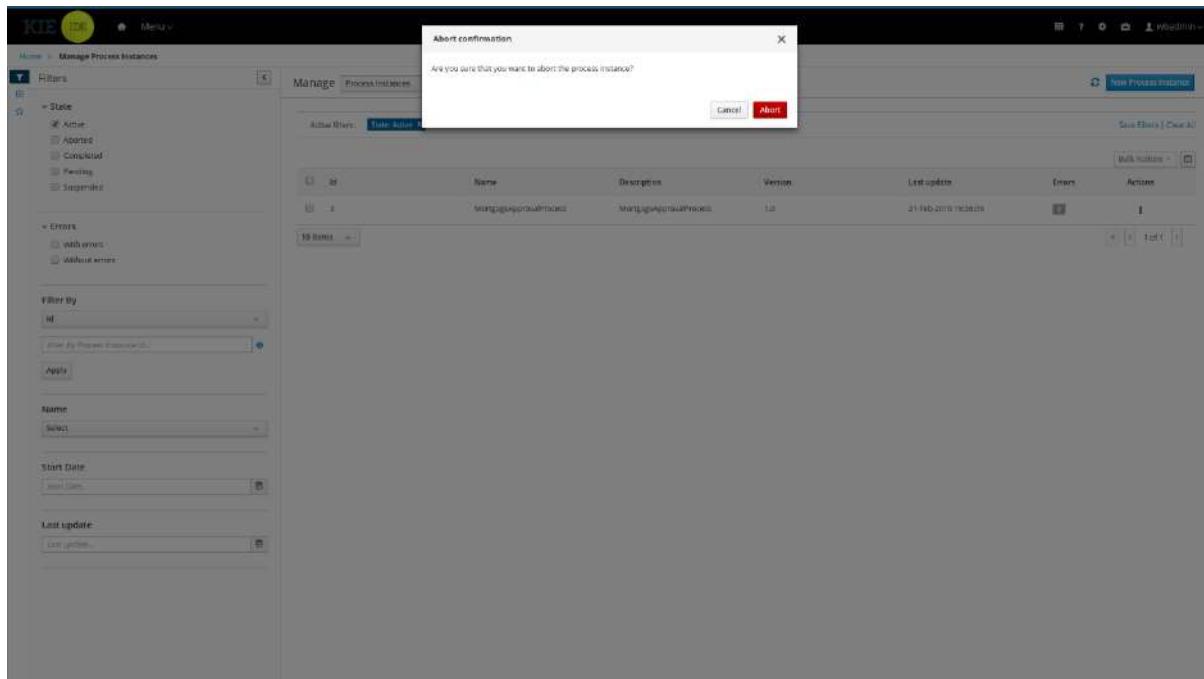


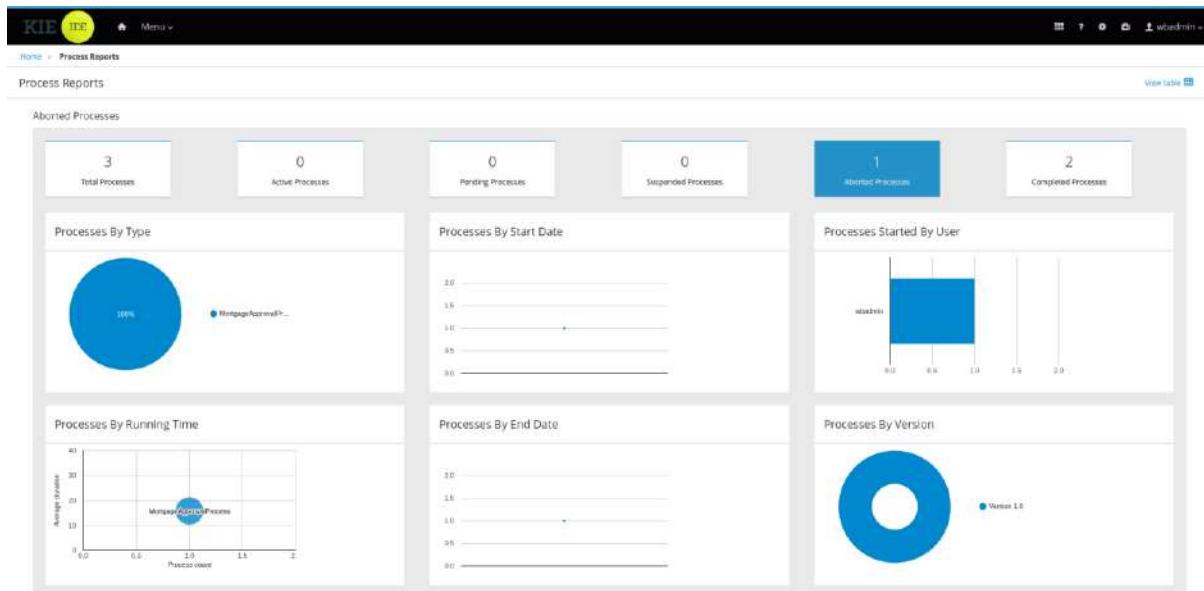
13) Abort/Cancel a process and its tasks: Go to main menu; Click **process instances**



A screenshot of the "Manage Process Instances" page in the KIE Workbench. On the left, there's a sidebar with filters for "State" (Active, Aborted, Completed, Pending, Suspended) and "Errors" (With errors, Without errors). Below that are sections for "Filter By" (id, Name, Start Date, Last update) and "List update" (Last update). The main area shows a table titled "Process Instances" with columns: Id, Name, Description, Version, Last update, Signal, Abort, View jobs, and View tasks. A single row is selected, showing Id: 3, Name: MortgageApprovalProcess, Description: MortgageApprovalProcess, Version: 1.0, Last update: 27-Feb-2019 16:26:09, and a signal icon. There are also buttons for "New Process Instance" and "Delete All". The URL at the bottom of the browser window is "localhost:8080/bpm-console/kieview.jsp#".

14)[Process Instances: **MortgageApprovalProcess**] Click Abort; Confirm **Abort**;

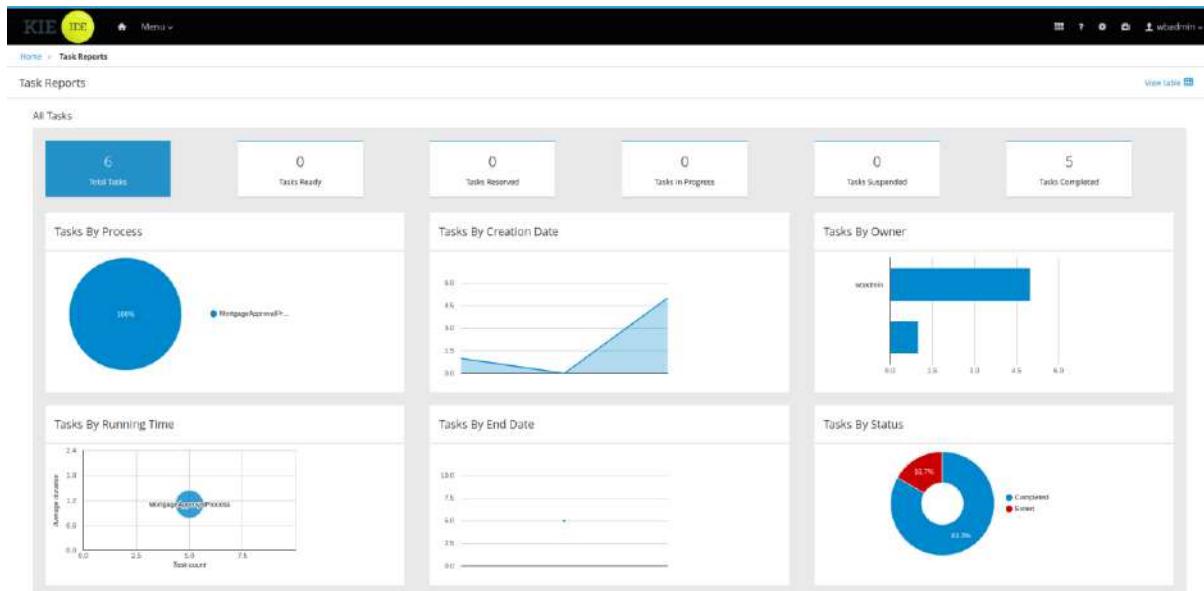




All Processes table:

| ID | Deployment Id | Process Id | Process name | Initiator | Status | Version | Start | End | Duration |
|----|----------------------|---------------------|---------------------|---------------|-----------|---------|----------------------|----------------------|----------------|
| 2 | mortgage-process_... | Mortgage_Process... | MortgageApproval... | administrator | Aborted | 1.0 | 21-Feb-2019 13:36... | 21-Feb-2019 13:51... | 15m 45s |
| 3 | mortgage-process_... | Mortgage_Process... | MortgageApproval... | administrator | Completed | 1.0 | 21-Feb-2019 12:41... | 21-Feb-2019 12:53... | 11m 59s |
| 1 | mortgage-process_... | Mortgage_Process... | MortgageApproval... | administrator | Completed | 1.0 | 16-Feb-2019 10:38... | 21-Feb-2019 12:11... | 10 201 49h 59s |

10 items -



The table lists the following process instances:

| ID | Process Id | Process instance Id | Task | Owner | Status | Start | End | Duration | Deployment Id |
|----|-------------------|---------------------|------------------|----------|-----------|---------------------|---------------------|----------------|----------------------------------|
| 6 | MortgageApprov... | 3 | Qualify | wisdomrm | Entered | 21-Feb-2019 15:3... | 21-Feb-2019 15:3... | 17m 16s | mortgage-services_3.0.0-SNAPSHOT |
| 5 | MortgageApprov... | 2 | Initial Approval | wisdomrm | Completed | 21-Feb-2019 12:5... | 21-Feb-2019 12:5... | 1m 17s | mortgage-process_2.0.0-SNAPSHOT |
| 4 | MortgageApprov... | 2 | Qualify | wisdomrm | Completed | 21-Feb-2019 12:4... | 21-Feb-2019 12:4... | 2m | mortgage-process_2.0.0-SNAPSHOT |
| 3 | MortgageApprov... | 2 | Correct Data | wisdomrm | Completed | 21-Feb-2019 12:4... | 21-Feb-2019 12:4... | 7m 23s | mortgage-process_2.0.0-SNAPSHOT |
| 2 | MortgageApprov... | 1 | Final Approval | wisdomrm | Completed | 21-Feb-2019 12:0... | 21-Feb-2019 12:1... | 11m 17s | mortgage-services_3.0.0-SNAPSHOT |
| 1 | MortgageApprov... | 1 | Qualify | wisdomrm | Completed | 19-Feb-2019 16:0... | 21-Feb-2019 12:0... | 1d 14h 59m 58s | mortgage-process_2.0.0-SNAPSHOT |

😊 Congratulations!

You have completed today's challenging workshop!

2. Workshop 2 – Knowledge Modelling

2.1. { Optional } Knowledge Representation and Acquisition

Construct knowledge models:

- Identify a business opportunity to use reasoning system.
- Study online documented knowledge source as knowledge acquisition.
- Compose relevant knowledge models in spreadsheets, e.g. Excel.
- { Optional } After completion, save to **Miscellaneous** project folder.

😊 Candidate Project: HDB BTO; Airport Gate Assignment System (AGAS); DoReMi

The screenshot shows a GitHub repository page for 'IRS-PM / Workshop-Project-Submission-Template'. The repository has 13 commits, 1 branch, 0 releases, and 1 contributor. A file named 'Miscellaneous' is highlighted with a red dashed box. The 'Clone with HTTPS' button is visible on the right.

| File | Last Commit |
|------------------|----------------|
| Miscellaneous | Initial |
| ProjectReport | Initial |
| SystemCode/clips | Initial |
| UserGuide | Initial |
| README.md | updated readme |

2.2. KIE BPMS/BRMS Business System Enhancement

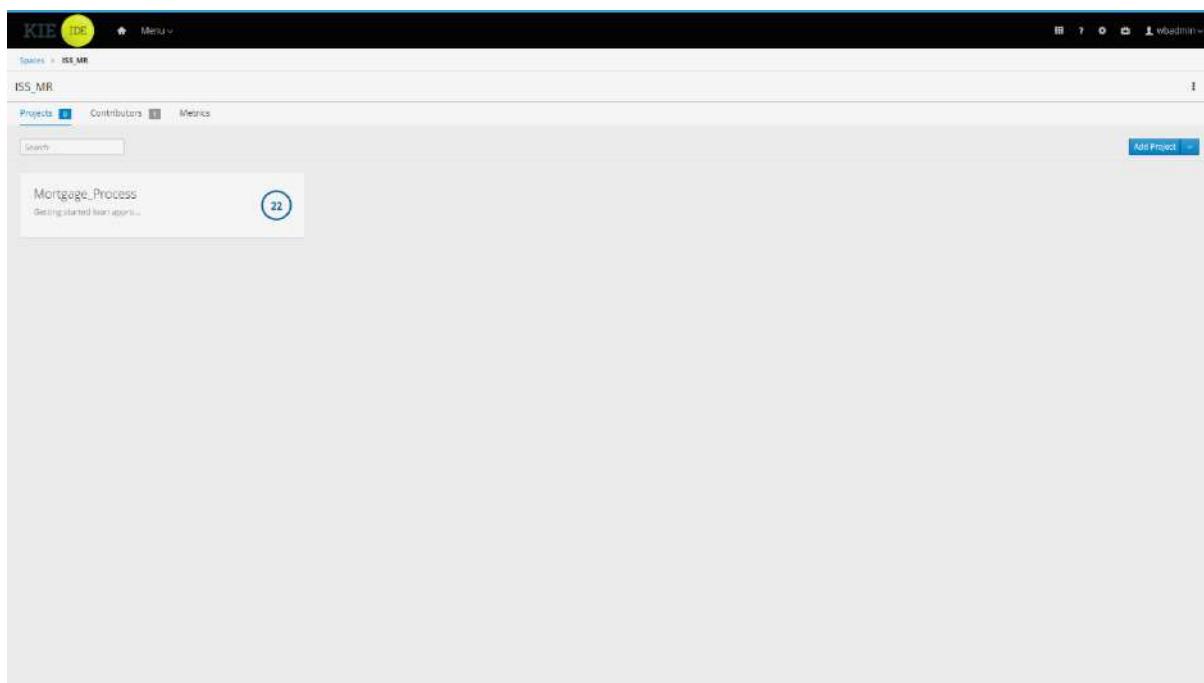
{ Objective } To enhance **Mortgage_Process** system by adding new machine reasoning **Business Rule Task**, to automate the decision of **User Task: Qualify**;

Enhancements involve: Data Model: Objects; Fields; Data Types; When-Then Guided Rules; Business Process, Task, Form

Core enhancement: [Task] Create a new '**MortgageMachineReasoning**' Business Rule Task to replace '**Qualify**' User Task for automated mortgage loan **Inlimit** checking.

2.2.1. Business system enhancement [Data Objects]

- 1) Go to asset list of project **Mortgage_Process**



2) Select [Data Objects: **Application**] from **Assets**:

The screenshot shows the KIE IDE interface with the 'Assets' tab selected. A list of data objects is displayed, including:

- Applicant (Form, Last modified today, Created 2 days ago)
- Applicant (Form, Last modified today, Created 2 days ago)
- Application** (Form, Last modified today, Created 2 days ago)
- Application (Data Objects, Last modified today, Created 2 days ago)
- ApplicationError (Form, Last modified today, Created 2 days ago)
- ApplicationMortgage (Form, Last modified today, Created 2 days ago)
- ApplicationMortgage (Form, Last modified today, Created 2 days ago)
- CorrectDataTaskForm (Form, Last modified today, Created 2 days ago)
- FinalApprovalTaskForm (Form, Last modified today, Created 2 days ago)

3) [Data Objects: **Application**] Click button: + add filed; Fill in the new field **Id***: **InlimitMR**; **Label: Inlimit Machine Reasoning**; **Type***: **Boolean**; Click blue button: **Create**

The screenshot shows the KIE IDE interface with the 'Model' tab selected. The 'Application' data object is open. A 'New Field' dialog box is displayed, showing the following fields:

| Name | Type | Label |
|-------|---------|---------------------------|
| Id* | Boolean | InlimitMR |
| Type* | Boolean | Inlimit Machine Reasoning |

At the bottom right of the dialog box, there are three buttons: 'Cancel', 'Create', and 'Create and continue'. The 'Create' button is highlighted in blue.

The screenshot shows the KIE IIE Application Data Objects editor. On the left, there's a sidebar with categories like BUSINESS PROCESSES, DATA OBJECTS, FORMS, GUIDED DECISION TABLES, GUIDED RULES, and OTHERS. The main area has tabs for Model, Overview, and Source. Under Model, there's a table titled 'Application' with columns: identifier, label, type, and actions (Delete). The table contains rows for amortization, applicant, downpayment, errors, mortgageamount, property, and a new row 'inimitMR'. The right side shows the properties for 'inimitMR': identifier (inimitMR), label (Inimit Machine Reasoning), description (empty), type (Boolean), and a list section.

| Identifier | Label | Type |
|-----------------|--------------------------|-----------------|
| amortization | Years of amortization | Integer |
| applicant | Applicant | Applicant |
| downpayment | Down Payment | Integer |
| errors | Error details | Validator Error |
| mortgageamount | Mortgage amount | Integer |
| property | Property | Property |
| inimitMR | Inimit Machine Reasoning | Boolean |

4) [Data Objects: **Application**] Remember to click button: **Save**;

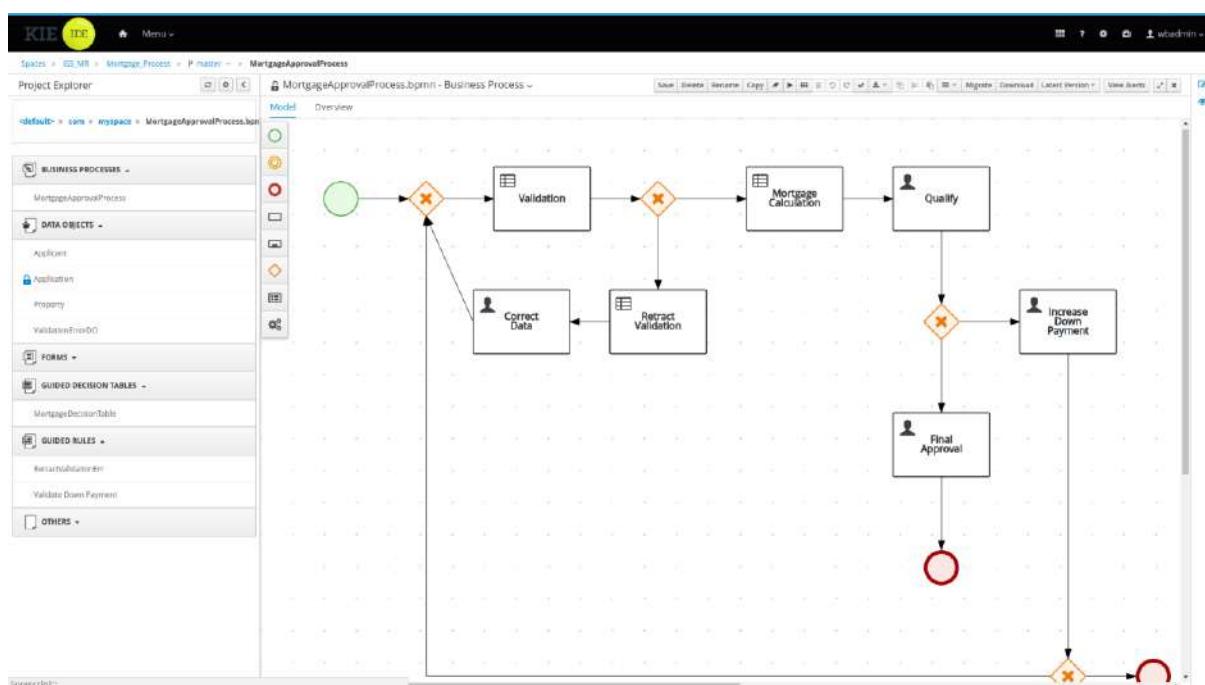
2.2.2. Business system enhancement [Business Processes]

- From left Project Explorer panel, click to edit **Business Processes: MortgageApprovalProcess**

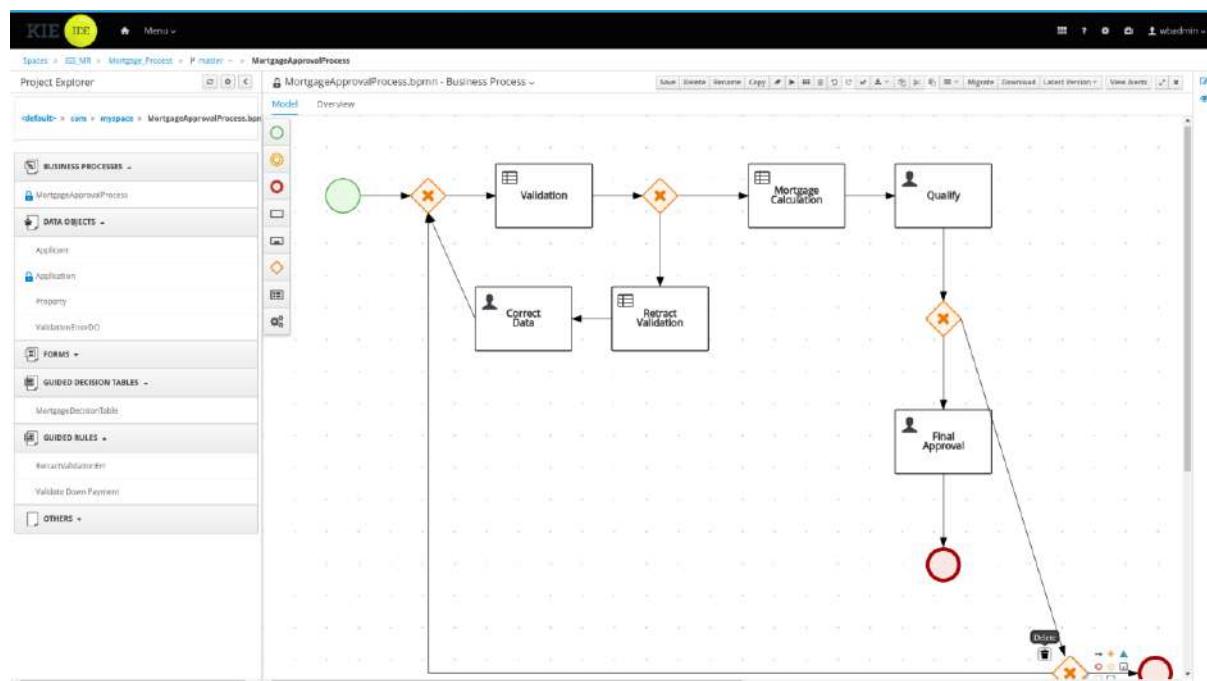
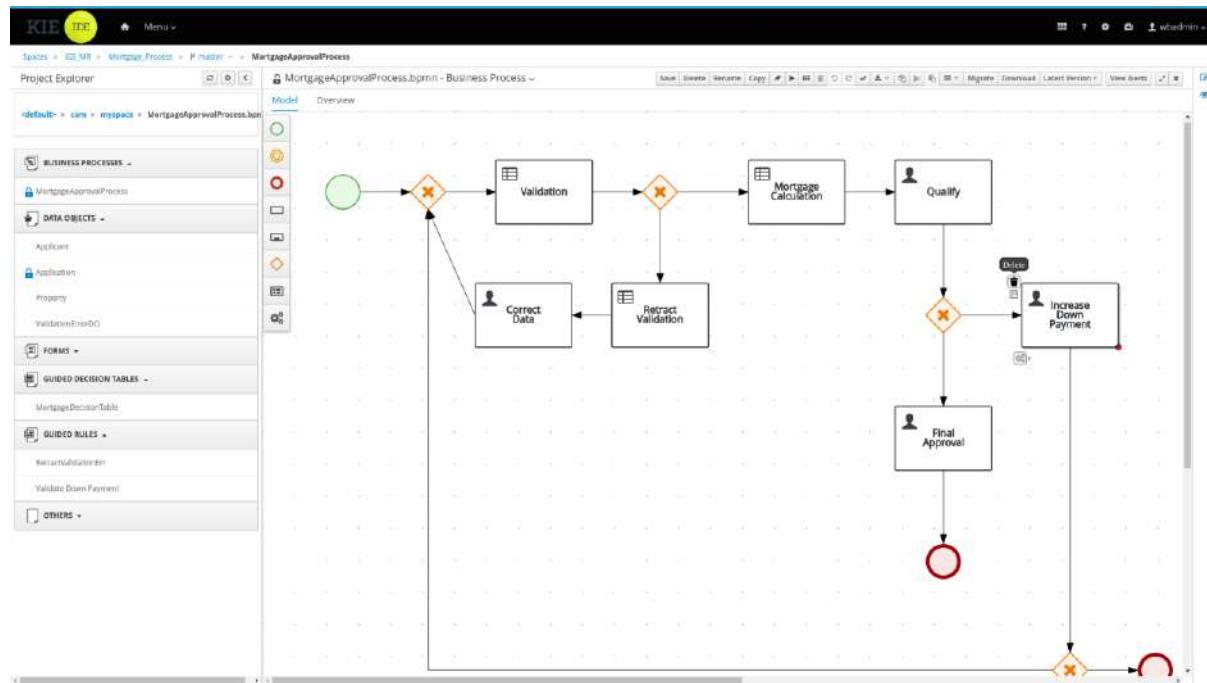
The screenshot shows the KIE Workbench interface with the following details:

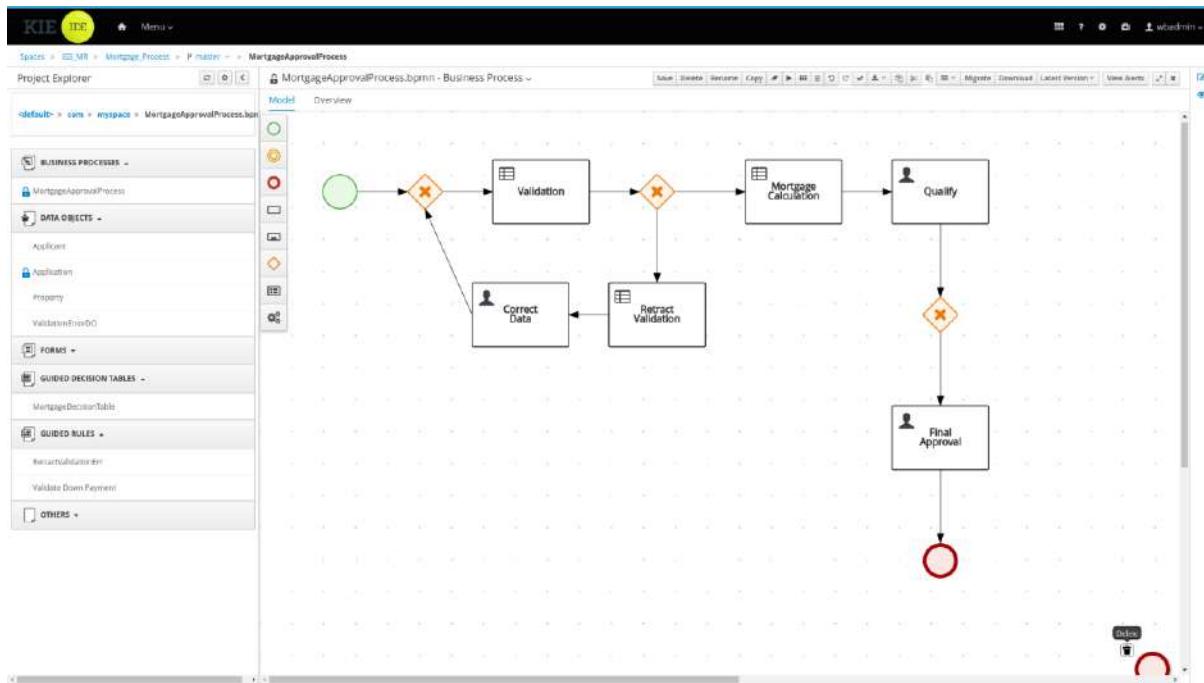
- Project Explorer:** Shows the 'MortgageApprovalProcess' under the 'com.innspire' package.
- Central Area:** The 'Application.java - Data Objects' editor is open, displaying a table of data objects:

| Identifier | Label | Type |
|----------------|---------------------------|------------------|
| amortization | Years of amortization | Integer |
| applicant | Applicant | Applicant |
| downpayment | Down Payment | Integer |
| errors | Error details | Validation Error |
| mortgageamount | Mortgage amount | Integer |
| property | Property | Property |
| inlimitMR | Inlimit Machine Reasoning | Boolean |
- Right Sidebar:** Shows the general properties for an object named 'inlimitMR' with fields for Identifier, Label, Description, Type (Boolean), and List.
- Left Sidebar:** Lists project components such as Business Processes, Data Objects, Guided Decision Tables, Guided Rules, and others.

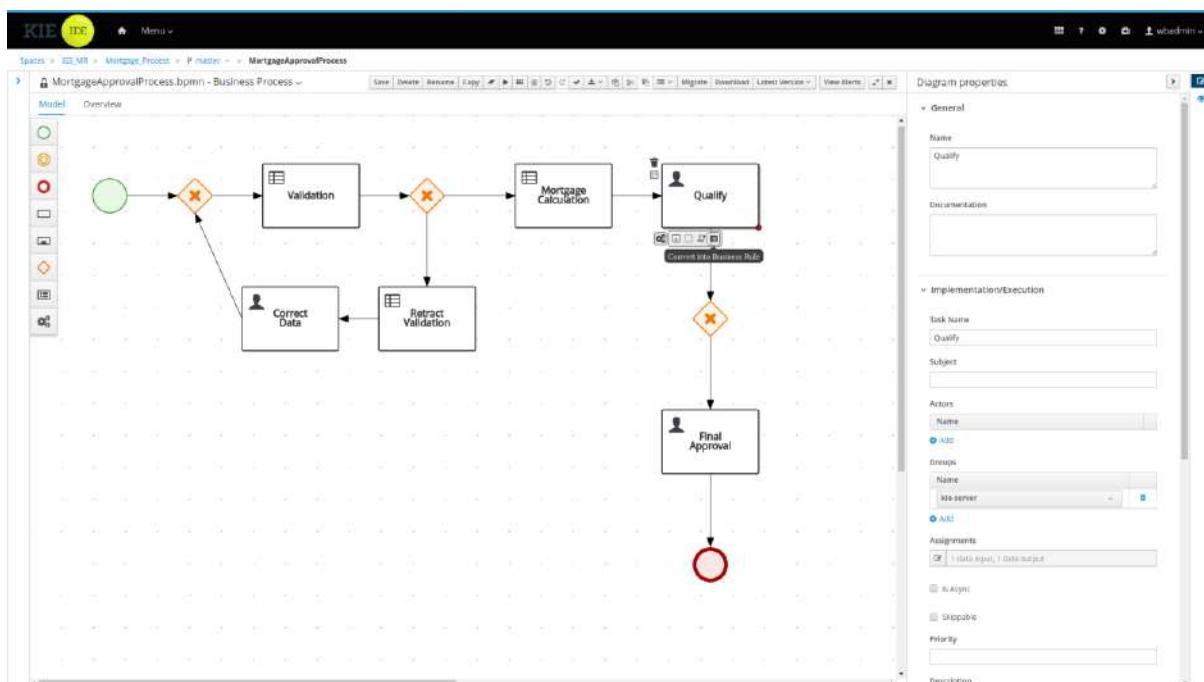


- 2) Edit business process: Delete ***Increase Down Payment*** and few other not to be used process nodes, e.g. end node, links;

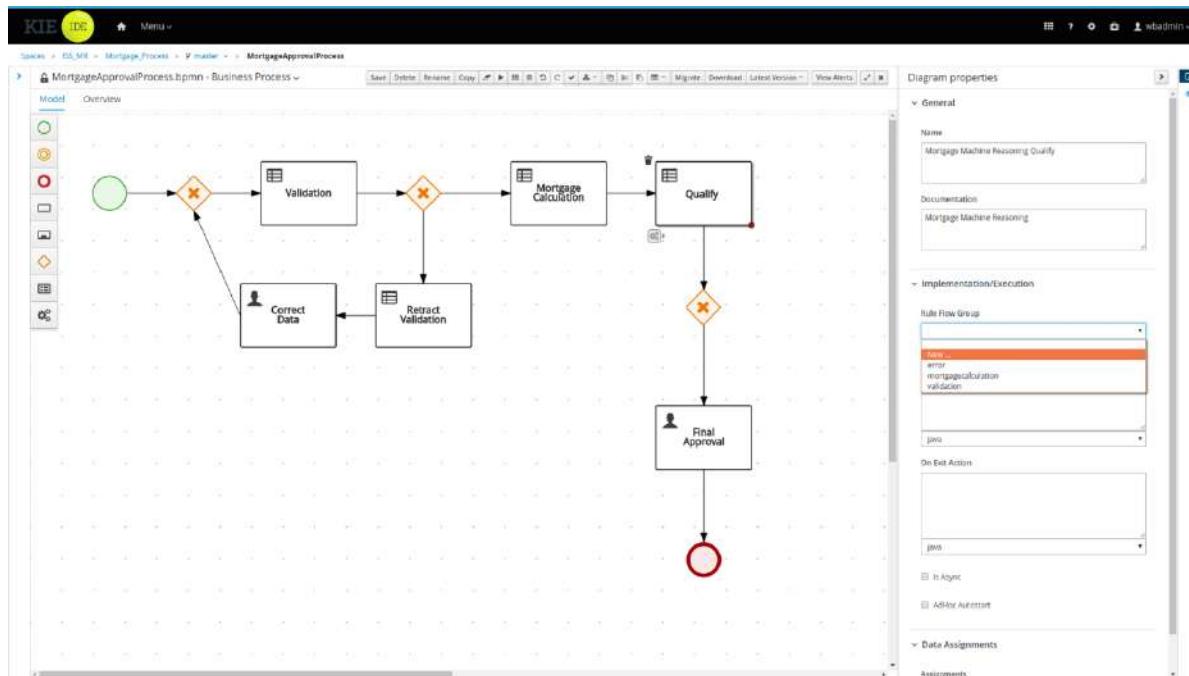




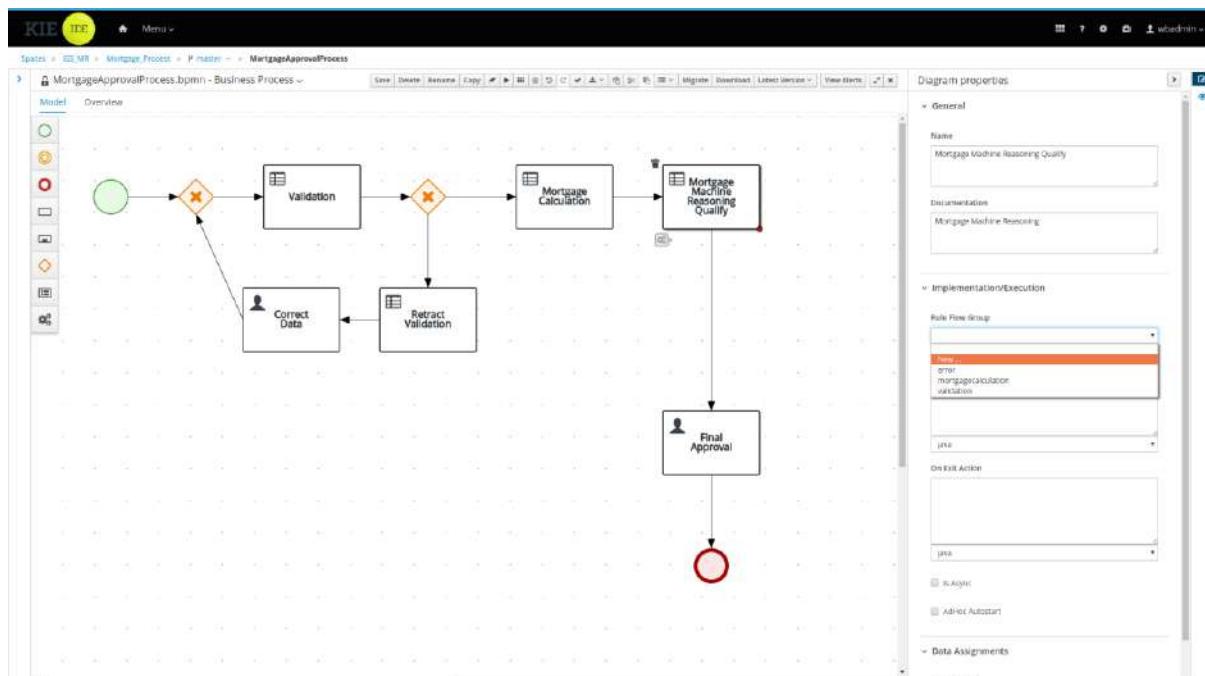
3) Convert User Task: **Qualify** into Business Rule Task;



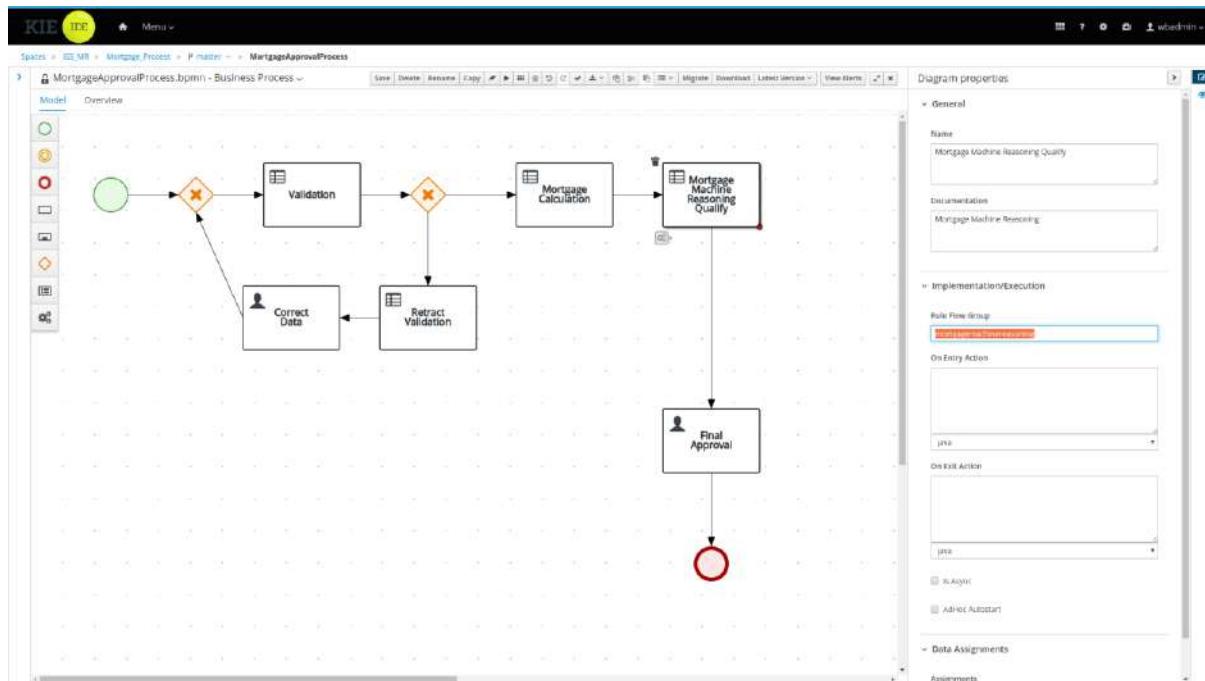
- 4) Remove  in-between **Qualify** and **Final Approval**



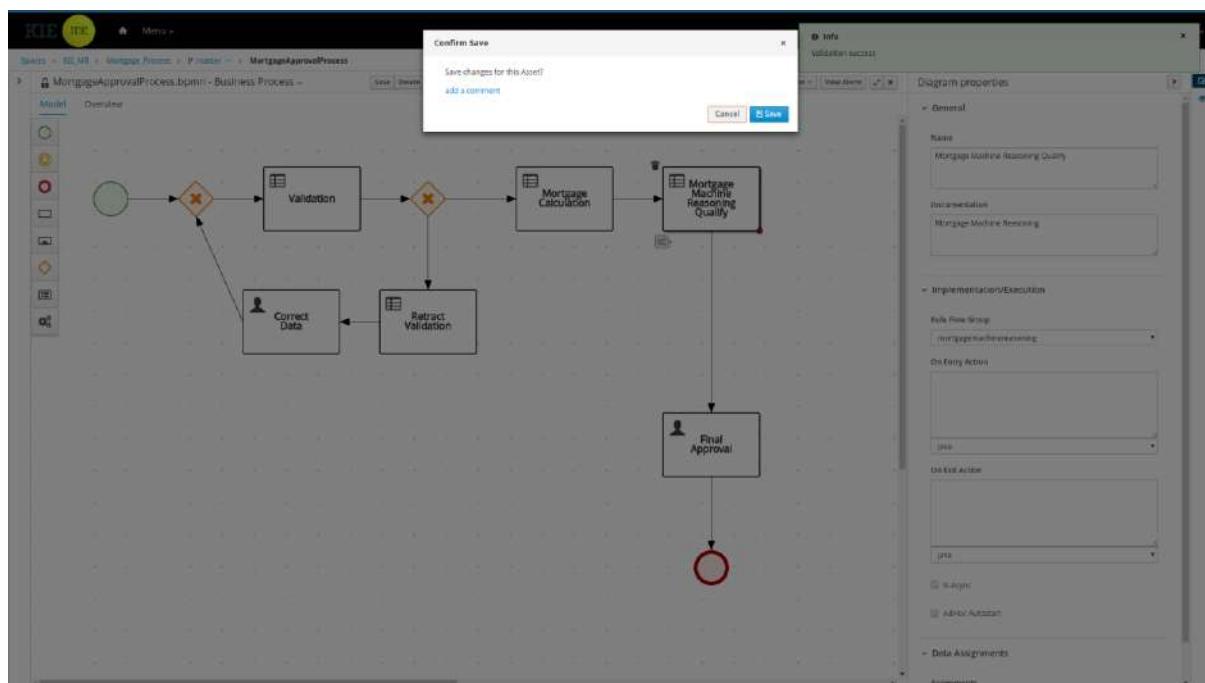
- 5) Update fields: **Name: Mortgage Machine Reasoning Qualify** and **Documentation: Mortgage Machine Reasoning** fields using its **Diagram properties**



6) Key in new Rule Flow Group name: ***mortgagemachineReasoning***



7) **Save** the changes;



2.2.3. Business system enhancement [Forms]

- From Assets list view, click to edit **Forms: ApplicationMortgage.frm**
[src/main/resource/ApplicationMortgage.frm](#)

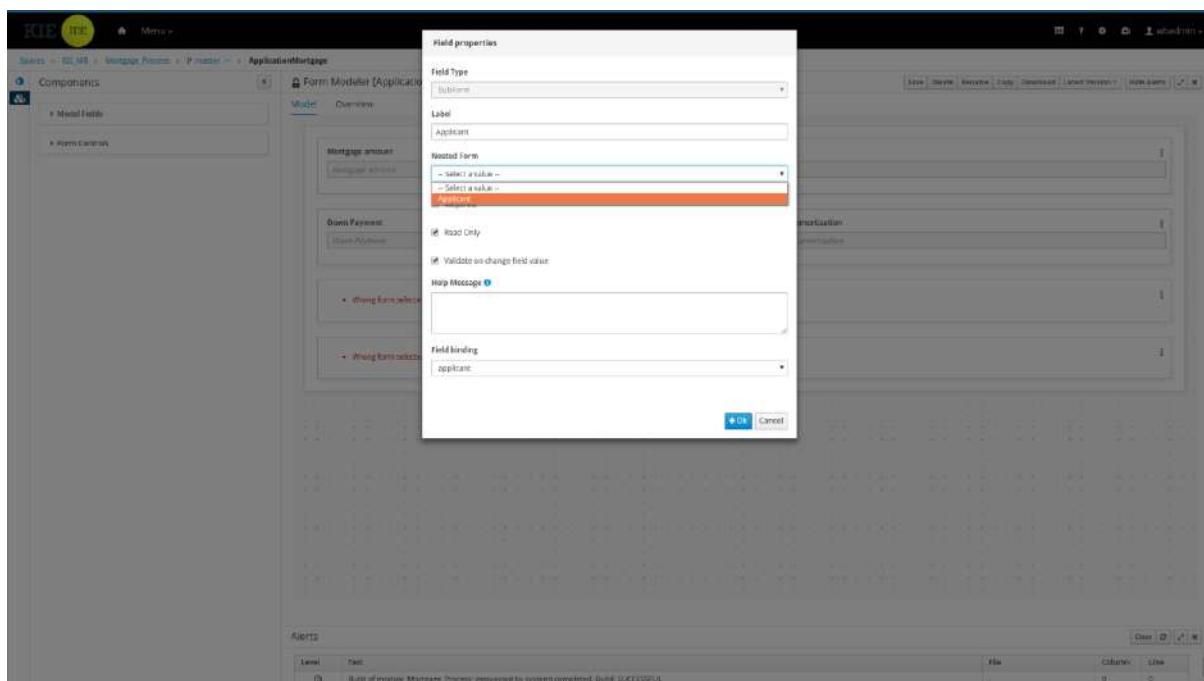
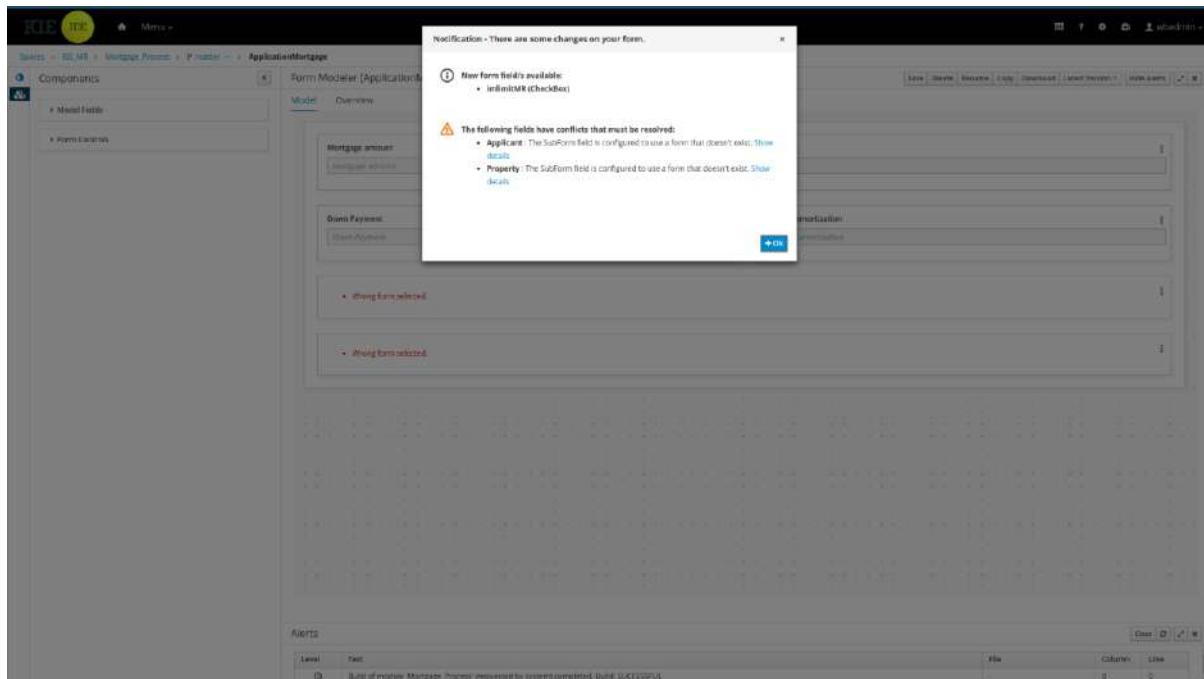
The screenshot shows the KIE IDE Assets list view. The navigation bar at the top includes 'Spaces > HSL_MH > Mortgage_Process > P master >'. Below the navigation is a toolbar with 'Build', 'Deploy', 'View Alerts', and other icons. The main area displays a table of assets:

| Icon | Name | Type | Last modified | Created |
|----------------------|--|--------------|---------------------|--------------------|
| Applicant | Applicant | Forms | last modified today | Created 2 days ago |
| Applicant | Applicant | Data Objects | last modified today | Created 2 days ago |
| Application | Application | Forms | last modified today | Created 2 days ago |
| Application | Application | Data Objects | last modified today | Created 2 days ago |
| Applicationerror | Applicationerror | Forms | last modified today | Created 2 days ago |
| ApplicationMortgage | ApplicationMortgage src/main/resource/ApplicationMortgage.frm | Forms | last modified today | Created 2 days ago |
| ApplicationMortgage | ApplicationMortgage | Forms | last modified today | Created 2 days ago |
| CorrectData-CardForm | CorrectData-CardForm | Forms | last modified today | Created 2 days ago |

The screenshot shows the KIE IDE Form Modeler interface for the 'ApplicationMortgage' form. The left sidebar lists 'Components', 'Model Fields', and 'Form Controls'. The main area shows various form fields like 'Mortgage amount', 'Down Payment', 'Applicant' (with fields for Name, Annual Income, SSN), 'Property' (with fields for Age of property, Address of property, Locale), and 'Years of amortization'. A modal dialog box is open with the title 'Notification - There are some changes on your form.' It contains the message 'New form field(s) available:
• InlimitMR (Checkbox)' and an 'OK' button. At the bottom of the screen, there is an 'Alerts' panel with a single entry: 'Build of module Mortgage_Process (invoked by system) completed. Result: SUCCESSFUL'.

{ Tips } If the new form field **InlimitMR** is not automatically shown, try to log out **wbadmin** and log in again to refresh.

- 2) { Optional } The system may send warning, regarding embedded sub-forms not found, in this case, update the sub-forms: **Applicant** and **Property**,



Field properties

Field type: RadioForm

Label: Property

Named Form: - Select a value -
Property

Read Only

Validate on change field value

Help Message:

Field binding:
property

OK **Cancel**

Alerts

| Level | Text |
|-------|--|
| Info | Build of module Mortgage_Process (requested by system) completed. Build SUCCESSFUL |

Form Modeler [ApplicationMortgage]

Mortgage amount: Mortgage amount

Down Payment: Down Payment

Years of amortization: Years of amortization

Applicant:

Name: Name

Annual Income: Annual income

SSN: SSN

Property:

Age of property: Age of property

Address of property: Address of property

Locale: Locale

Alerts

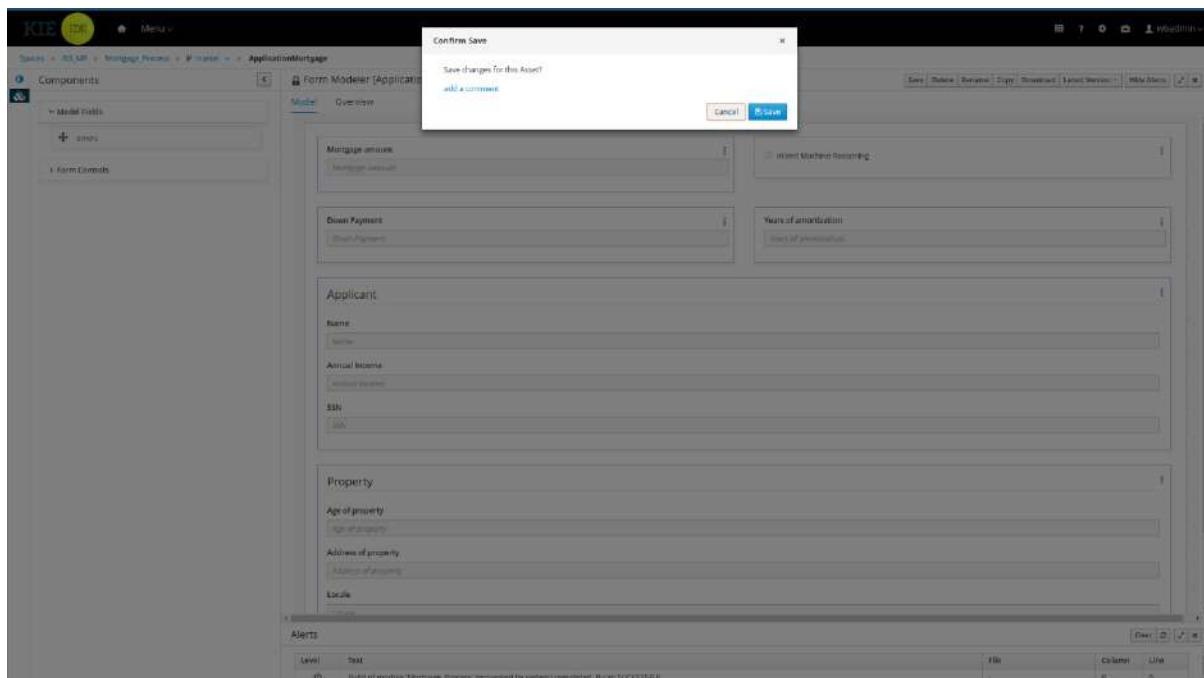
| Level | Text |
|-------|--|
| Info | Build of module Mortgage_Process (requested by system) completed. Build SUCCESSFUL |

- 3) Add new field **InlimitMR** from left panel: **Model Fields** to actual form; Drag it next to **Mortgage amount** field;

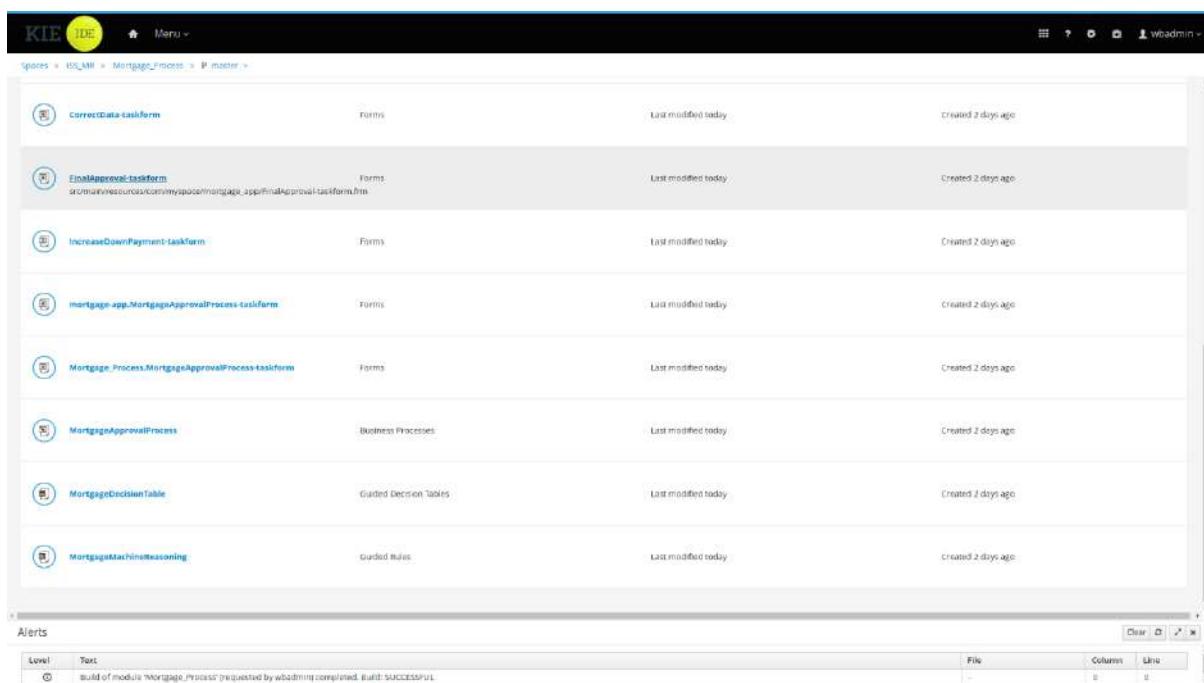
The screenshot shows the KIE IDE Form Modeler interface. On the left, there's a sidebar with 'Components' and 'Model Fields' sections. The main area shows a form with fields for 'Mortgage amount', 'Down Payment', 'Applicant' (with 'Name', 'Annual Income', and 'SSN' fields), and 'Property' (with 'Age of property', 'Address of property', and 'Locality'). A modal dialog titled 'Field properties' is open, allowing configuration of a new field named 'InlimitMachineReasoning'.

This screenshot shows the same KIE IDE Form Modeler interface after the new field has been added. The 'Model Fields' section now includes the 'InlimitMachineReasoning' field. The main form layout remains the same, with the 'InlimitMachineReasoning' field positioned next to the 'Mortgage amount' field.

4) **Save** the form changes;



5) Open form: ***FinalApproval-taskform***; Ensure the '**Inlimit Machine Reasoning**' checkbox is visible;

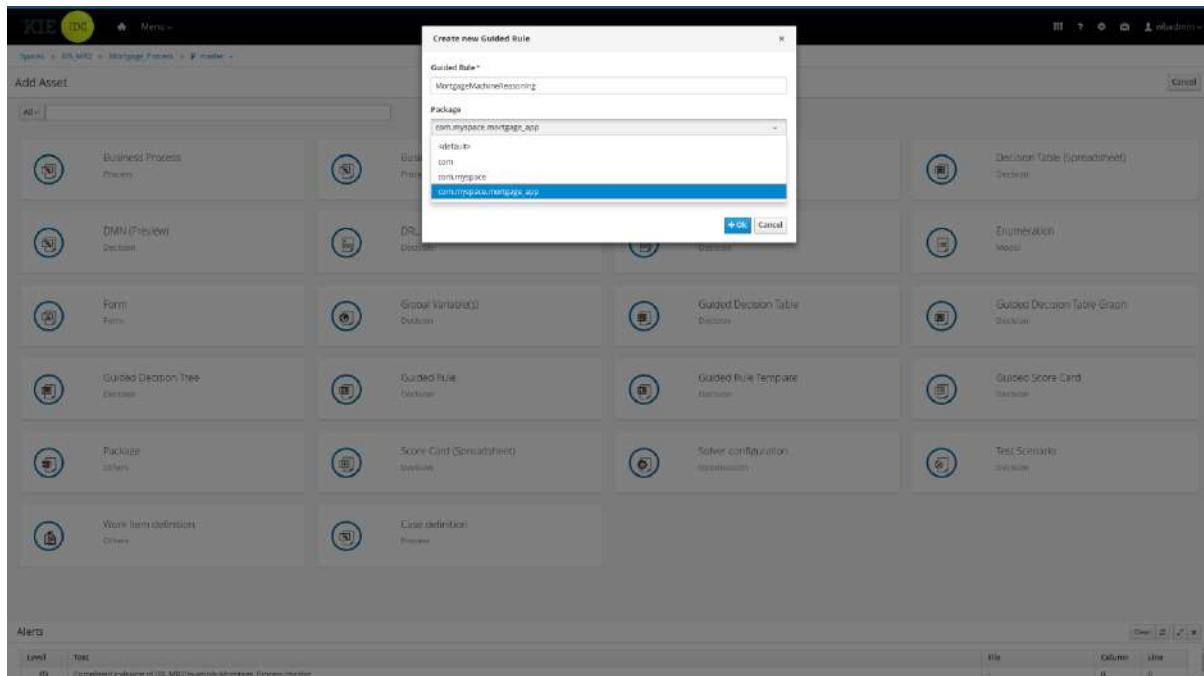


The screenshot shows the KIE IDE Modeler interface. The left sidebar displays the Project Explorer with various business processes, data objects, forms, and guided decision tables. The central area is titled "Form Modeler [FinalApproval-taskform]" and shows the "Model" tab with an "Overview" section. The form contains several input fields grouped under sections: "Application" (Mortgage amount, Down Payment, Years of amortization), "Applicant" (Name, Annual income, SSN), and "Property" (Age of property, Address of property). A red dashed box highlights the "Mortgage amount" field. At the bottom, there is an "Alerts" table with one entry: "Level: Info, Text: --> --> if module 'Mortgage_Process' (requested by wbadmin) compiled, build SUCCESSFUL." The top right corner shows standard file operations: Save, Delete, Rename, Copy, Download, Latest Version, Hide Alerts, and Close.

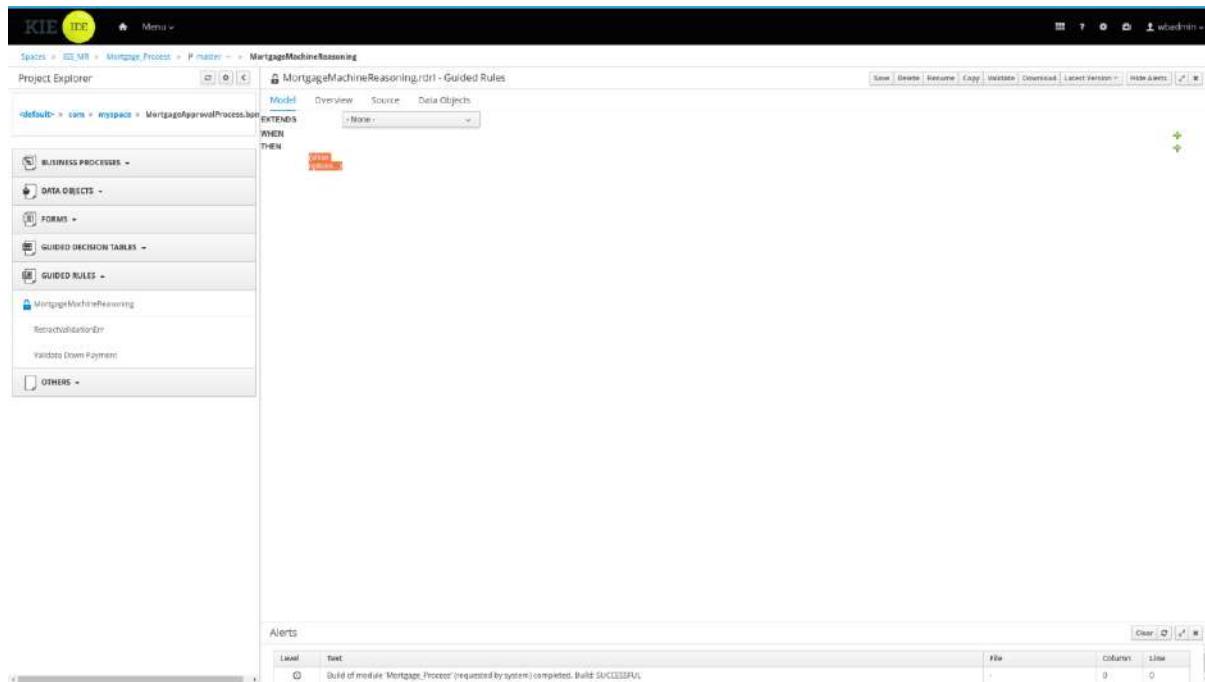
2.2.4. Business system enhancement [Guided Rules]

- 1) Click blue button **Add Asset**; Select Guided Rule (Decision Automation);

- 2) Fill in rule (file) name: **MortgageMachineReasoning**; Select Package: **com.myspace.mortgage_app**

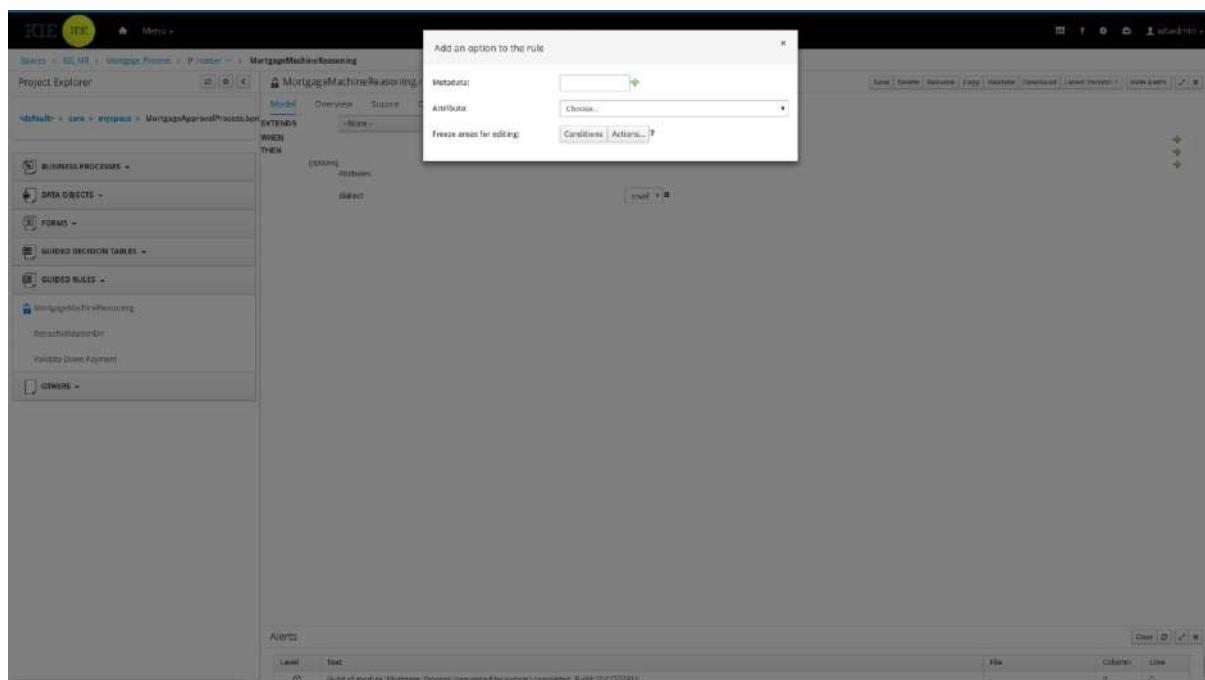


3) Click (**show options...**); Then click the lowest 3rd button: 



The screenshot shows the KIE IDE interface with the following details:

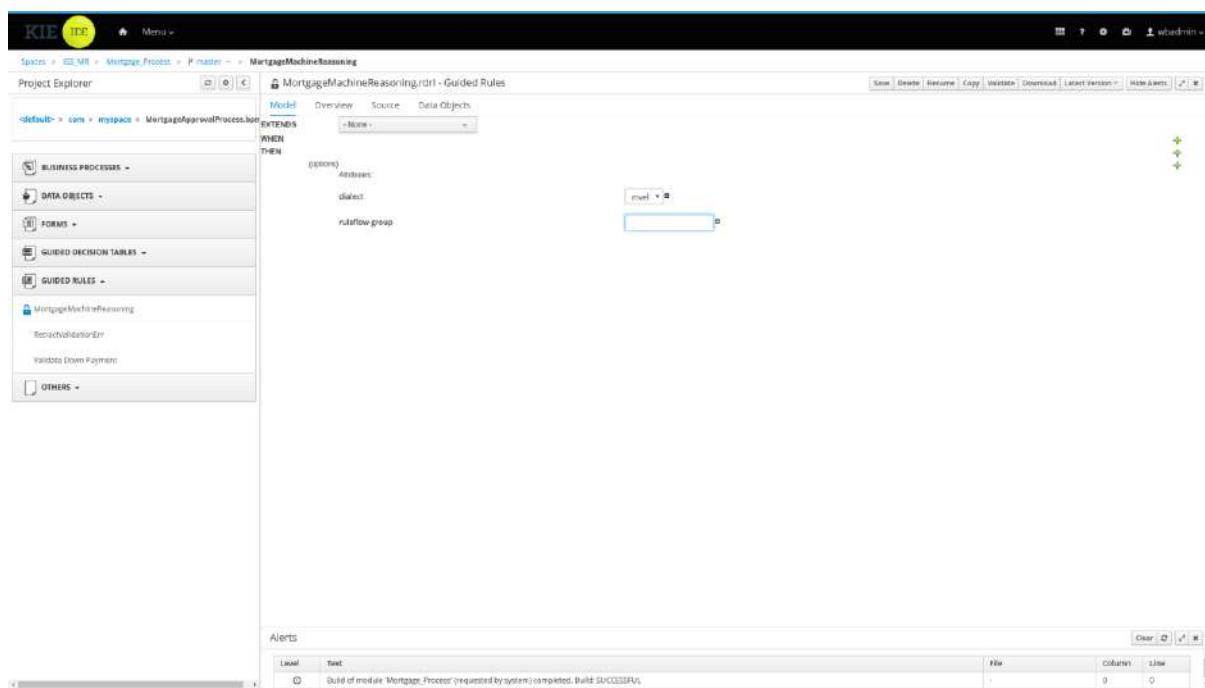
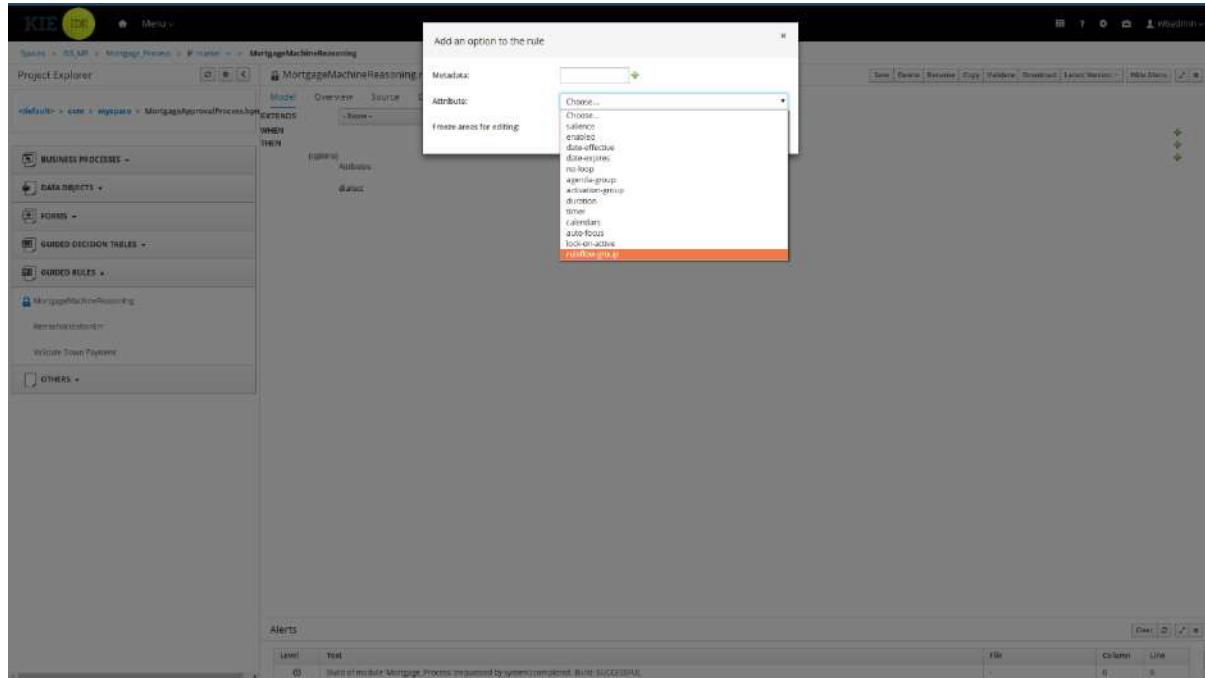
- Project Explorer:** Mortgage_Process > MortgageMachineReasoning
- Model Tab:** MortgageMachineReasoning.rdl - Guided Rules
- Context Menu:** A context menu is open over a 'WHEN THEN' section, with the 'show options...' option highlighted.
- Alerts Panel:** Shows a message: "Build of module 'Mortgage_Process' (requested by system) completed. Build SUCCESSFUL."



The screenshot shows the KIE IDE interface with the following details:

- Project Explorer:** Mortgage_Process > MortgageMachineReasoning
- Model Tab:** MortgageMachineReasoning.rdl - Guided Rules
- Dialog Box:** 'Add an option to the rule' dialog is open, showing fields for Metadata and Attribute, and a 'Freeze areas for editing' button.
- Alerts Panel:** Shows a message: "Build of module 'Mortgage_Process' (requested by system) completed. Build SUCCESSFUL."

4) Choose ruleflow-group



{ Quiz } What value should be filled in the **ruleflow-group** field?

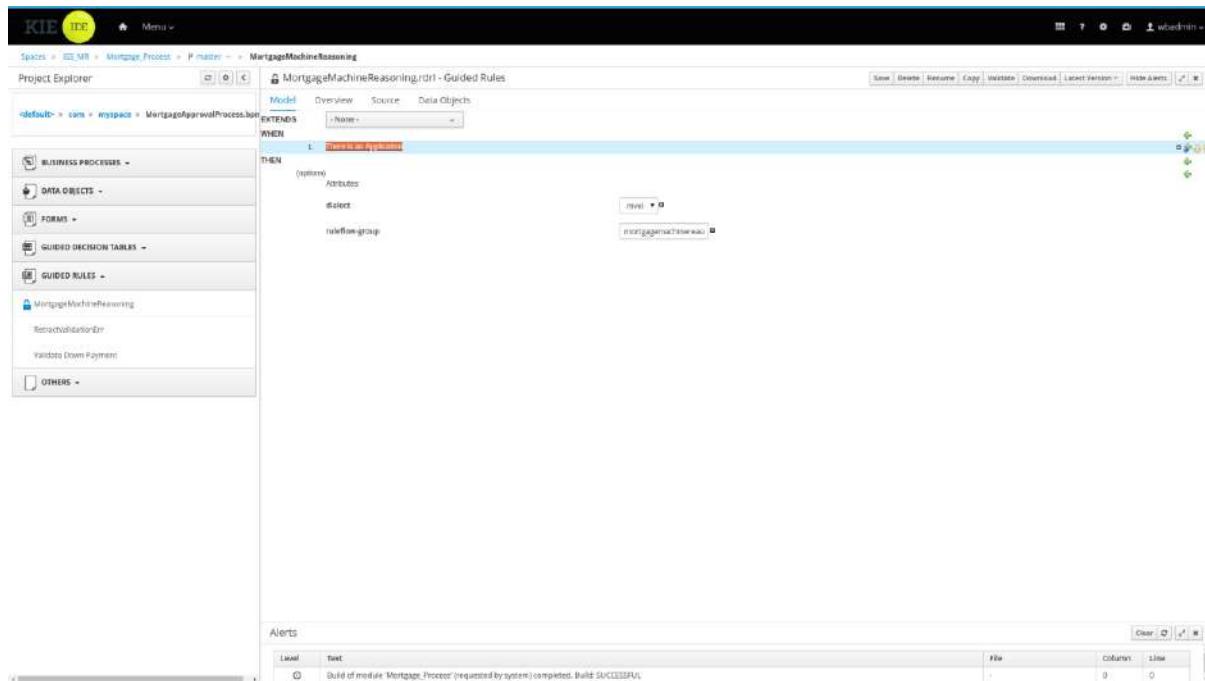
- 5) Key in the **Rule Flow Group** name we defined earlier at **Business Process [Business Rule Task: Mortgage Machine Reasoning Qualify]**; The name is **mortgagemachineReasoning**

The screenshot shows the KIE IDE interface for a 'MortgageMachineReasoning.rdrl - Guided Rules' model. In the main workspace, under the 'Model' tab, there is a 'ruleflow group' field which contains the value 'mortgagemachineReasoning'. This field is highlighted with a red box. The 'Project Explorer' sidebar on the left lists various project components like 'Business Processes', 'Data Objects', and 'GUIDED RULES'. The 'GUIDED RULES' section contains entries for 'MortgageMachineReasoning' and 'QualifyDownPayment'. The 'Alerts' panel at the bottom right shows a single entry: 'Build of module 'Mortgage_Process' (requested by system) completed. Build: SUCCESSFUL'.

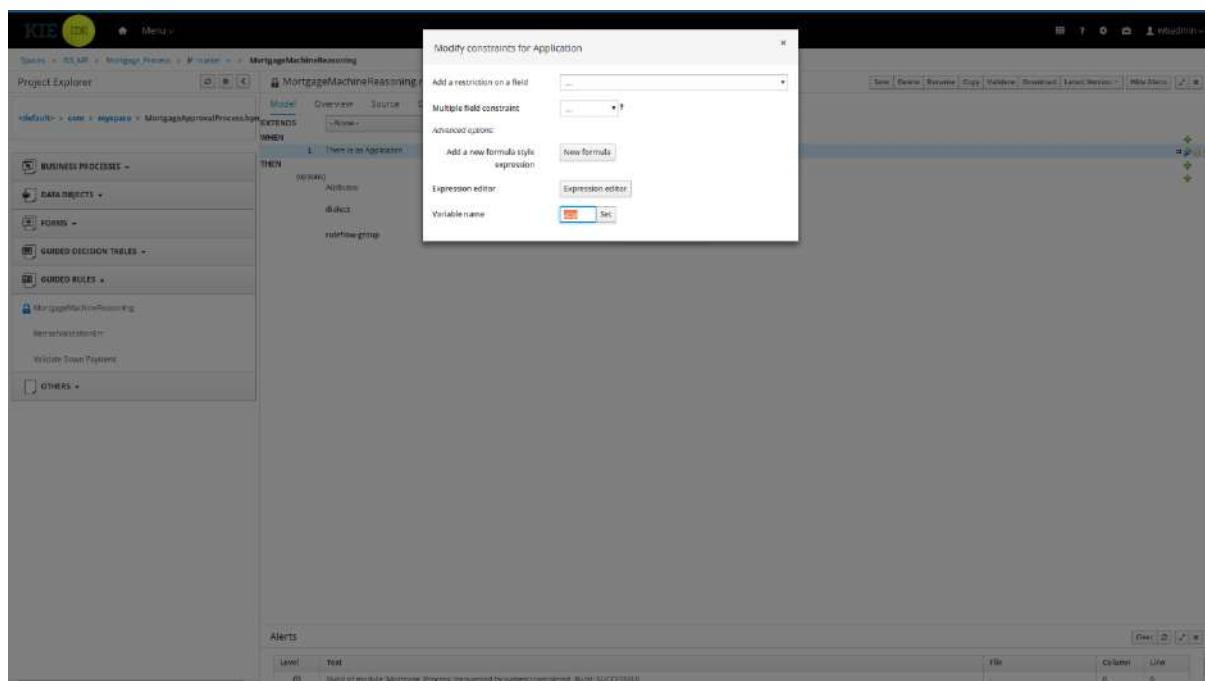
- 6) Click the highest 1st button: +

The screenshot shows the KIE IDE interface again, but this time a modal dialog box is open in the center. The dialog is titled 'Add a condition to the rule...' and has a 'Postbox' tab selected. Inside the dialog, there is a list of conditions such as 'Applicant...', 'Number...', 'Property...', 'Validation/Re/DO...', 'The following does not exist...', 'The following exists...', 'Any of the following are true...', 'From...', 'From Account...', 'From Collect...', 'From Entry Point...', and 'From Form DR...'. At the bottom of the dialog are two buttons: a blue '+' button labeled 'Add' and a 'Cancel' button.

7) Click 'There is an Application'



8) Update Variable name: *app*; Click button Set;



The screenshot shows the KIE Workbench interface with the following details:

- Header:** Shows the KIE logo, a yellow circle with 'kie' and 'IDE', and a 'Menu' dropdown.
- Top Bar:** Displays 'Spaces > 602 MR > Mortgage_Process > P master > MortgageMachineReasoning' and a set of toolbar icons.
- Project Explorer:** On the left, it lists 'BASIC BUSINESS PROCESSES', 'DATA OBJECTS', 'FORMS', 'GUIDED DECISION TABLES', 'GUIDED RULES', and specific items like 'MortgageMachineReasoning', 'RecontractValidationErr', and 'Validates Down Payment'.
- Central Editor:** The main area is titled 'MortgageMachineReasoning.rdtl - Guided Rules'. It shows a rule definition:

```
Model Overview Source Data Objects
EXTENDS None
WHEN
  1. There is an Application [app]
THEN
  (optional)
    direct:
      mortgage-group
```
- Right Panel:** Contains a 'File' menu with options like 'Save', 'Delete', 'Rename', 'Copy', 'Validate', 'Download', 'Lastest Version', and 'Hide Alerts'.
- Bottom:** An 'Alerts' panel at the bottom right shows a single entry: 'Build of module "Mortgage_Process" (requested by system) completed. (exit: SUCCESSFUL)'.

- 9) Click lick ‘**There is an Application**’; From drop down “**Add a restriction on a field**”, select ***mortgageamount***;

The screenshot shows the KIE Workbench interface with the following details:

- Project Explorer:** MortgageMachineReasoning
- Model View:** MortgageMachineReasoning
- Constraints Tab:** WHERE
- Constraint Type:** Then in Application
- Constraint Content:** `THEN (MORTGAGE) Address: ddd123 review_group: review_group`
- Constraint Editor Dialog:** "Modify constraints for Application" is open, showing:
 - Add a restriction on a Field:** dropdown menu with options: amortization, applicant, downpayment, interest, interestrate, mortgageamount, property, rate, repaymentmethod.
 - Multiple field constraint:** dropdown menu with options: amortization, applicant, downpayment, interest, interestrate, mortgageamount, property, rate, repaymentmethod.
 - Advanced options:** dropdown menu with options: Add a new formula style expression.
 - Expression editor:** dropdown menu with options: AND, OR, NOT, ANDNOT, ORNOT.
 - Variable name:** dropdown menu with options: add, set.
- Toolbar:** Save, Delete, Rename, Copy, Validate, Download, Launch Services, Help, More.
- Bottom Bar:** Alerts, Date, Column, Line.

The screenshot shows the KIE IDE interface for the MortgageMachineReasoning.rdrl model. In the center, the 'Model' tab is active, displaying a guided rule structure. The 'WHEN' section contains a condition: 'There is an Application [app] with mortgageamount — please choose —'. Below this, the 'THEN' section includes 'Attributes' (with a 'mortel' field), 'dialect' (set to 'mvel'), and a 'ruleflow group' ('mortgagereasoning'). On the left, the Project Explorer lists various components like Business Processes, Data Objects, and GUIDED RULES. At the bottom, the Alerts panel displays a single entry: 'Build of module 'Mortgage_Process' (requested by system) completed. Build: SUCCESSFUL'.

{ Tips } The purpose of this new rule: Is mortgage application in limit?

WHEN ***Mortgage amount >= Property Sale Price – Down Payment***
 THEN Set ***InLimitMR*** to 'TRUE'

10) Update rule's WHEN part:

This screenshot is identical to the one above, showing the KIE IDE interface for the MortgageMachineReasoning.rdrl model. The focus is on the 'WHEN' section of a rule, where the 'greater than or equal to' operator is selected from a dropdown menu. The rest of the rule structure and the surrounding environment are consistent with the previous screenshot.

The screenshot shows the KIE Workbench interface for editing a guided rule. The left sidebar lists various project components like Business Processes, Data Objects, and Guided Rules. The main area displays a rule definition:

```

    WHEN
      1. There is an Application [app] with
         mortgagelower greater than or equal to
    THEN
      (optional)
      Attributes
      dialect
      new formula
      mortgagelower
  
```

The 'new formula' button in the formula editor is highlighted with a red box.

At the bottom, an 'Alerts' table shows a successful build message:

| Level | Text |
|-------|--|
| Info | Build of module 'Mortgage_Process' (requested by system) completed. Build: SUCCESSFUL. |

This screenshot shows the same KIE Workbench environment, but the formula editor is more prominent. It displays the 'Field value' dialog with the 'Advanced options' section open, showing the 'A formula' dropdown which has 'New formula' selected. Other options like 'Expression editor' are also visible.

The rest of the interface and alerts table are identical to the first screenshot.

MortgageMachineReasoning.rdrl - Guided Rules

Model Overview Data Objects

EXTENDS: None

WHEN

- There is an Application [app] with:
 - mortgageamount greater than or equal to

THEN

(options)

- Attributes:
- dialect: mvel
- ruleflow-group: mortgagemachine

Alerts

| Level | Text | File | Column | Line |
|-------|---|------|--------|------|
| Info | Build of module 'Mortgage_Process' (requested by system) completed. Build SUCCESSFUL. | - | 0 | 0 |

MortgageMachineReasoning.rdrl - ...

Model Overview Data Objects

EXTENDS: None

WHEN

- There is an Application [app] with:
 - mortgageamount greater than or equal to

THEN

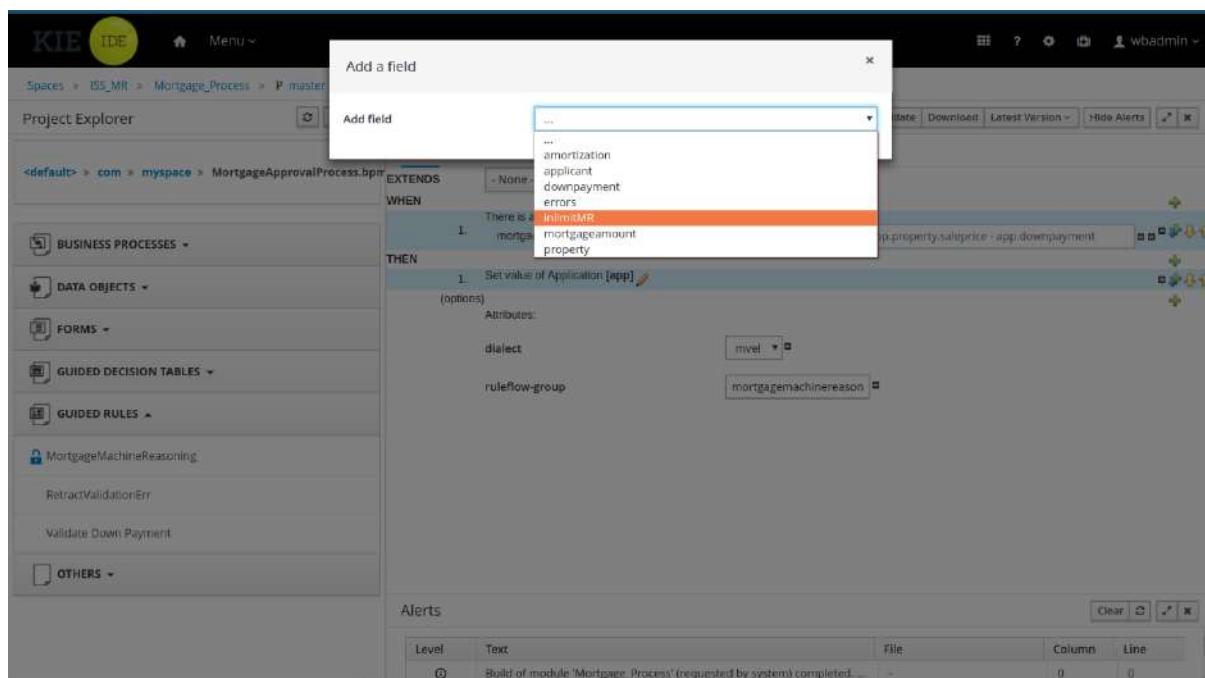
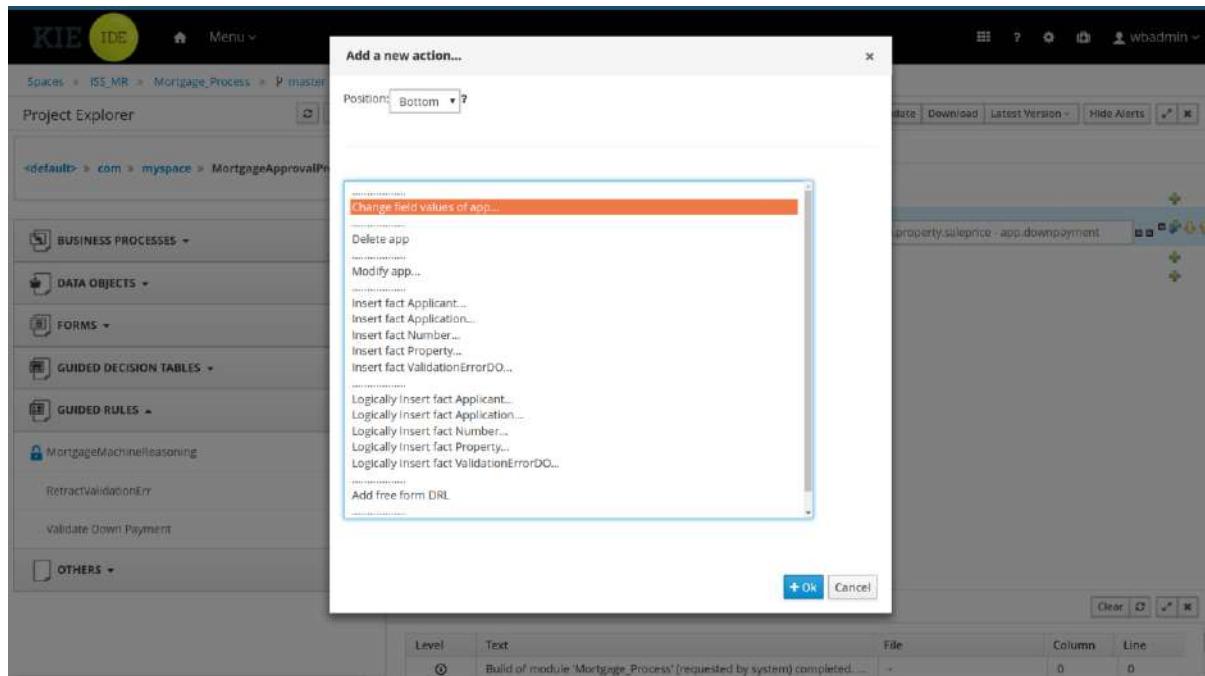
(options)

- Attributes:
- dialect: mvel
- ruleflow-group: mortgagemachine

Alerts

| Level | Text | File | Column | Line |
|-------|---|------|--------|------|
| Info | Build of module 'Mortgage_Process' (requested by system) completed. Build SUCCESSFUL. | - | 0 | 0 |

11) Update rule's THEN part: Click the middle button: 



KIE IDE

Project Explorer

Model Overview Source Data Objects

EXTENDS - None -

WHEN

1. There is an Application [app] with:
mortgageamount greater than or equal to property.saleprice - app.downpayment

THEN

1. Set value of Application [app]

(options) Attributes:
dialect mvel
ruleflow-group mortgagemachine reason

Alerts

| Level | Text | File | Column | Line |
|-------|---|------|--------|------|
| Info | Build of module 'Mortgage_Process' (requested by system) completed. | - | 0 | 0 |

KIE IDE

Project Explorer

Field value

Literal value

Advanced

Formula

Formula

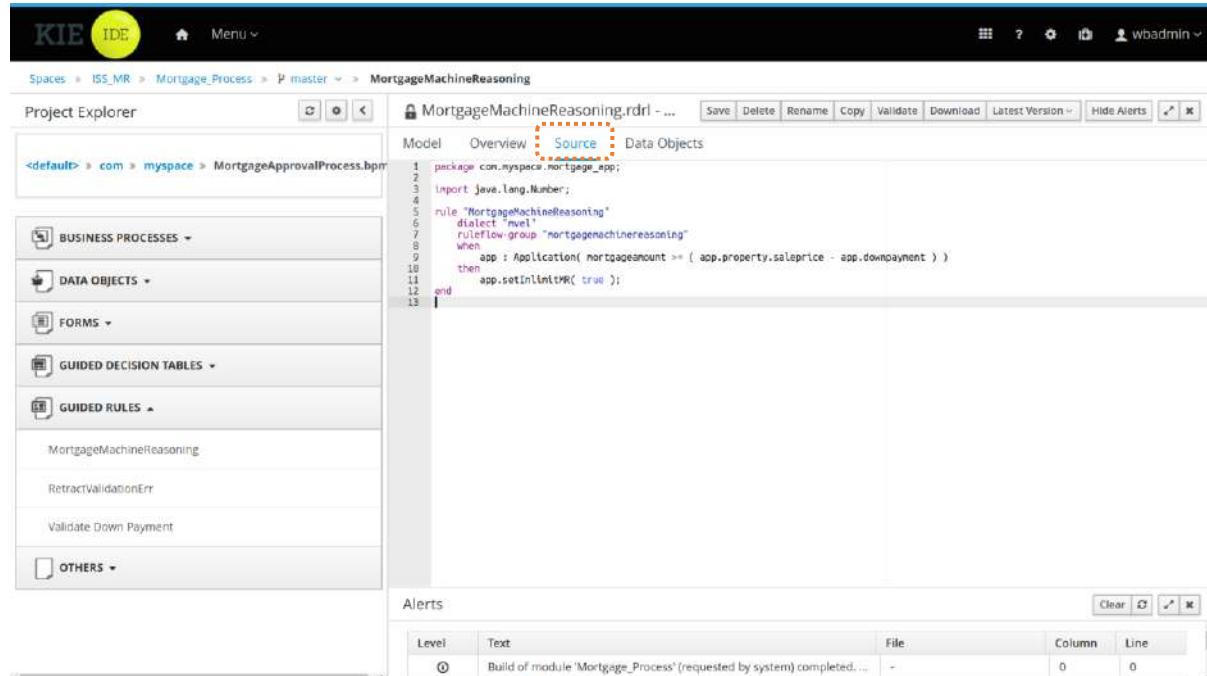
(options) Attributes:
dialect mvel
ruleflow-group mortgagemachine reason

Alerts

| Level | Text | File | Column | Line |
|-------|---|------|--------|------|
| Info | Build of module 'Mortgage_Process' (requested by system) completed. | - | 0 | 0 |

12) Save the rule;

13){ Optional } The rule in its original source code form can be found at tab:
[Source](#)



The screenshot shows the KIE IDE interface with the following details:

- Project Explorer:** Shows the file structure: <default> > com > myspace > MortgageApprovalProcess.bpmn.
- Source Tab:** The current tab is "Source", which displays the rule definition in RDL (Rule Definition Language). The code is as follows:

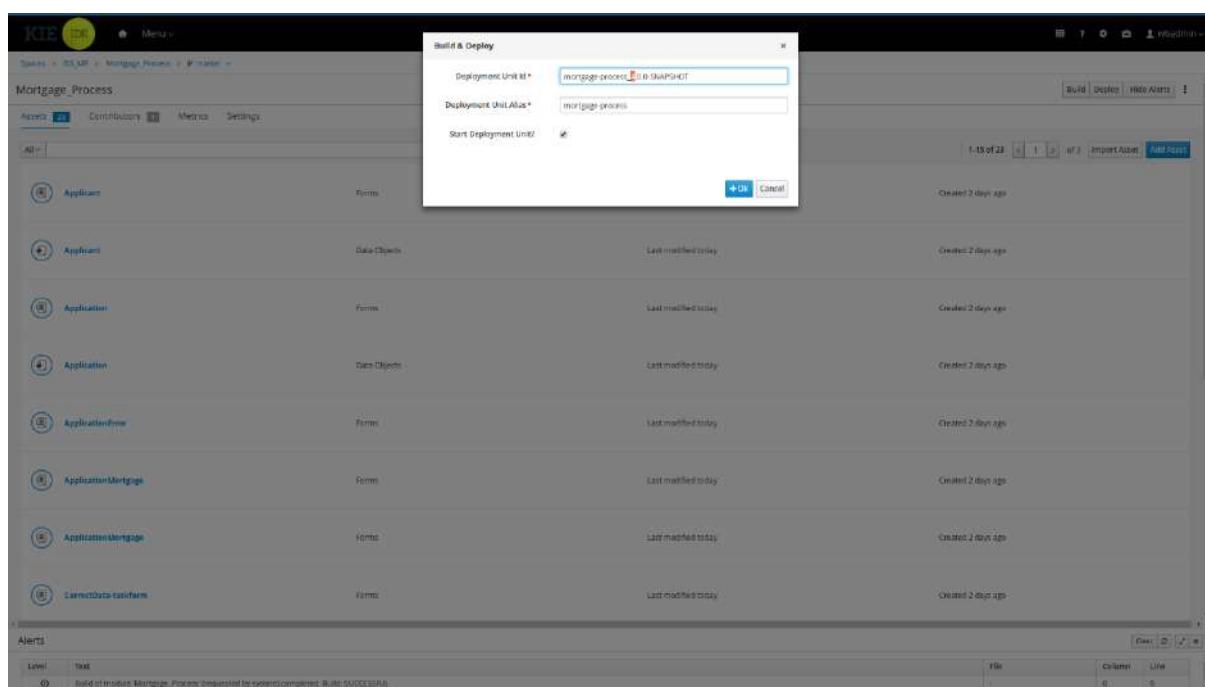
```
1 package com.myspace.mortgage_app;
2
3 import java.lang.Number;
4
5 rule "MortgageMachineReasoning"
6   dialect "mvel"
7   ruleflow-group "mortgagemachineReasoning"
8   when
9     app : Application( mortgageAmount >= ( app.property.saleprice - app.downpayment ) )
10   then
11     app.setInLimitMR( true );
12   end
13 }
```

- Alerts:** A table titled "Alerts" shows one entry: "Build of module 'Mortgage_Process' (requested by system) completed...." with Level: Info, File: -, Column: 0, Line: 0.

2.2.5. Business system enhancement [Deploy] v4.0.0

{ Objective } Deploy enhanced mortgage application: Start a new mortgage application, fill in application form to trigger business process and **InLimitMR** decision automation.

- 1) Deploy enhanced system onto KIE web server: **mortgage-process_4.0.0-SNAPSHOT**



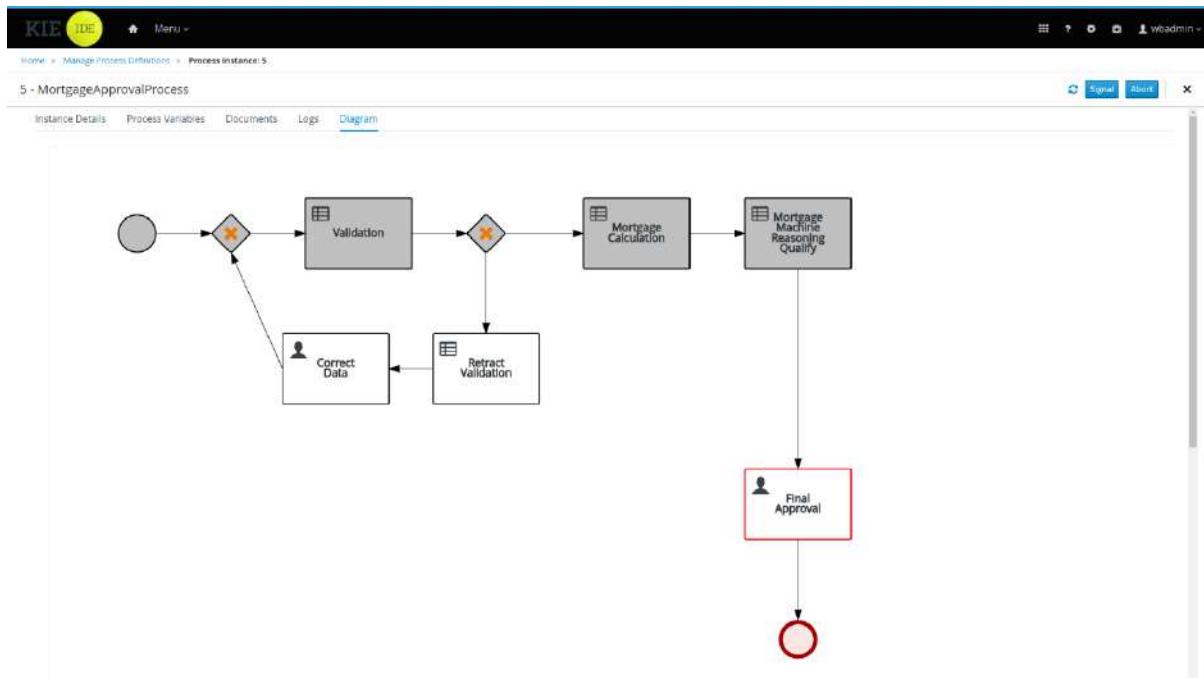
The screenshot shows the KIE IDE interface. On the left, the 'SERVER CONFIGURATIONS' sidebar is open, showing 'sample-server' selected. Under 'DEPLOYMENT UNITS', 'mortgage-process_4.0.0-SNAPSHOT' is also selected. In the main panel, the 'Status' tab is active, displaying the deployment status for 'sample-server@localhost:8080'. The status is shown as green with a checkmark, indicating successful deployment. Below the status, the URL http://localhost:8080/kie-server/services/rest/server/containers/mortgage-process_4.0.0-SNAPSHOT and version v1.0.0-SNAPSHOT are listed.

- 2) Select the mortgage system with intended version, e.g., ***mortgage-process_4.0.0-SNAPSHOT***, then click: **Start**

The screenshot shows the 'Manage Process Definitions' page in the KIE IDE. The table lists four process definitions: MortgageApprovalProcess at version 1.0 deployed to mortgage-process_4.0.0-SNAPSHOT; MortgageApprovalProcess at version 1.0 deployed to mortgage-process_1.0.0-SNAPSHOT; MortgageApprovalProcess at version 1.0 deployed to mortgage-process_2.0.0-SNAPSHOT; and MortgageApprovalProcess at version 1.0 deployed to mortgage-process_3.0.0-SNAPSHOT. A context menu is open over the first row, with 'Start' highlighted in blue. An arrow points from the 'Start' option to the 'View Process Instances' option in the menu.

| Name | Version | Deployment |
|-------------------------|---------|---------------------------------|
| MortgageApprovalProcess | 1.0 | mortgage-process_4.0.0-SNAPSHOT |
| MortgageApprovalProcess | 1.0 | mortgage-process_1.0.0-SNAPSHOT |
| MortgageApprovalProcess | 1.0 | mortgage-process_2.0.0-SNAPSHOT |
| MortgageApprovalProcess | 1.0 | mortgage-process_3.0.0-SNAPSHOT |

3) Fill in the mortgage form as shown below; Then click blue button: **Submit**



- 4) To review (pending user task: ***Final Approval***) the mortgage application, click: **Menu → Task Inbox**

The screenshot shows the KIE IDE Task Inbox interface. On the left, there is a sidebar with a 'Filters' section containing a tree view of task statuses: Completed, Created, Error, Failed, InProgress, Ongoing, Ready, Reserved, and Suspended. Below this are sections for 'Filter By' (Id, Filter by id...), 'Process Definition id' (Select), and 'Created On' (Created On...). The main area is titled 'Task Inbox' and displays a table with one row. The table columns are Task, Process Definition Id, Status, and Actions. The single row shows 'Final Approval' under 'Task', 'Mortgage_Process_MortgageApprovalProc...' under 'Process Definition Id', 'Ready' under 'Status', and '21-Feb-2019 20:24:37' under 'Created On'. At the bottom right of the table, it says '10 items' and '1 of 1'.

The screenshot shows the KIE IDE Task details view for the 'Final Approval' task. The top navigation bar includes 'Home', 'Task inbox', and 'Task: B'. The main content area has tabs for 'Work' (which is selected), 'Details', 'Assignments', 'Comments', 'Admin', and 'Logs'. The 'Work' tab contains several input fields grouped by category: 'Application' (Mortgage amount: 100000, Down Payment: 10000), 'Applicant' (Name: Sam GO, Annual income: 30000, SSN: 123456789), and 'Property' (Age of property: 10 years, Address of property: 123 WNET, Singapore, Locale: United States, Sale Price: 250000). A note 'Intelligent Machine Reasoning' is highlighted with a red dotted box. The bottom of the screen shows a vertical scroll bar.

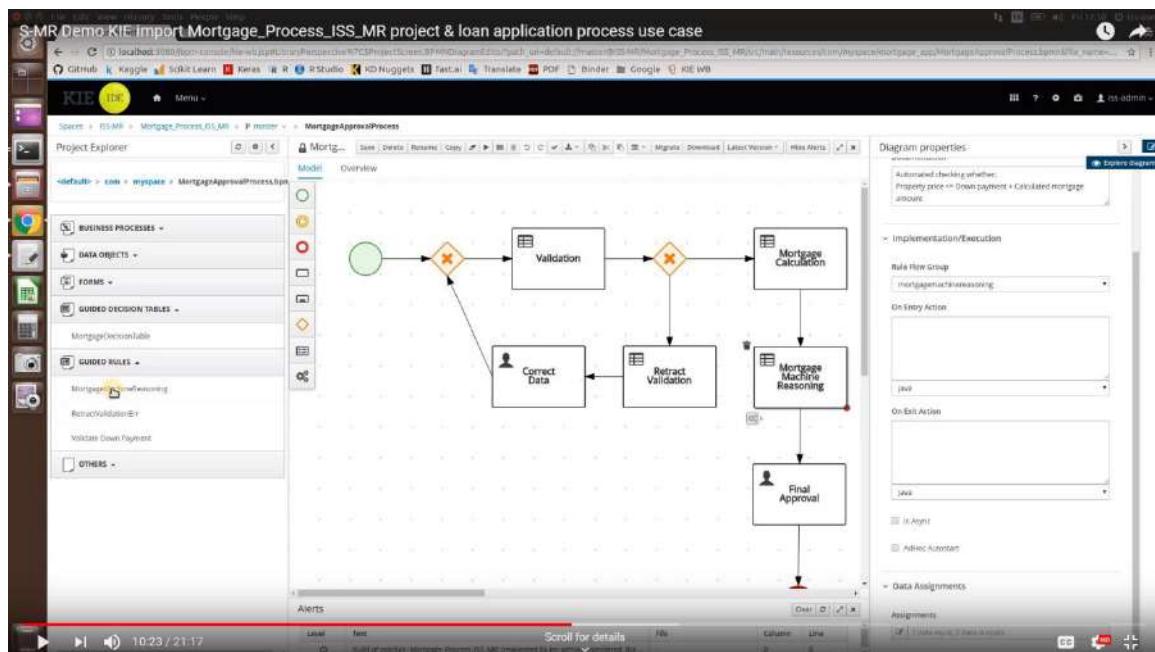
- 5) Start a new mortgage application with a lower **Down Payment** of **\$40,000**; What's the result of **InLimitMR** ?

The screenshot shows the KIE IDE interface with the 'MortgageApprovalProcess' form open. The 'Down Payment' field contains '\$40000'. The 'InLimitMR' checkbox is checked. Other fields like 'Name', 'Annual Income', 'SSN', 'Address of property', 'Sale Price', and 'Locale' are also visible.

The screenshot shows the KIE IDE interface with the 'MortgageApprovalProcess' form open. The 'Down Payment' field contains '\$200000'. The 'InLimitMR' checkbox is checked. Other fields like 'Name', 'Annual Income', 'SSN', 'Address of property', 'Sale Price', and 'Locale' are also visible.

{ Quiz } Check whether: $\$200,000 \geq \$250,000 - \$40,000$?

Did the decision automation correctly set the value for **InLimitMR** ?



Reference https://www.youtube.com/watch?v=s_8rct45b84

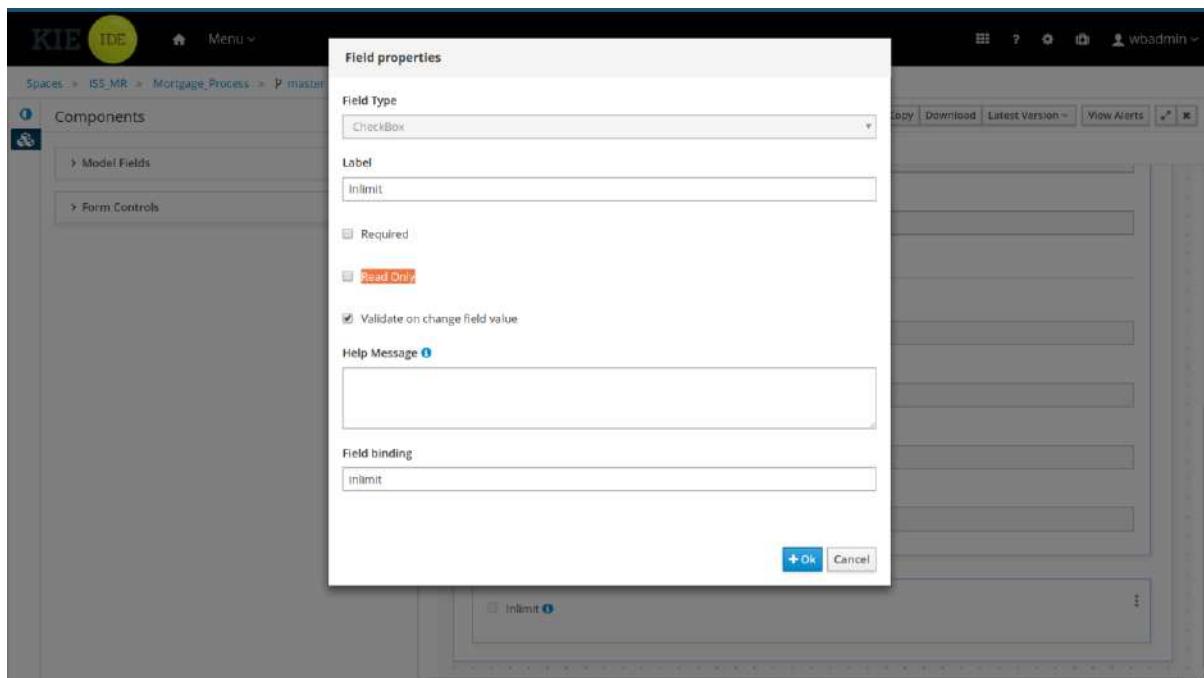
2.2.6. Business system enhancement [User Task] v5.0.0 [Optional]

{ Exercise Challenge }

{ Objective } Add human control to '**Inlimit**' checkbox, for { **User Task: Final Approval** } ; This is to enable human decision having the 'final say', which could overwrite the automated machine decision '**InlimitMR**';

{ Tips }

- 1) Identify the relevant user interface (Form);
- 2) Update '**Inlimit**' field property: uncheck '**Read Only**';
- 3) Save changes;
- 4) Re-deploy enhanced system onto KIE web server: **mortgage-process_5.0.0-SNAPSHOT**
- 5) Verify by starting a new mortgage application;



KIE Workbench

Home > Manage Process Definitions

Manage Process Definitions

MortgageApprovalProcess

MortgageApprovalProcess

MortgageApprovalProcess

MortgageApprovalProcess

MortgageApprovalProcess

10 items

MortgageApprovalProcess

Correlation key

Form

Application

Down Payment: Years of amortization:

Applicant

Name:

Annual Income:

SSN:

Property

Age of property:

Address of property:

Locale:

Sale Price:

Submit

KIE IDE Home > Task inbox > Task: 10

10 - Final Approval

Work Details Assignments Comments Admin Logs

Inputs:

Application

Mortgage amount: (100000) Initial Machine Reasoning

Down Payment: (10000) Years of amortization:

Applicant

Name: (Sam Clark)

Annual income: (50000)

SSN: (123-45-6789)

Property

Age of property: (10)

Address of property: (25-1888, Singapore)

Locate: (Urban)

Sale Price: (200000)

Initial Machine Reasoning

Save Release Complete

😊 Congratulations!

You have completed today's challenging workshop!

3. Workshop 3 – Knowledge Discovery

{ Objective } Enhance mortgage process using techniques of Data mining / Rule induction / Orange3 Decision Tree

- Extract business rules from data using inductive reasoning: historic bank loan approval data; Use tool: **Orange3** (Python)
- Update **Mortgage_Process** system using the discovered knowledge: business rules; Use tool: **KIE BPMS/BRMS**

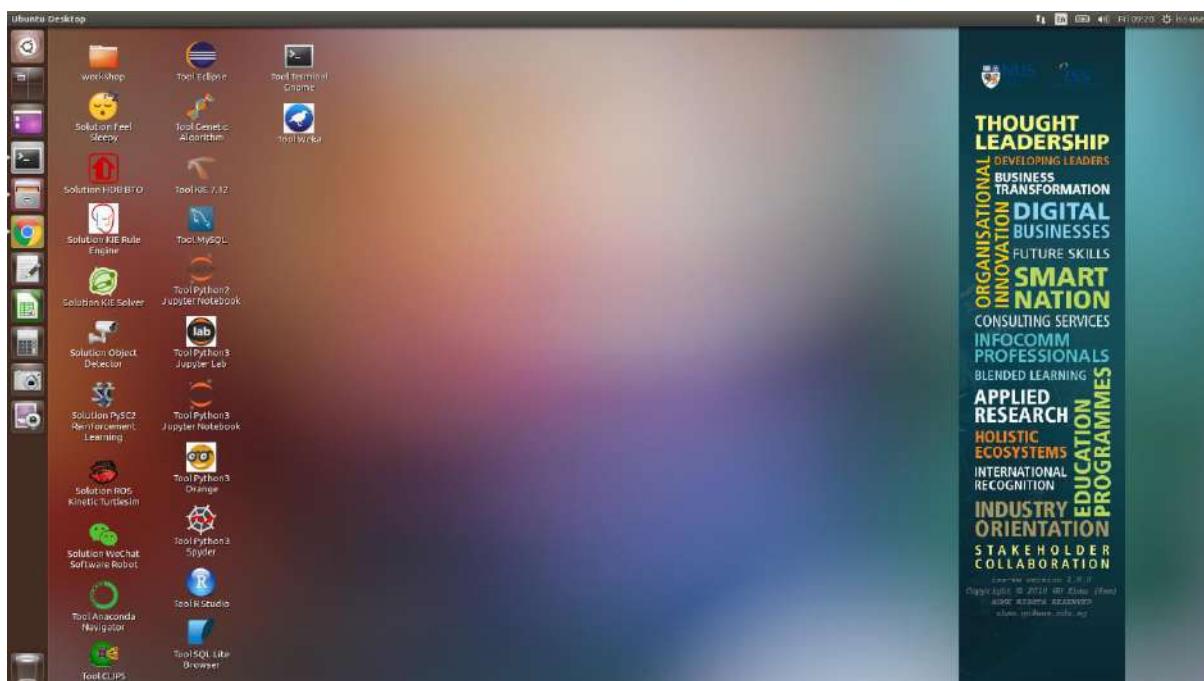


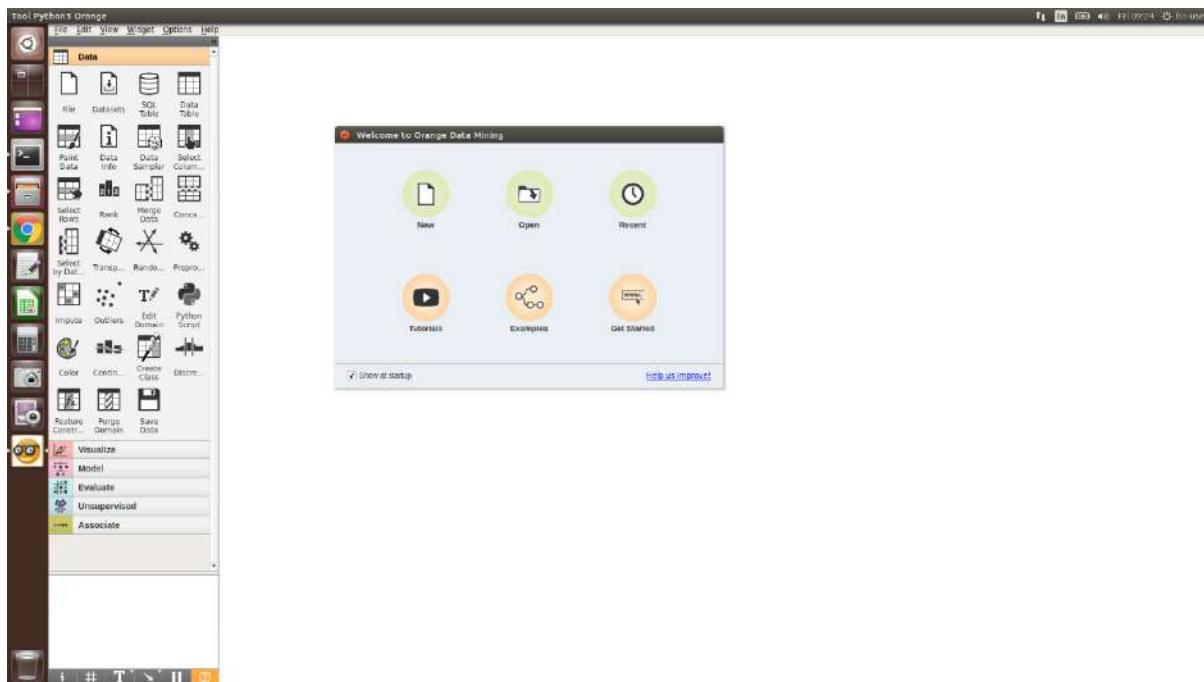
3.1. Knowledge Discovery [Orange3]

{ Objective } Enhance mortgage process using techniques of Data mining / Rule induction / Orange3 Decision Tree

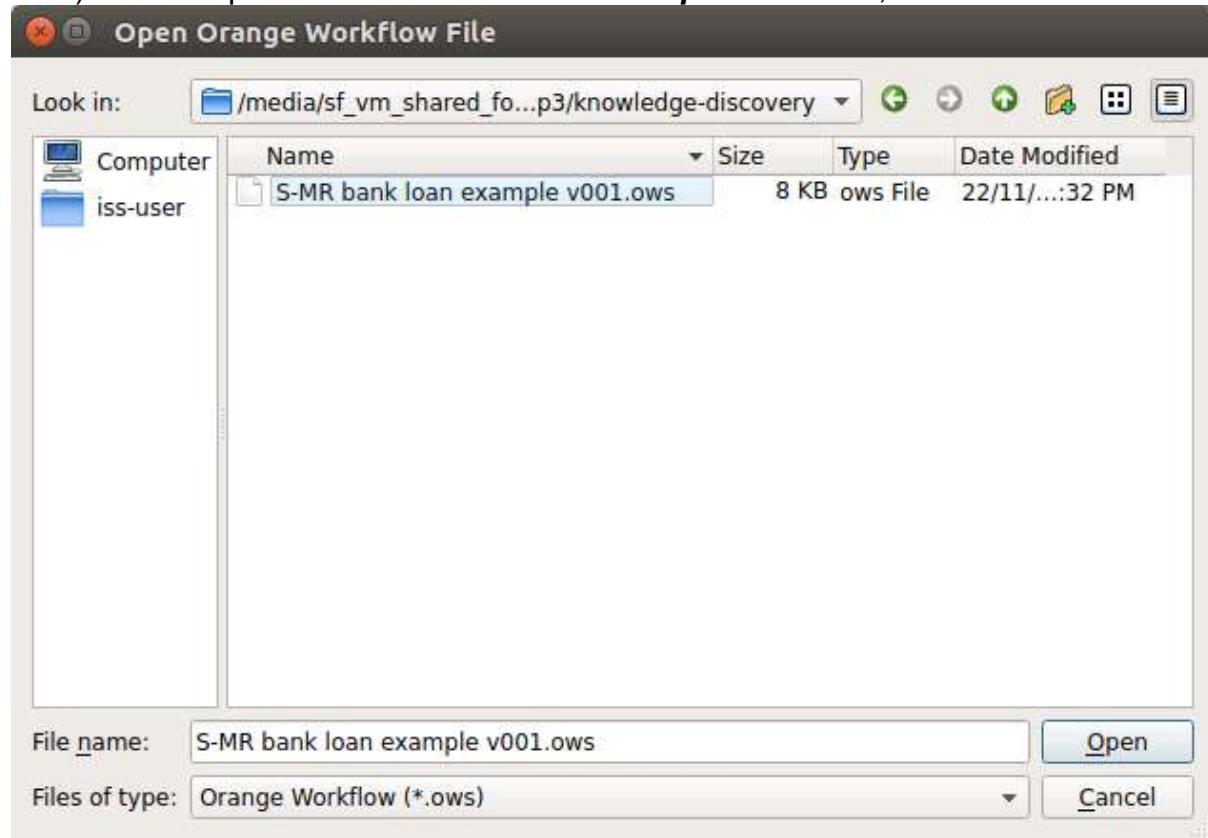
- Extract business rules from data using inductive reasoning: historic bank loan approval data; Use tool: **Orange3** (Python)
- Update **Mortgage_Process** system using the discovered knowledge: business rules; Use tool: **KIE BPMS/BRMS**

1) From desktop, start **Tool Python3 Orange**:

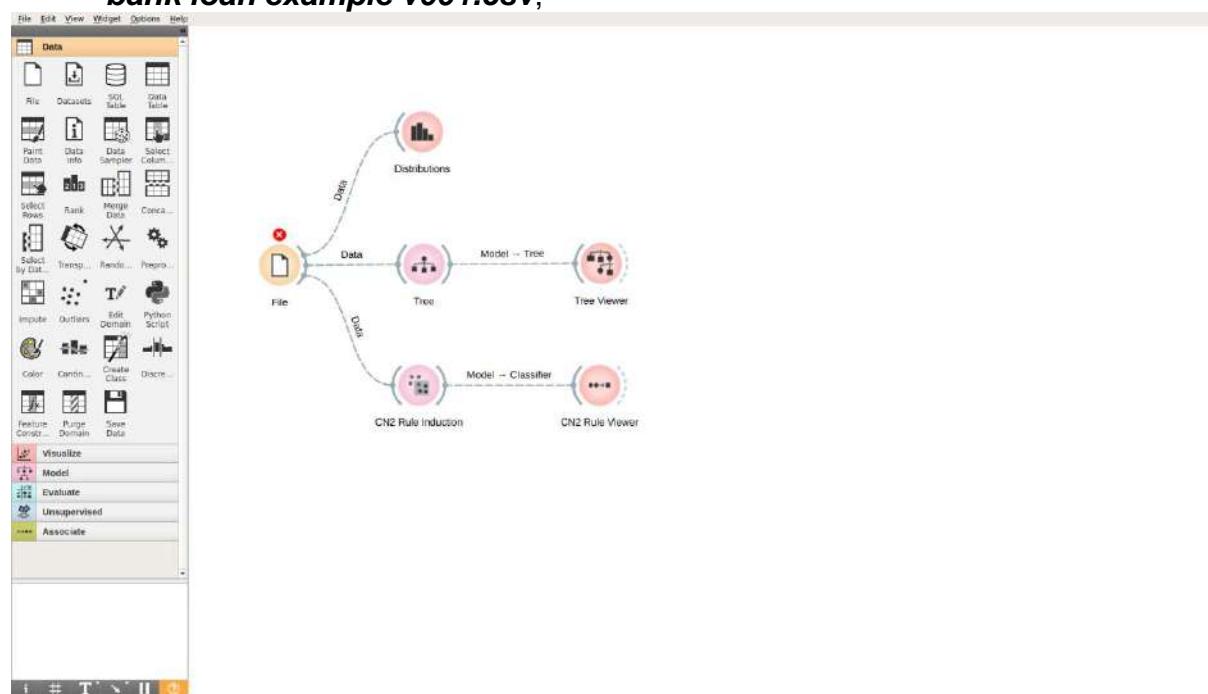


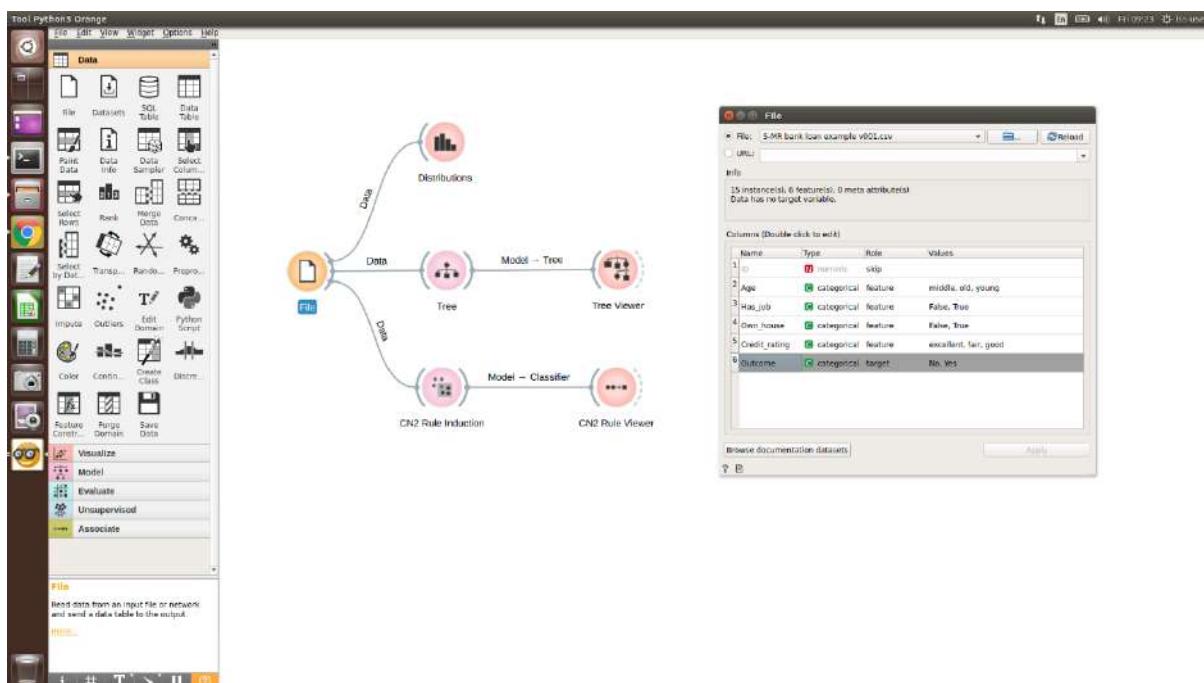
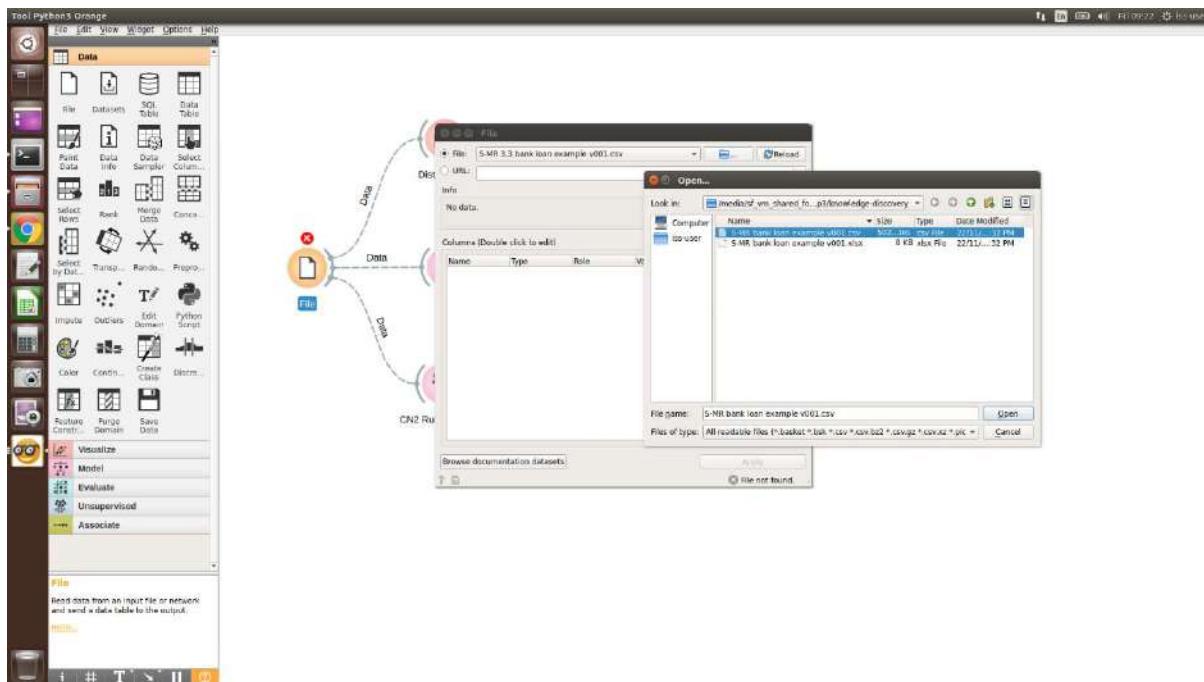


2) Select/Open file: **S-MR bank loan example v001.ows**;

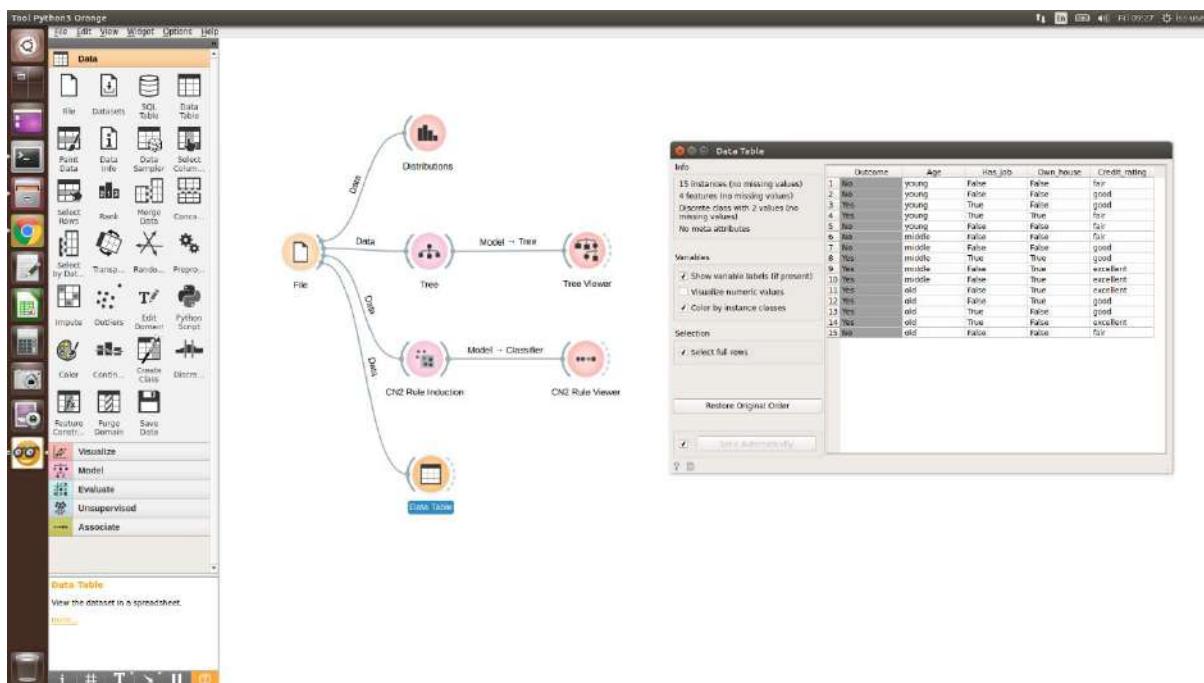


3) If **File** indicates error, click the **File** icon to locate the required data file: **S-MR bank loan example v001.csv**;

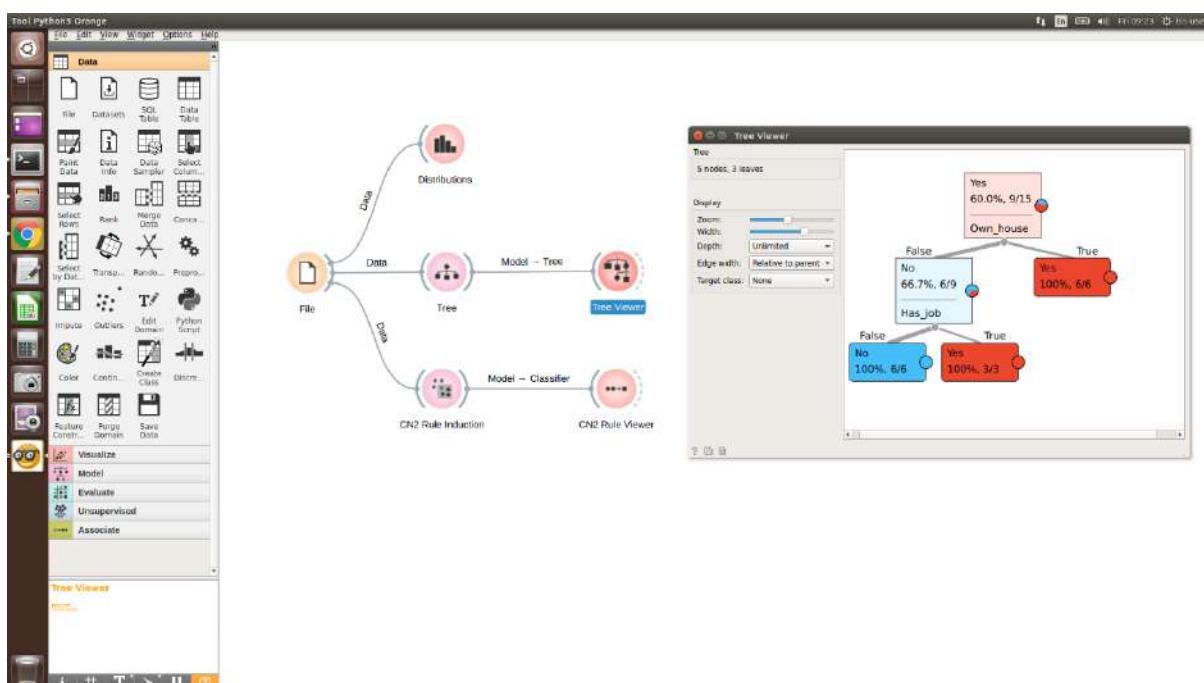




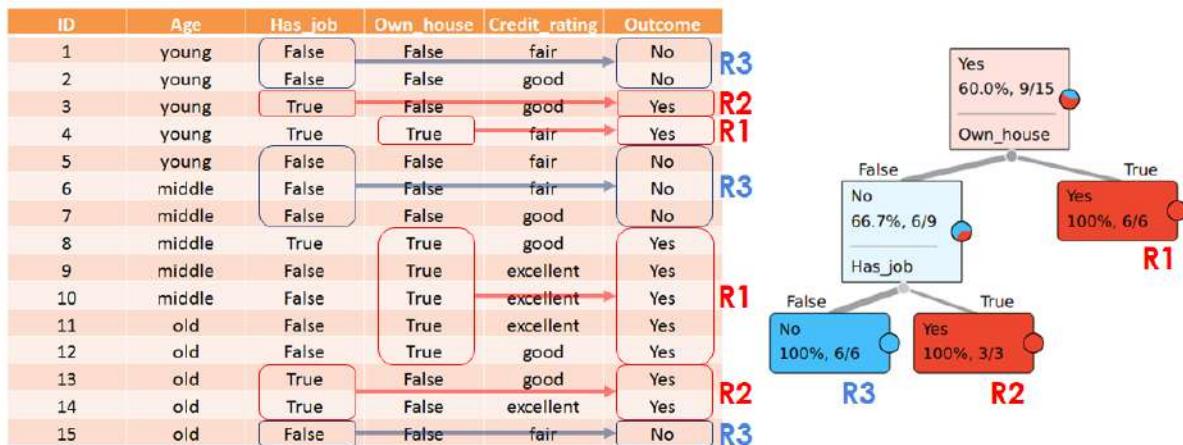
- 4) Optionally, add a **Data Table** node to view the input data table/file;



- 5) Open Tree Viewer to view the Decision Tree generated via knowledge discovery;



6) The Decision Tree's Leaf Nodes represent the discovered business rules;



{ Quiz } Write down the business rules:

Rule 1: WHEN

THEN

Rule 2: WHEN

THEN

Rule 3: WHEN

THEN

3.2. KIE BPMS/BRMS Business System Enhancement

{ Objective } Enhance mortgage process using techniques of Data mining / Rule induction / Orange3 Decision Tree

- Extract business rules from data using inductive reasoning: historic bank loan approval data; Use tool: **Orange3** (Python)
- Update **Mortgage_Process** system using the discovered knowledge: business rules; Use tool: **KIE BPMS/BRMS**

3.2.1. Business system enhancement [Decision Table]

[Reference Solution] Data-Mining Enhanced Mortgage loan application process

- Update **Data Object** : *Applicant*
- New **Business Rule Task** : *Mortgage Machine Reasoning DT*
- New **Guided Decision Table** : *MortgageMachineReasoningDT*

- 1) Go to **Assets** list of project **Mortgage_Process**; Edit [**Data Objects: Applicant**];

| Identifier | Label | Type |
|--------------|---------------|---------|
| address | Address | String |
| annualincome | Annual Income | Integer |
| creditrating | Credit Rating | Integer |
| name | Name | String |
| ssn | SSN | Integer |

'Applicant (Applicant)'- general properties

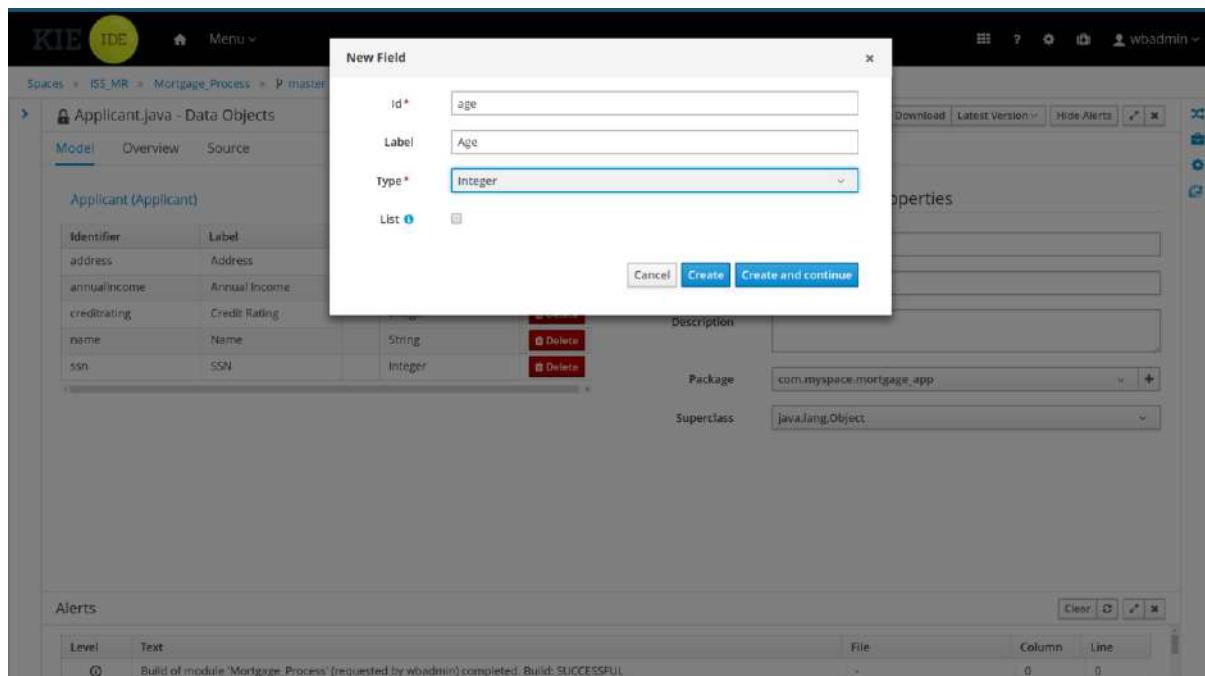
| | |
|-------------|--------------------------|
| Identifier | Applicant |
| Label | Applicant |
| Description | (empty) |
| Package | com.myspace.mortgage_app |
| Superclass | java.lang.Object |

Alerts

| | | | | |
|-------|---|------|--------|------|
| Level | Text | File | Column | Line |
| Info | Build of module 'Mortgage_Process' (requested by wbadmin) completed. Build: SUCCESSFUL. | - | 0 | 0 |

2) Add below new fields;

| Identifier | Label | Type |
|------------|-----------|---------|
| age | Age | Integer |
| hasJob | Has Job | Boolean |
| ownHouse | Own House | Boolean |



The screenshot shows the KIE IDE interface for creating a new field. A modal dialog titled "New Field" is open, prompting for the following details:

- Id ***: hasJob
- Label**: Has Job
- Type ***: Boolean

Below the input fields, there are three buttons: "Cancel", "Create", and "Create and continue". The "Create" button is highlighted in blue. The background of the IDE shows a list of fields for an "Applicant" entity, including address, annualIncome, creditRating, name, ssn, and age. An alert at the bottom indicates a successful build.

The screenshot shows the KIE IDE interface for creating a new field. A modal dialog titled "New Field" is open, prompting for the following details:

- Id ***: ownHouse
- Label**: Own House
- Type ***: Boolean

Below the input fields, there are three buttons: "Cancel", "Create", and "Create and continue". The "Create" button is highlighted in blue. The background of the IDE shows a list of fields for an "Applicant" entity, including address, annualIncome, creditRating, name, ssn, age, and hasJob. An alert at the bottom indicates a successful build.

KIE IDE

Spaces > ISS_MR > Mortgage_Process > master > Applicant

Model Overview Source

Applicant.java - Data Objects

Applicant (Applicant)

| Identifier | Label | Type | |
|--------------|---------------|---------|--|
| address | Address | String | |
| annualincome | Annual Income | Integer | |
| creditrating | Credit Rating | Integer | |
| name | Name | String | |
| ssn | SSN | Integer | |
| age | Age | Integer | |
| hasjob | Has job | Boolean | |
| ownHouse | Own House | Boolean | |

+ add field

'Applicant (Applicant)'- general properties

| | |
|-------------|--------------------------|
| Identifier | Applicant |
| Label | Applicant |
| Description | |
| Package | com.myspace.mortgage_app |
| Superclass | java.lang.Object |

Alerts

| Level | Text | File | Column | Line |
|-------|--|------|--------|------|
| Info | Build of module 'Mortgage_Process' (requested by wbadmin) completed. Build: SUCCESSFUL | - | 0 | 0 |

Clear

- 3) **Save** changes;

The screenshot shows the KIE IDE interface. A modal dialog titled "Confirm Save" is open, asking "Save changes for this Asset?". Below the question, there is a text input field labeled "add a comment". At the bottom of the dialog are two buttons: "Cancel" and "Save". The background of the dialog is dimmed, showing the "Applicant.java - Data Objects" editor. The editor displays a table of fields:

| Identifier | Label | Type | |
|--------------|---------------|---------|---------------------------------------|
| address | Address | String | <input type="button" value="Delete"/> |
| annualIncome | Annual Income | Integer | <input type="button" value="Delete"/> |
| creditrating | Credit Rating | Integer | <input type="button" value="Delete"/> |
| name | Name | String | <input type="button" value="Delete"/> |
| ssn | SSN | Integer | <input type="button" value="Delete"/> |
| age | Age | Integer | <input type="button" value="Delete"/> |
| hasJob | Has Job | Boolean | <input type="button" value="Delete"/> |
| ownHouse | Own House | Boolean | <input type="button" value="Delete"/> |

On the right side of the editor, there is a panel titled "Applicant (Applicant)- general properties" with the following fields:

- Identifier: Applicant
- Label: Applicant
- Description:
- Package: com.myspace.mortgage_app
- Superclass: java.lang.Object

At the bottom of the screen, there is an "Alerts" section with a table showing one entry:

| Level | Text | File | Column | Line |
|-------|---|------|--------|------|
| Info | Build of module 'Mortgage_Process' (requested by wbadmin) completed. Build: SUCCESSFUL. | - | 0 | 0 |

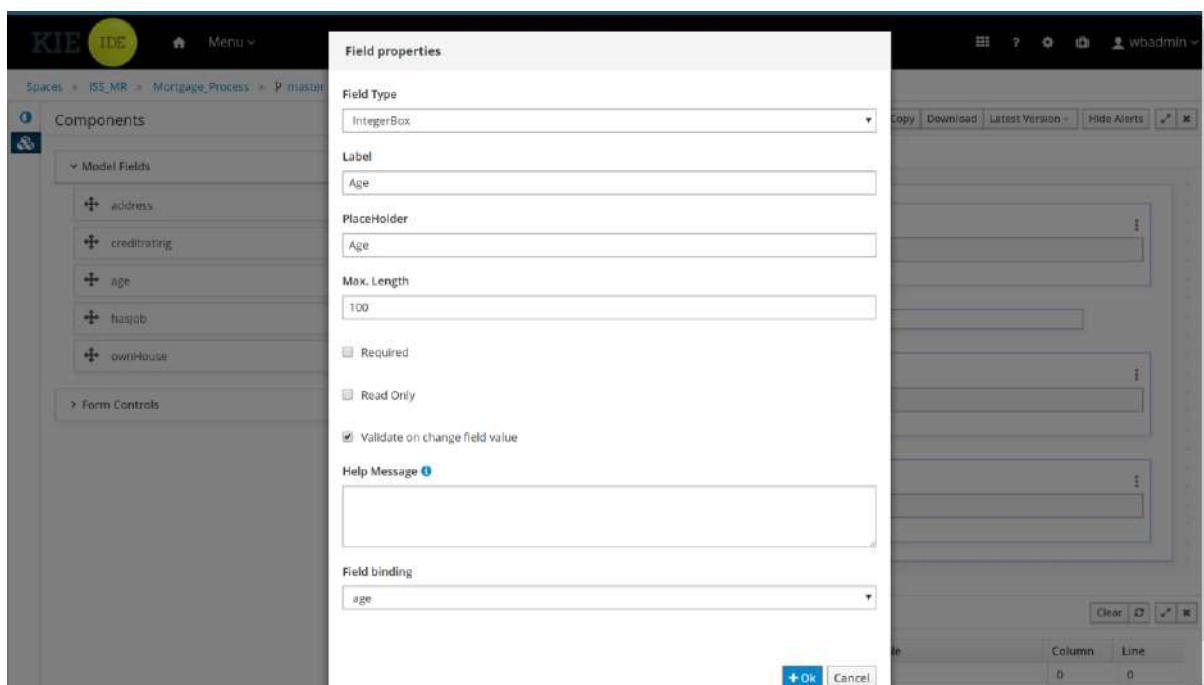
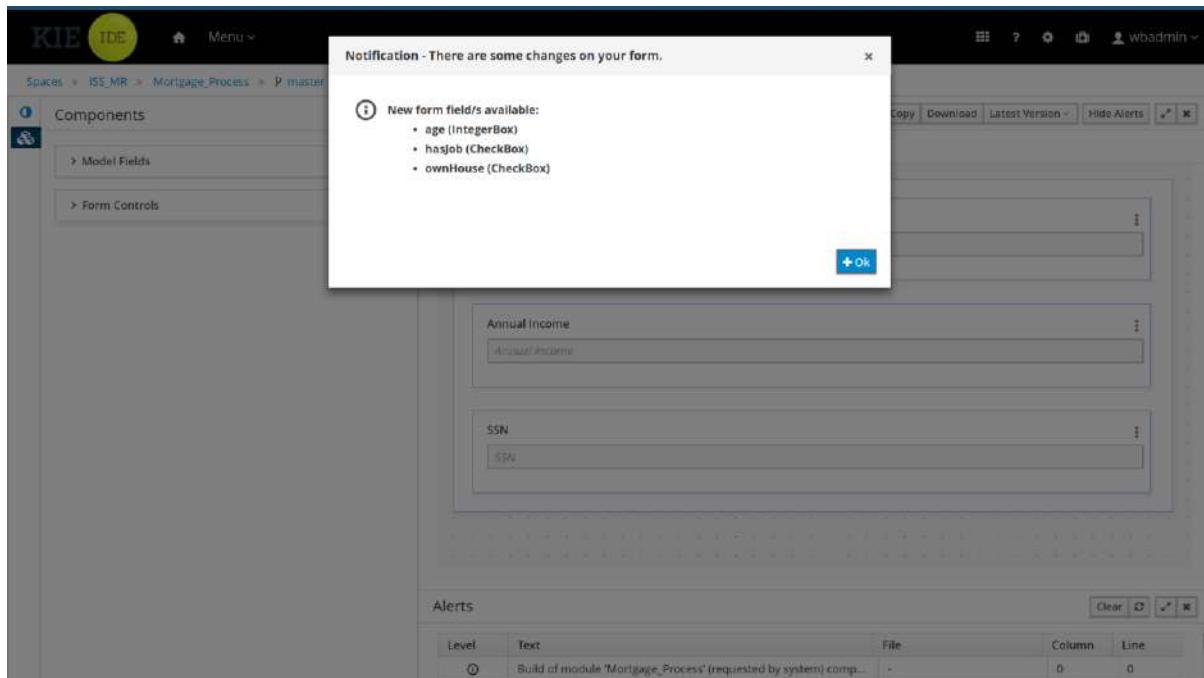
- 4) Go to **Assets** list of project **Mortgage_Process**; Edit [Forms: **Applicant**]; Add new fields onto the form;

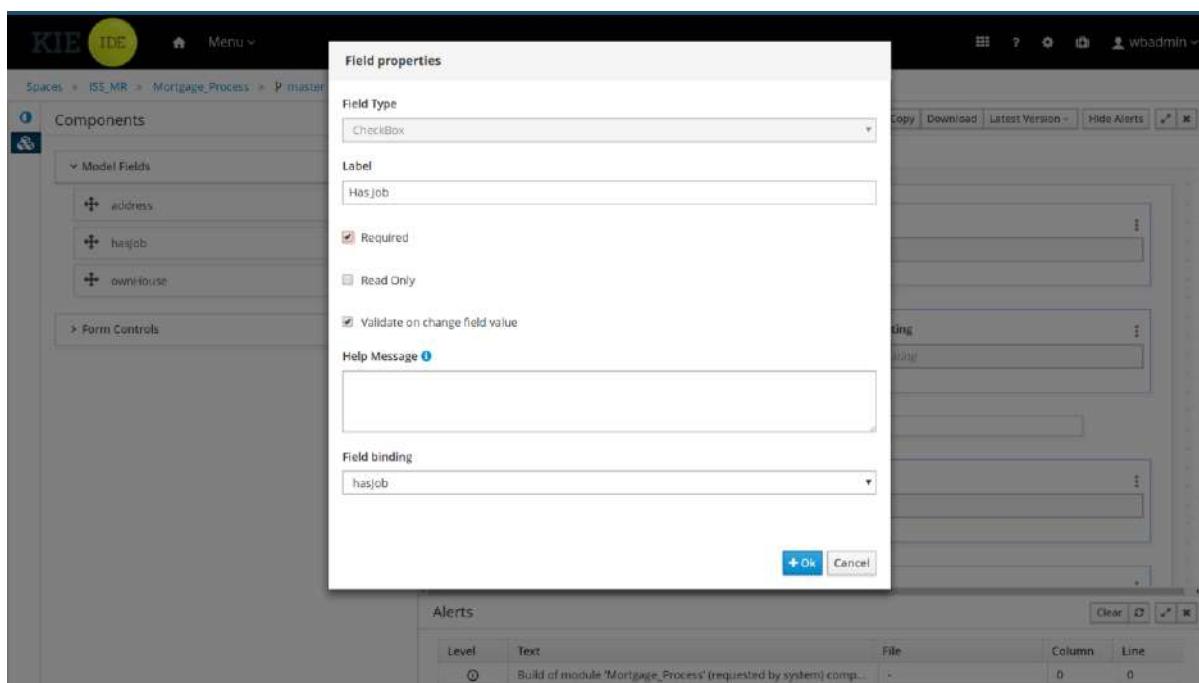
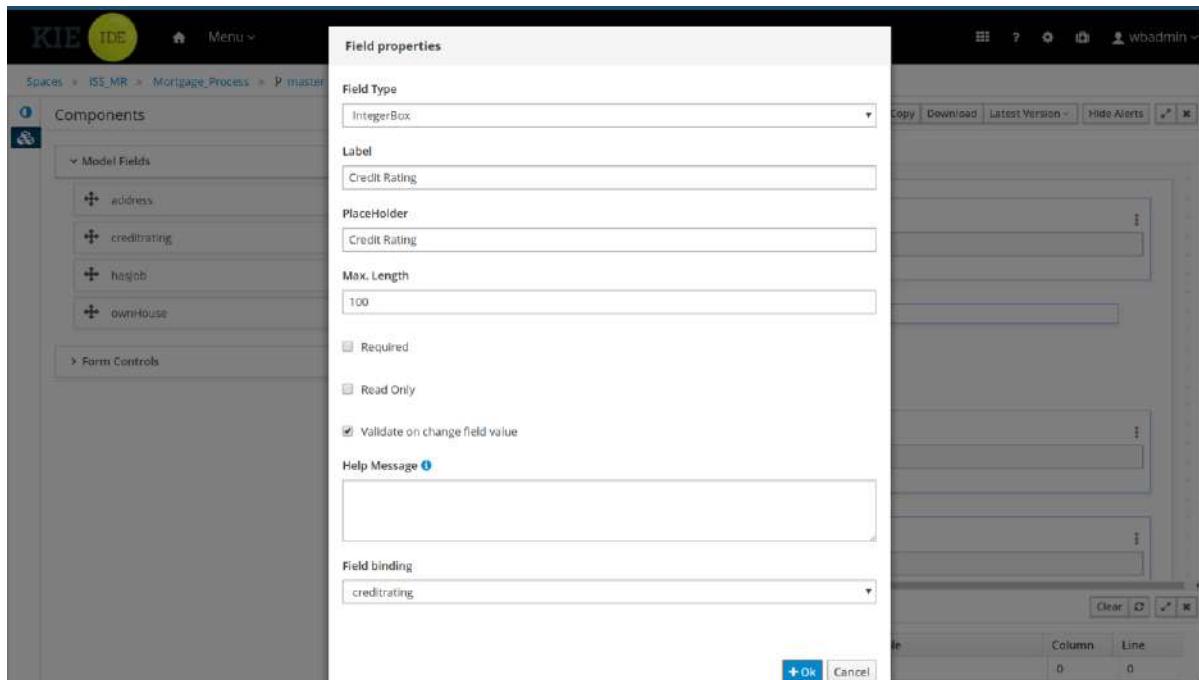
The screenshot shows the KIE IDE interface with the "Assets" tab selected in the top navigation bar. The page title is "Mortgage_Process". The main content area displays a list of assets:

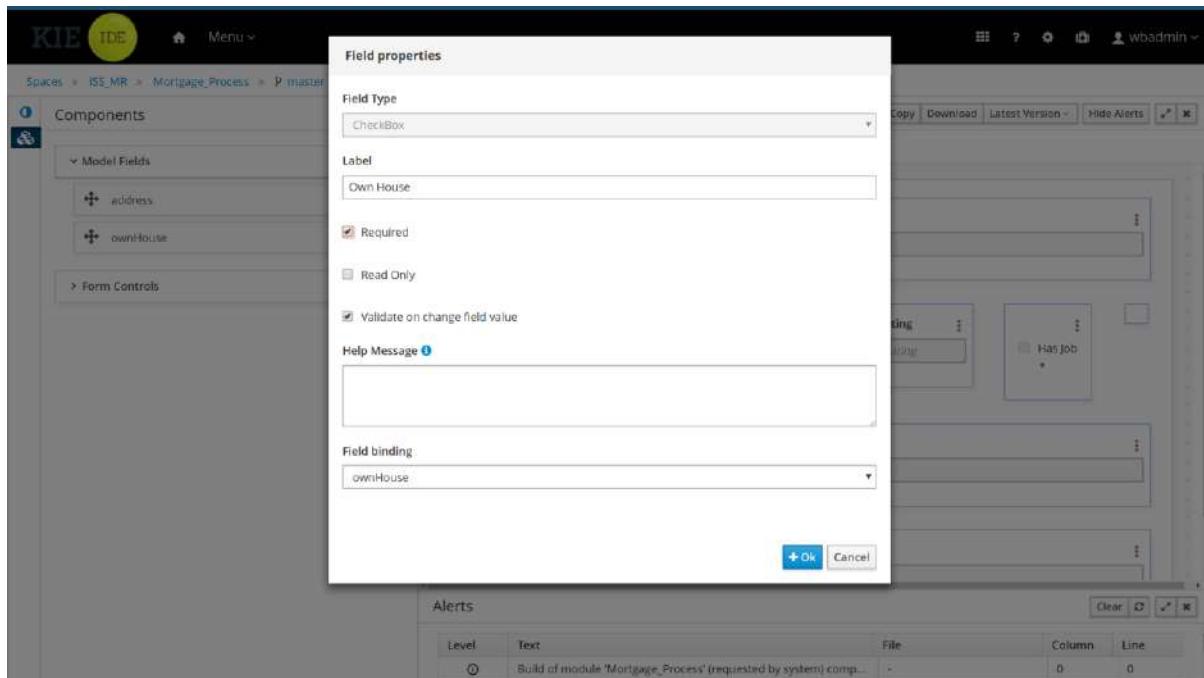
| Icon | Name | Type | Last modified | Created |
|------|-------------|--------------|---------------------|--------------------|
| | Applicant | Forms | Last modified today | Created 2 days ago |
| | Applicant | Data Objects | Last modified today | Created 2 days ago |
| | Application | Forms | Last modified today | Created 2 days ago |
| | Application | Data Objects | Last modified today | Created 2 days ago |

At the bottom of the screen, there is an "Alerts" section with a table showing one entry:

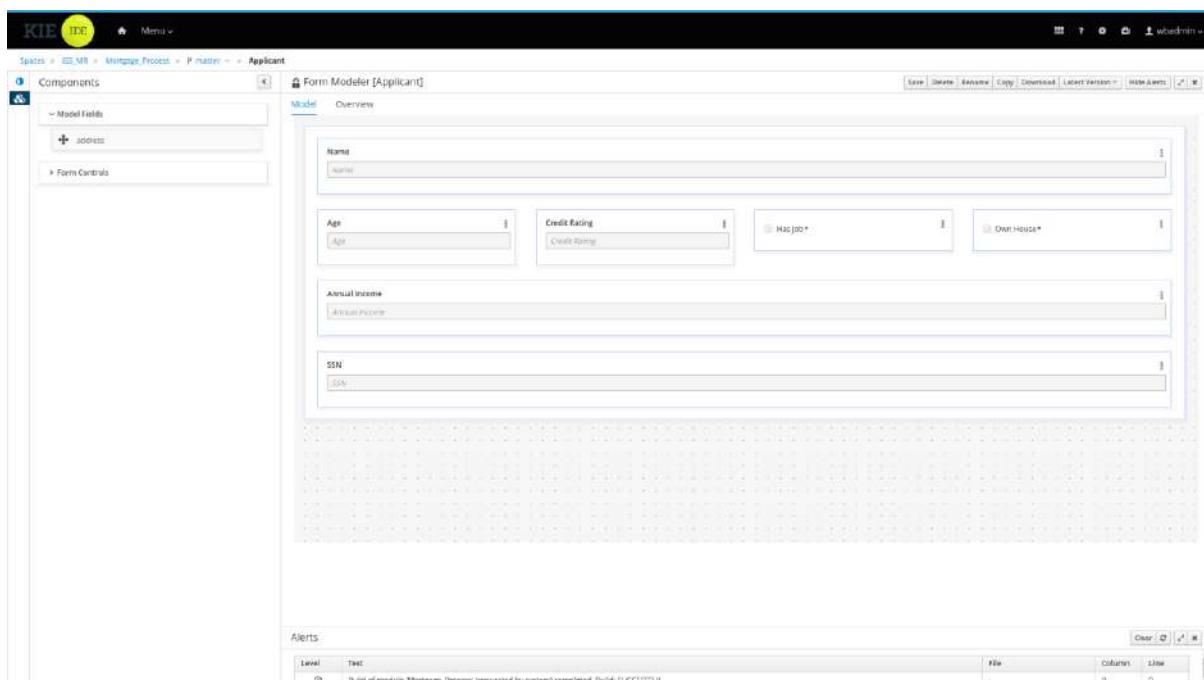
| Level | Text | File | Column | Line |
|-------|--|------|--------|------|
| Info | Build of module 'Mortgage_Process' (requested by system) completed. Build: SUCCESSFUL. | - | 0 | 0 |



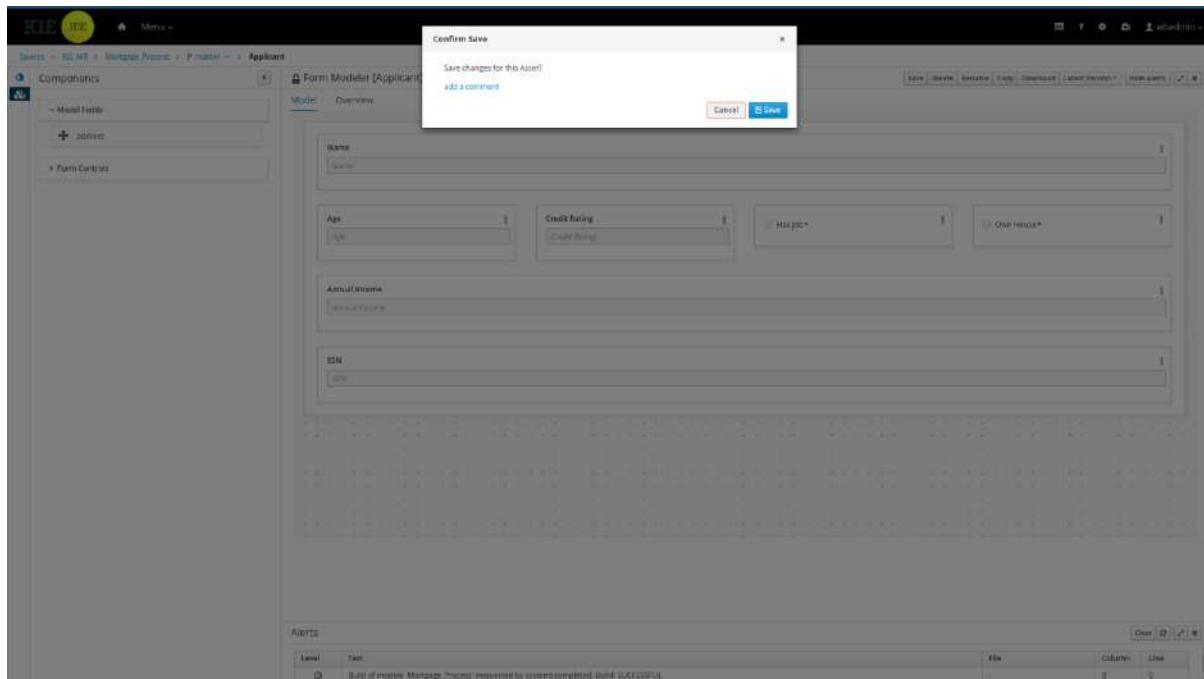




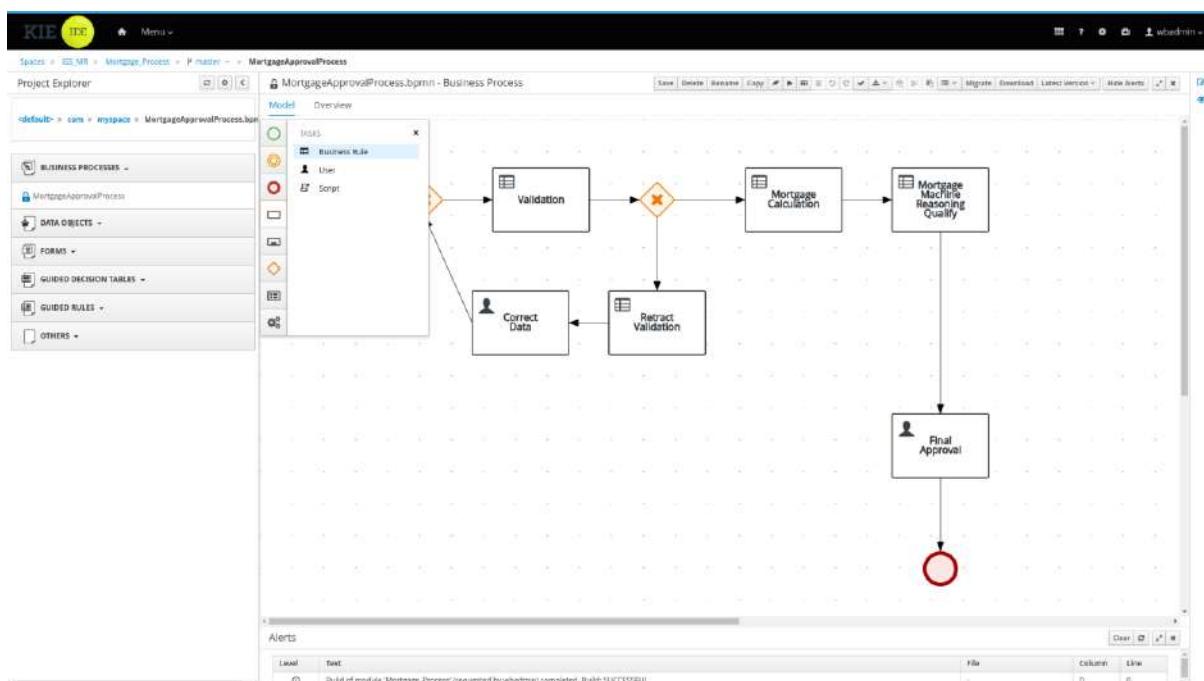
5) Adjust field width aesthetically;

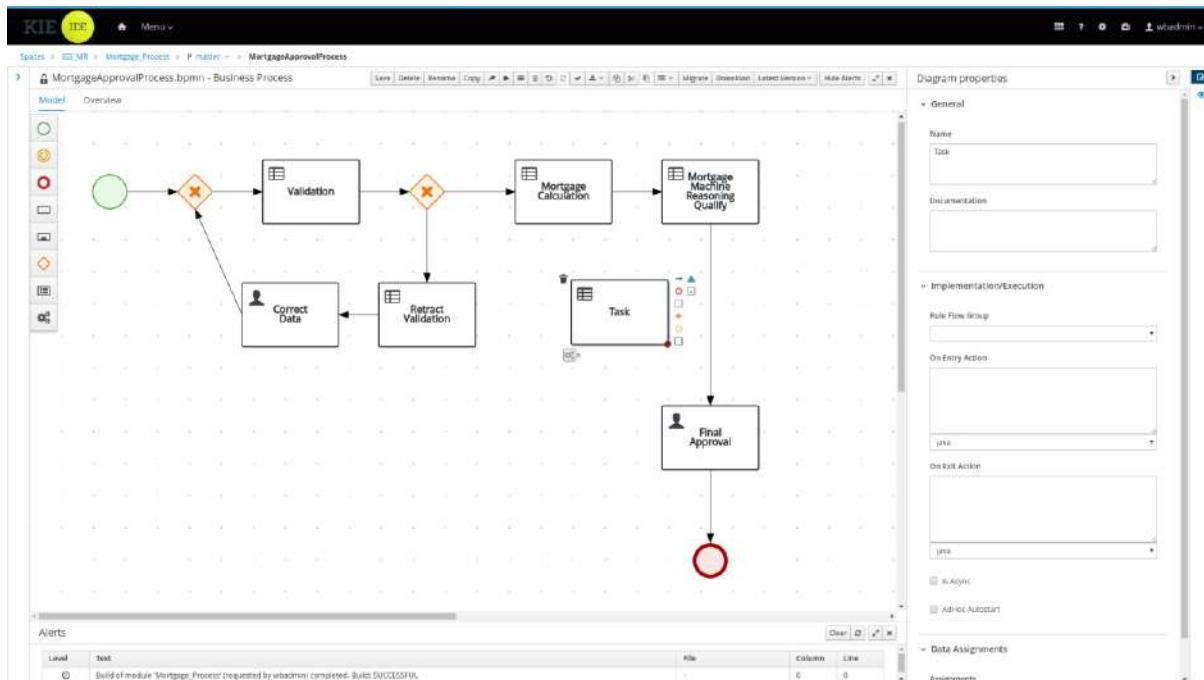


6) **Save** changes of **Form** updates;

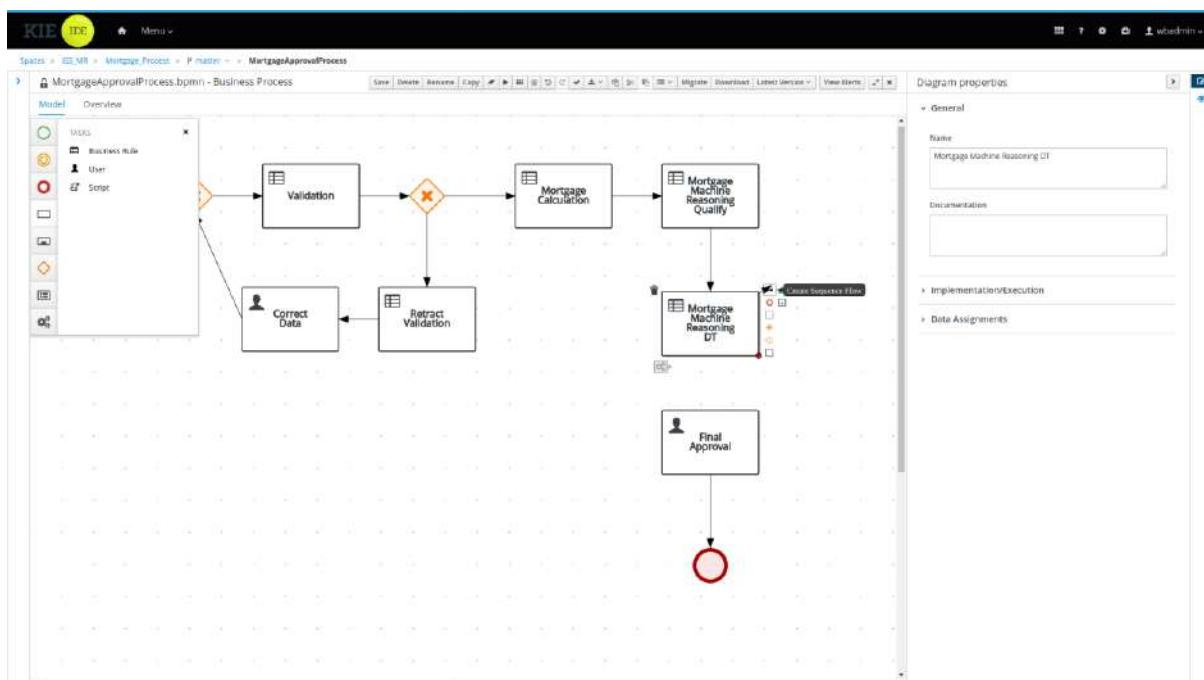


7) Go to **Assets** list of project **Mortgage_Process**; Edit [Business Processes: **MortgageApprovalProcess**]; Add a **Business Rule** process task;

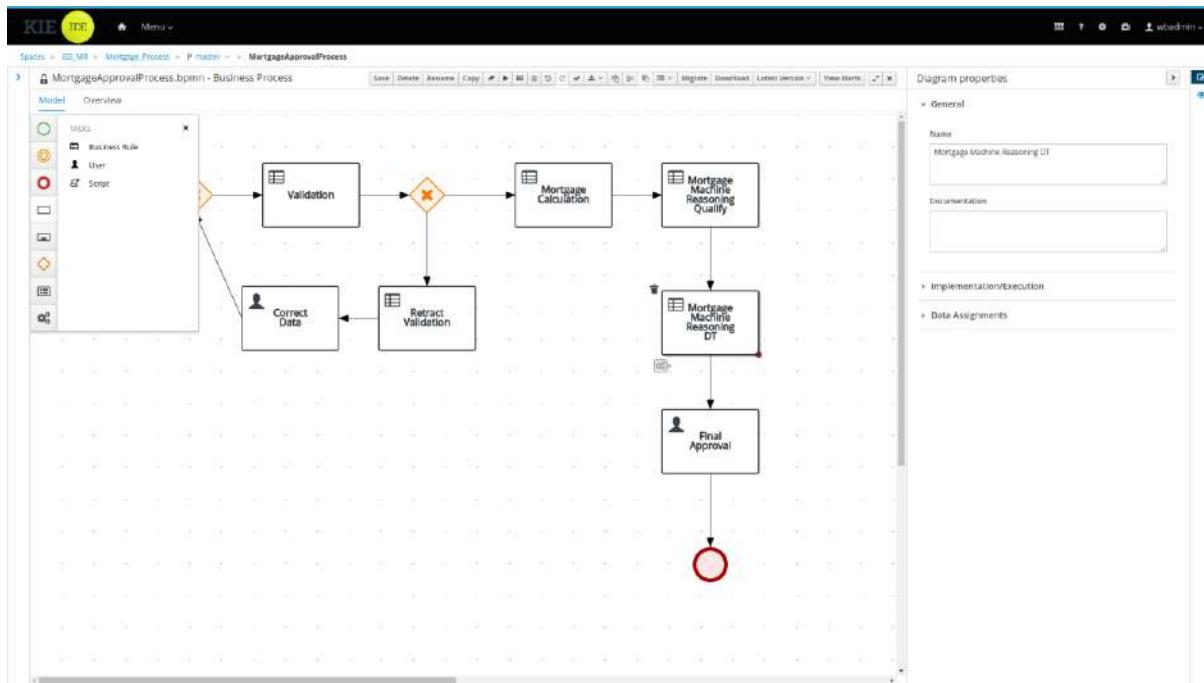




8) Rename the task name to **Mortgage Machine Reasoning DT**;



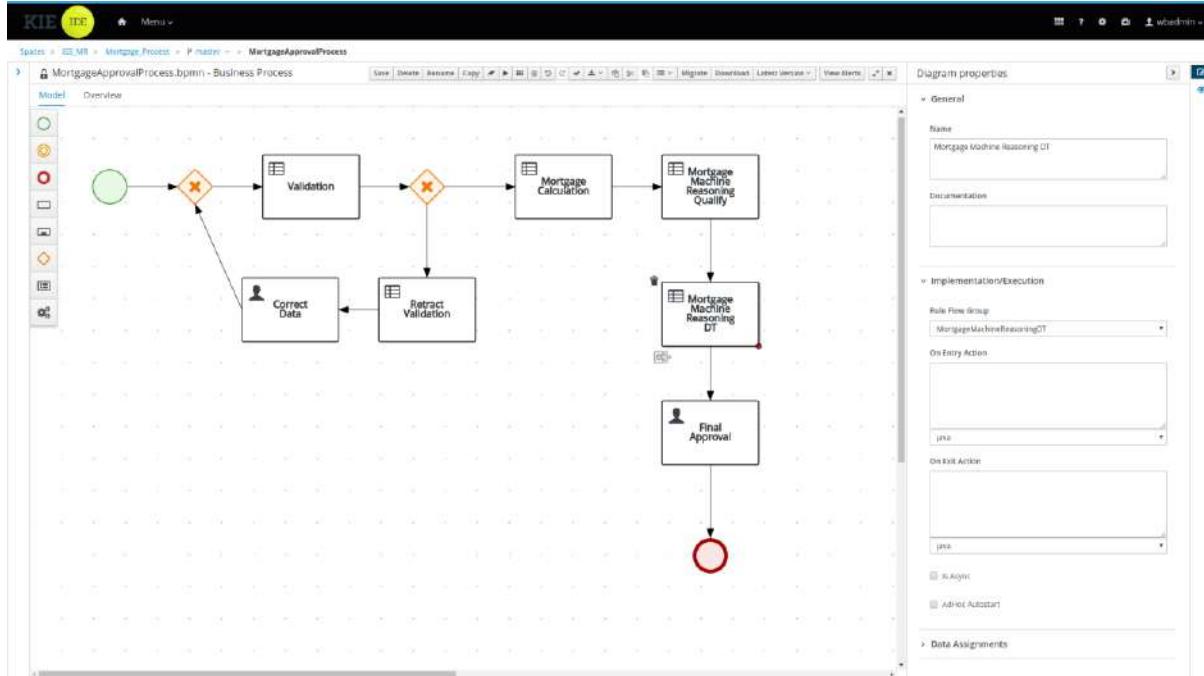
- 9) Update flow link to place the task in between [**Rule Task: Mortgage Machine Reasoning Qualify**] and [**User Task: Final Approval**];



10) In **Diagram properties** panel at right, update values for [Rule Task: **Task**];

Name : **Mortgage Machine Reasoning DT**

Rule Flow Group : **MortgageMachineReasoningDT**

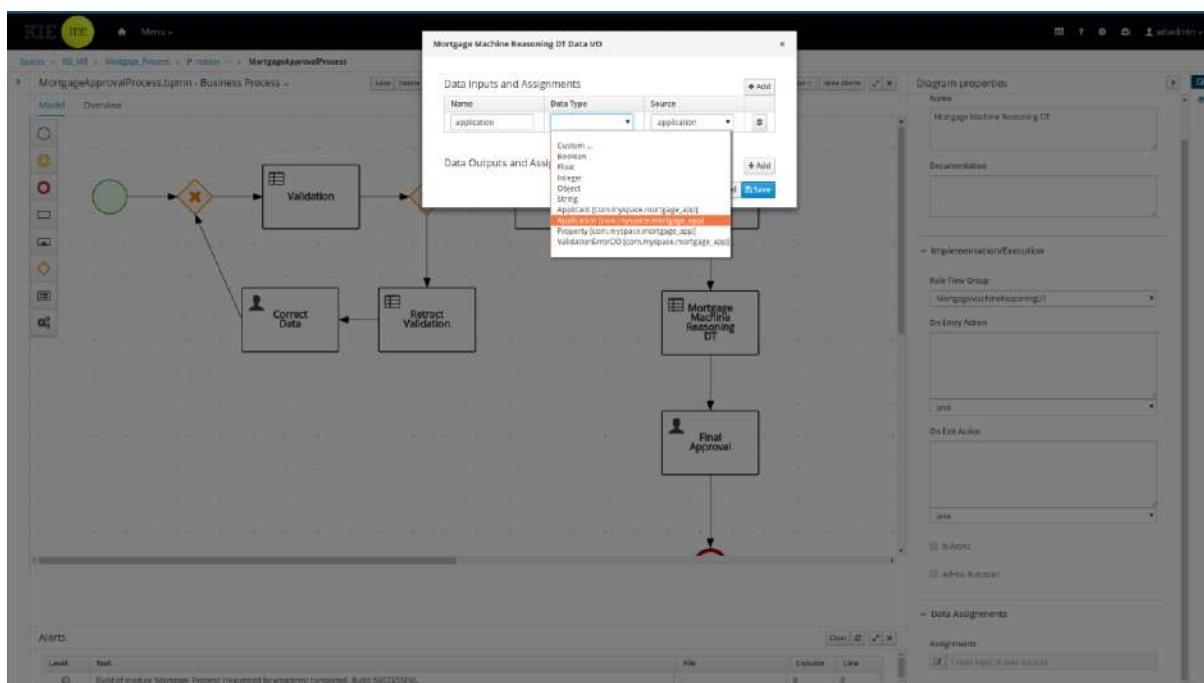
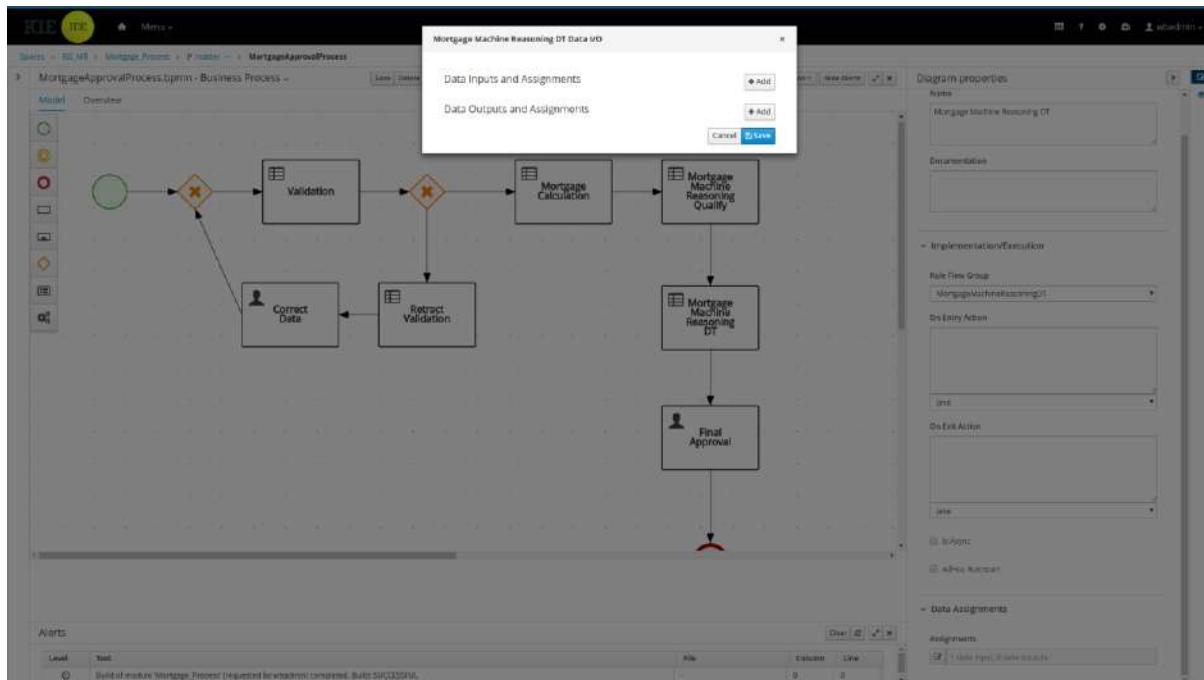


11) In **Diagram properties** panel at right, open **Assignments of Data Assignments**; Key in or select below values from drop down list; **Save**

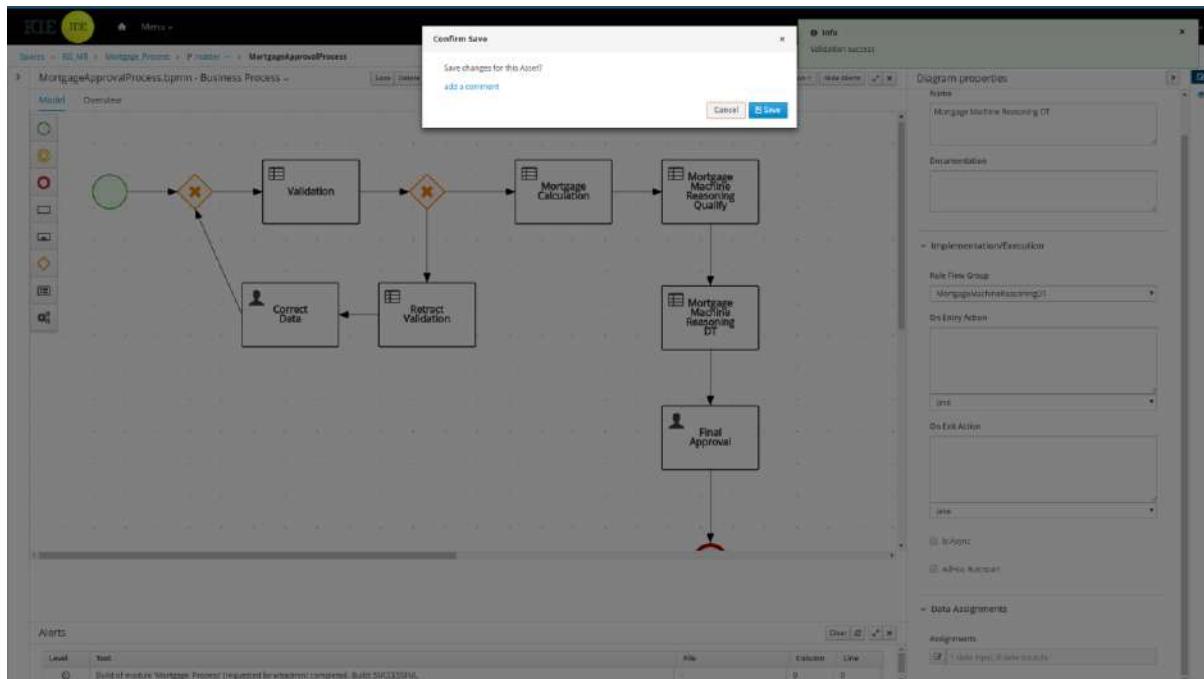
changes at last;

Inputs:

Name : **application**
 Data Type : **Application** [Data Type]
 Source : **applicaiton**

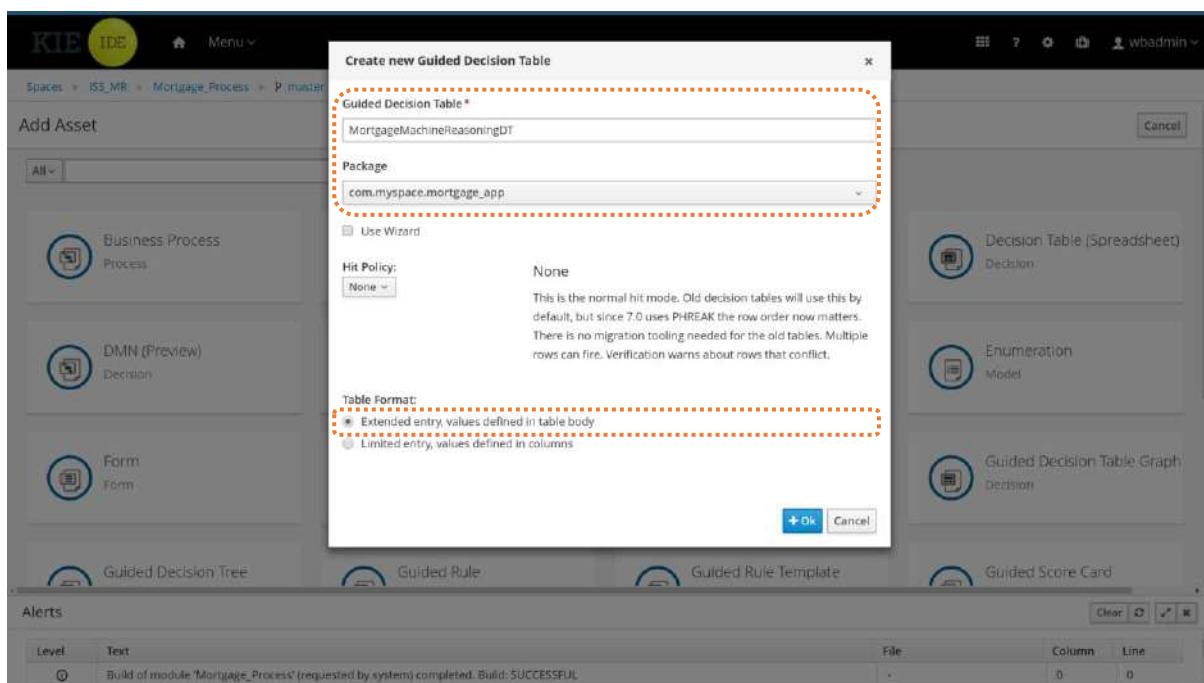
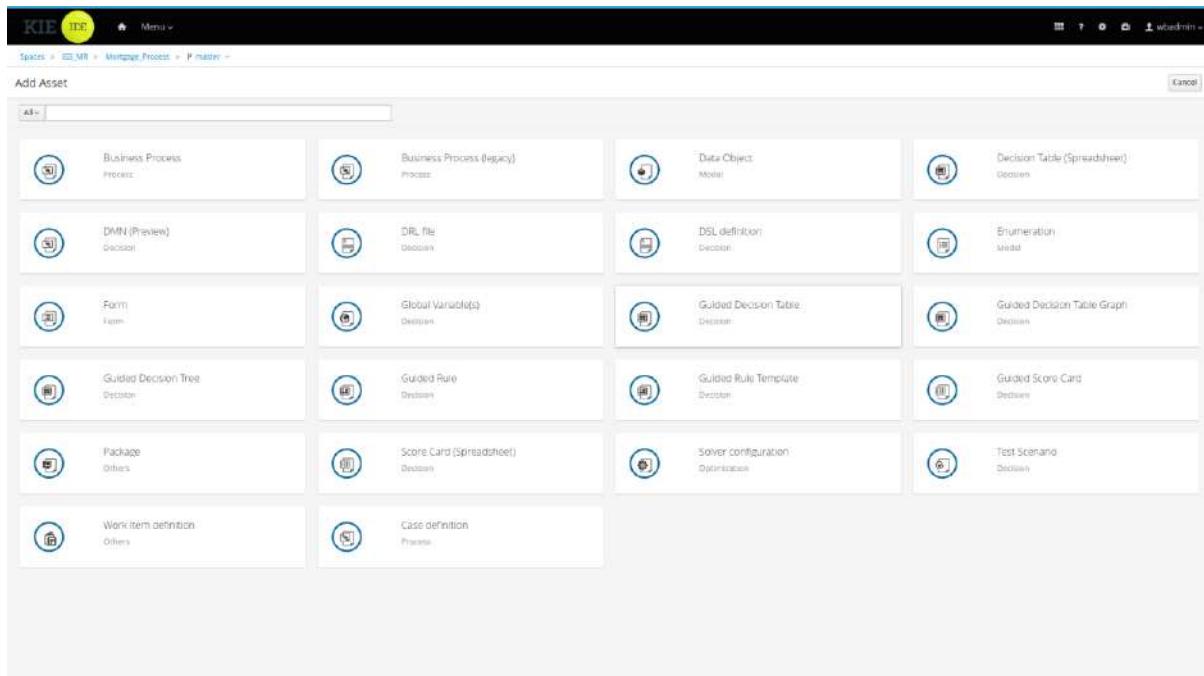


12) Save changes to [Business Processes: **MortgageApprovalProcess**];



13) Go to Assets list of project **Mortgage_Process**; **Add Asset Guided Decision Table**

| Asset | Type | Last modified | Created |
|---------------------|--------------|---------------------|--------------------|
| Applicant | Form | Last modified today | Created 2 days ago |
| Applicant | Data Objects | Last modified today | Created 2 days ago |
| Application | Form | Last modified today | Created 2 days ago |
| Application | Data Objects | Last modified today | Created 2 days ago |
| ApplicationMortgage | Form | Last modified today | Created 2 days ago |
| ApplicationMortgage | Form | Last modified today | Created 2 days ago |



Spaces > ISS_MR > Mortgage_Process > master > MortgageMachineReasoningDT

Model Columns Overview Source Data Objects

| MortgageMachineReasoningDT | |
|----------------------------|-------------|
| # | Description |
| | |

Alerts

| Level | Text | File | Column | Line |
|-------|--|------|--------|------|
| Info | Build of module 'Mortgage_Process' (requested by system) completed. Build: SUCCESSFUL. | - | 0 | 0 |

Spaces > ISS_MR > Mortgage_Process > master > MortgageMachineReasoningDT

Model Columns Overview Source Data Objects

Configure the columns first, then add rows (rules). A fact model (in the current package) will be needed to provide the facts and fields to configure this decision table.

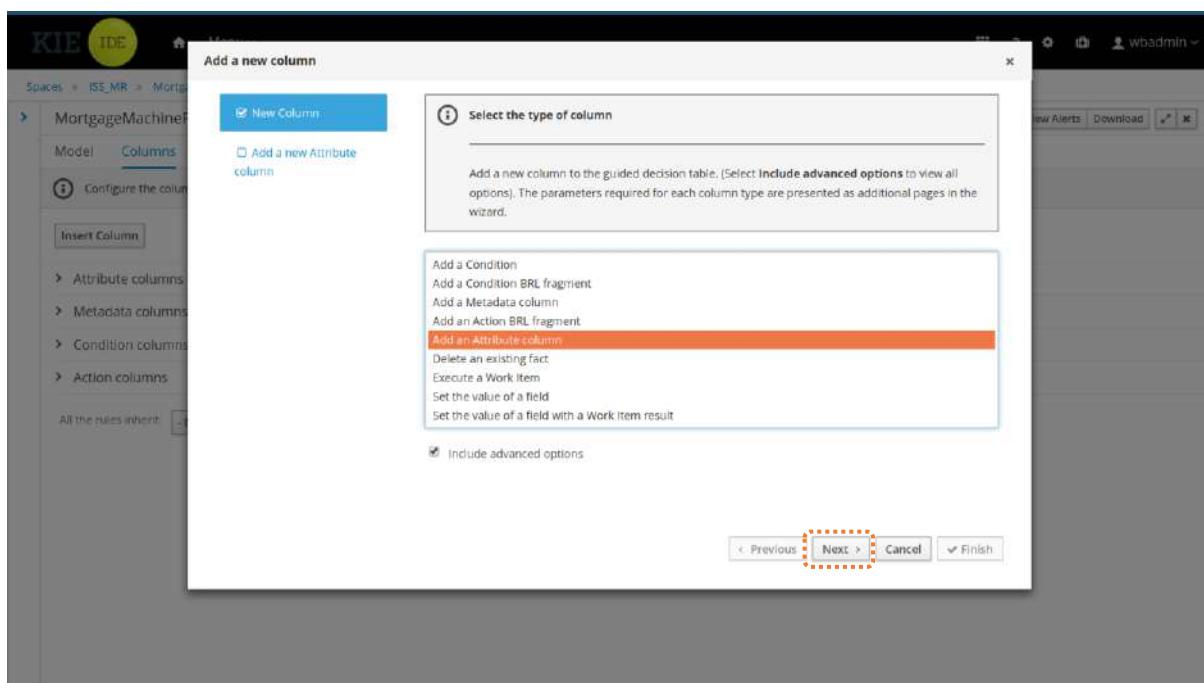
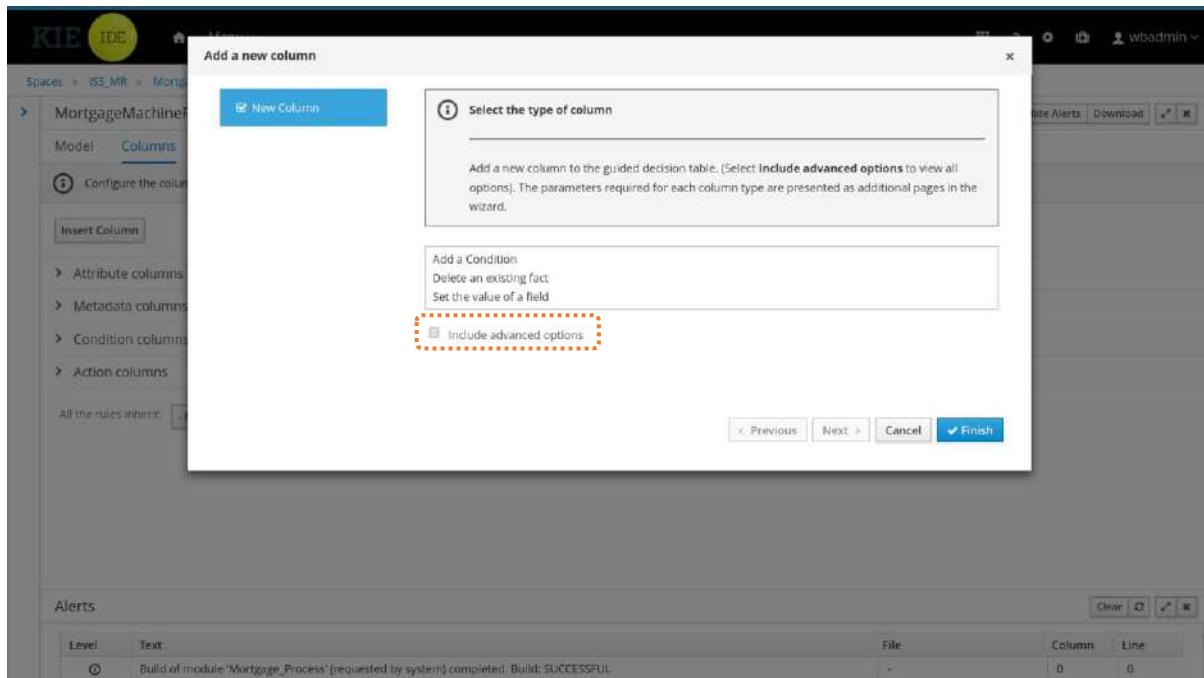
Insert Column

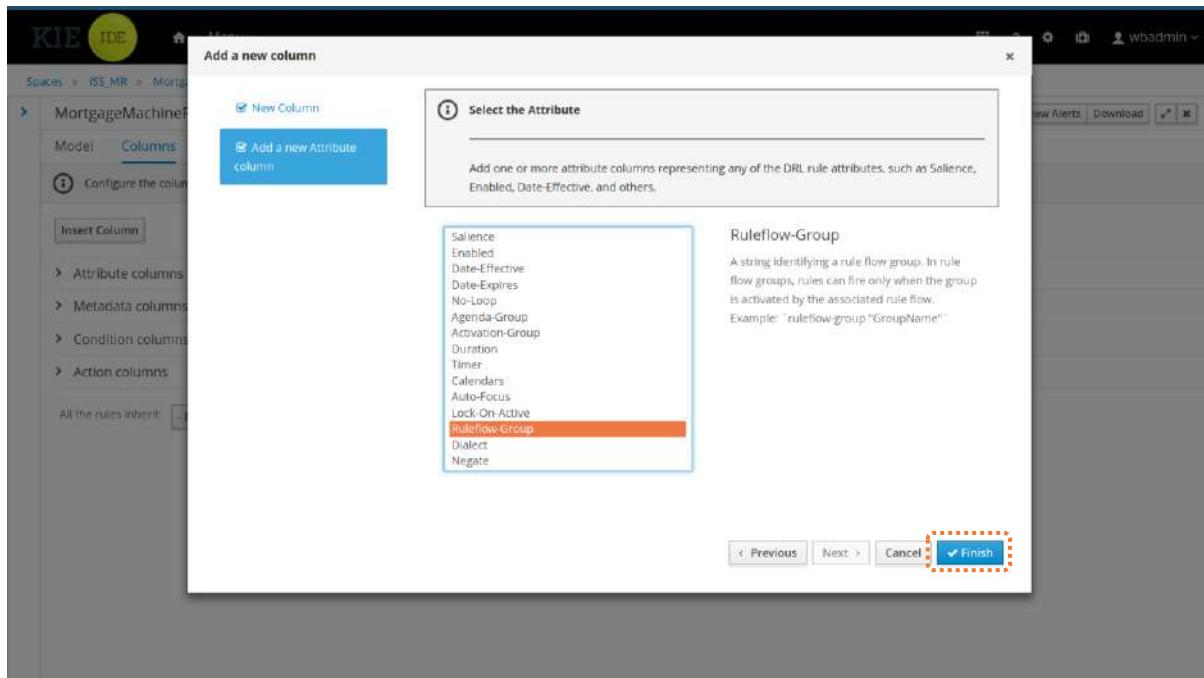
- > Attribute columns
- > Metadata columns
- > Condition columns
- > Action columns

All the rules inherit: - None -

Alerts

| Level | Text | File | Column | Line |
|-------|--|------|--------|------|
| Info | Build of module 'Mortgage_Process' (requested by system) completed. Build: SUCCESSFUL. | - | 0 | 0 |

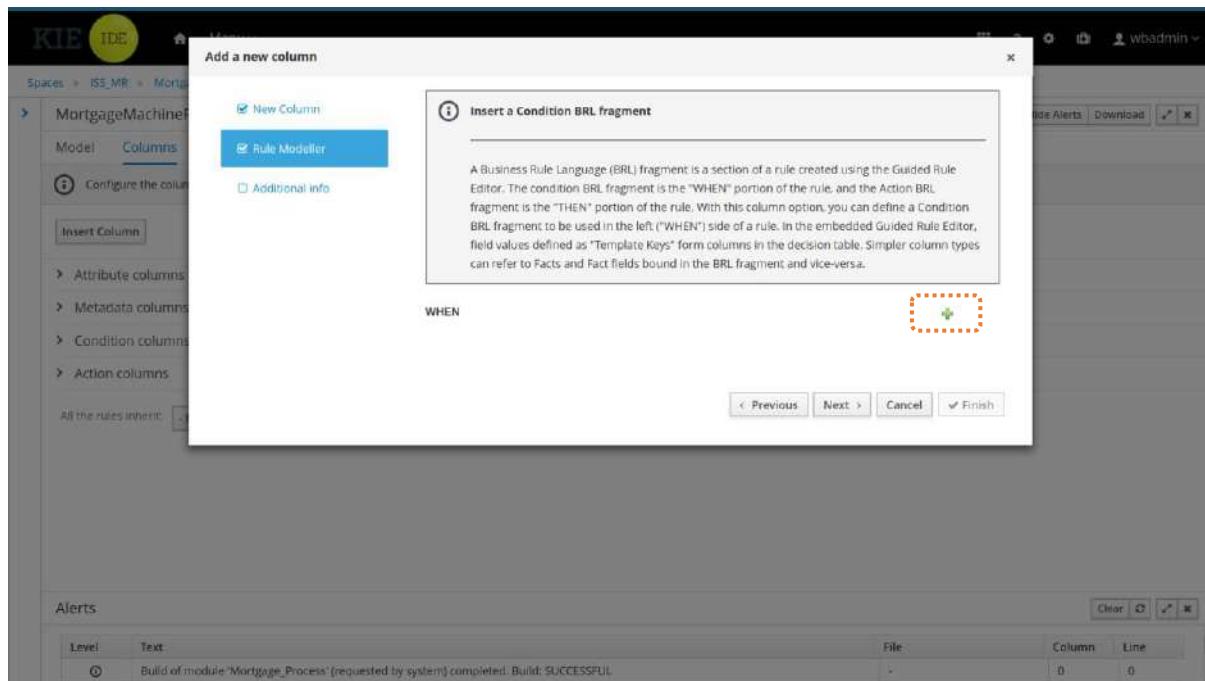
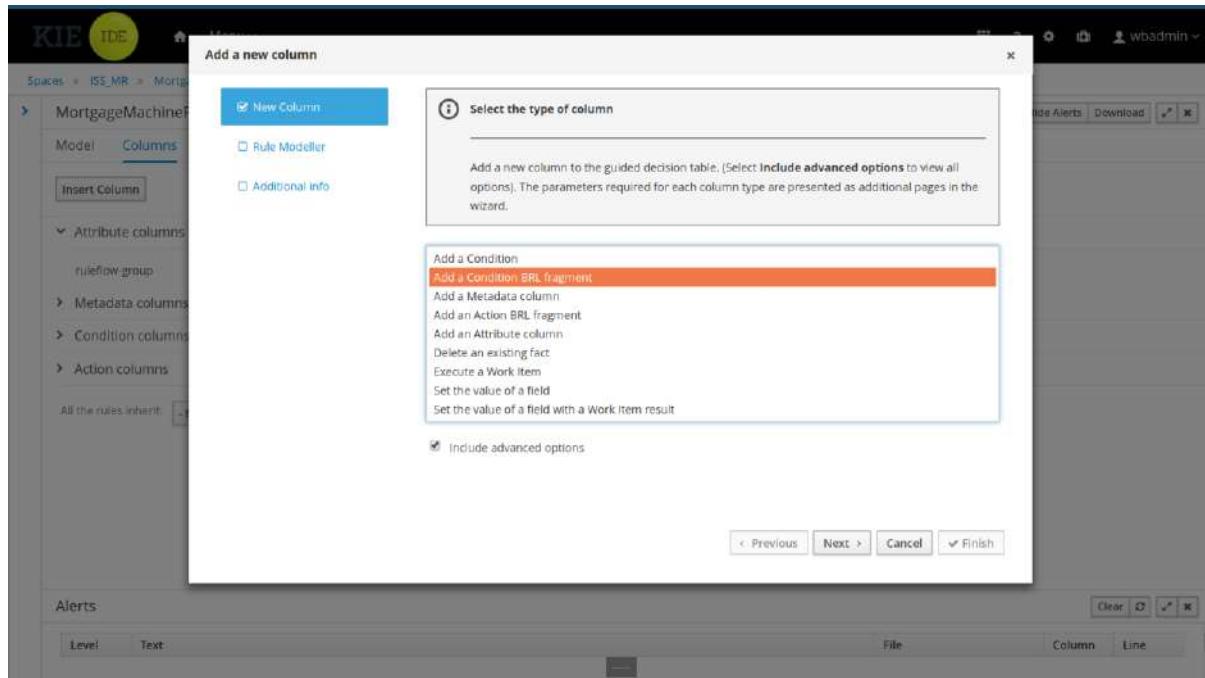


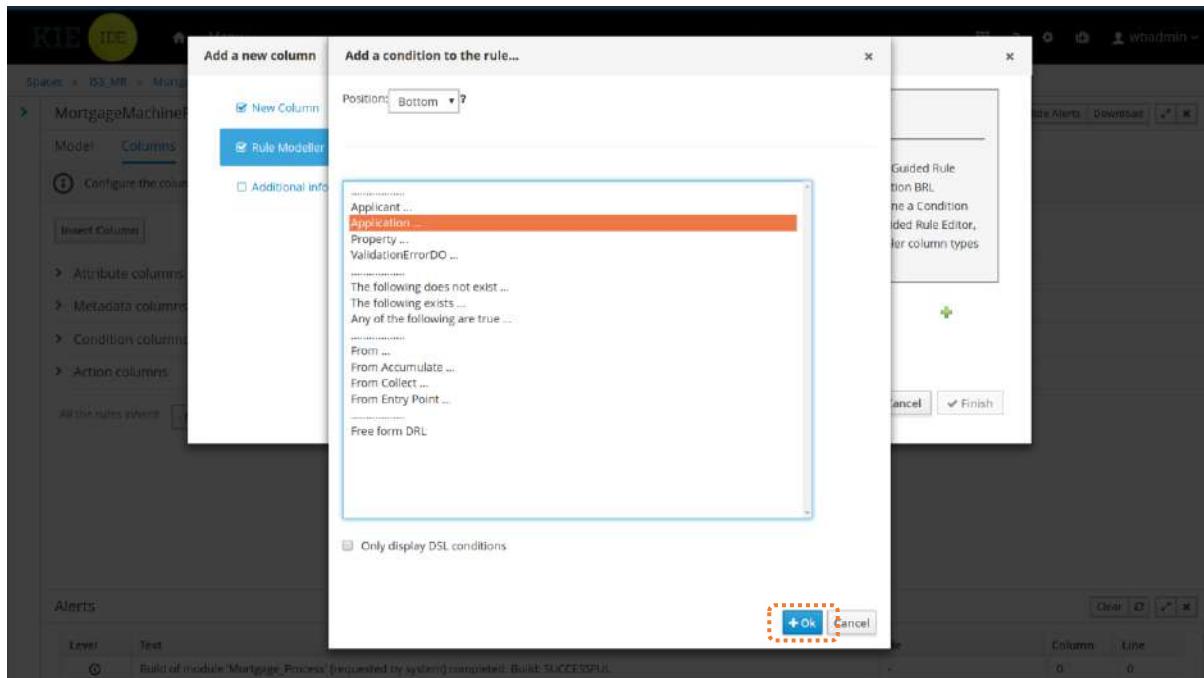


14) Key in Rule Flow Group value: ***MortgageMachineReasoningDT***,

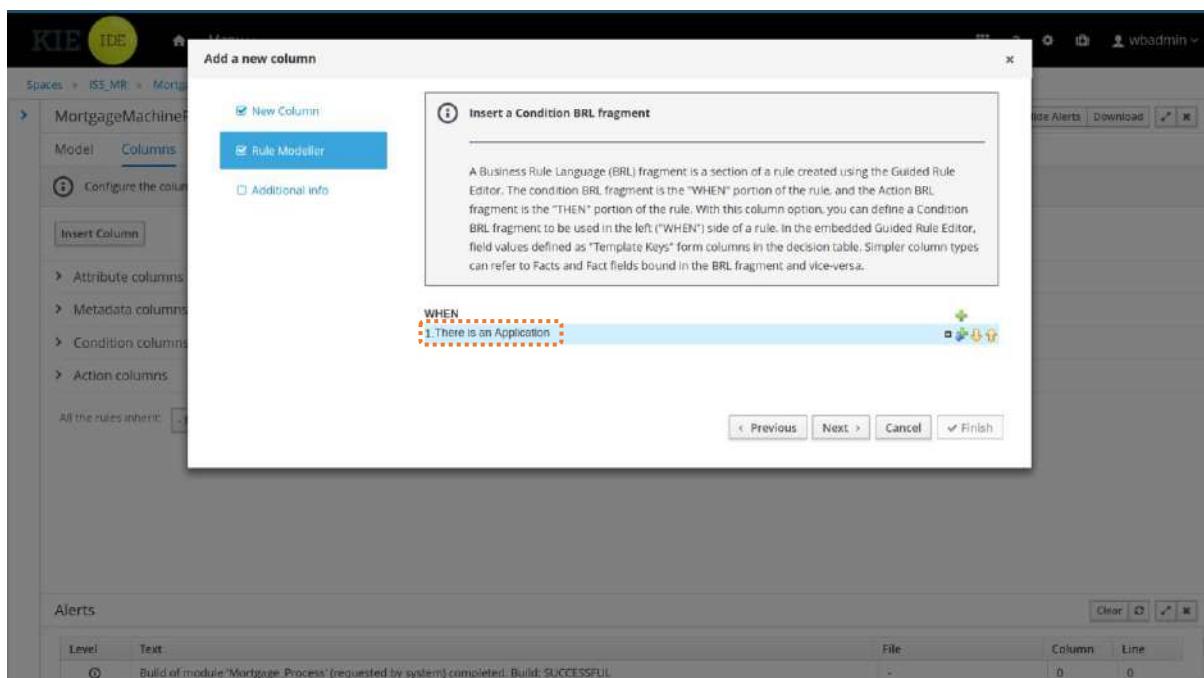
The screenshot shows the 'MortgageMachineReasoningDT' table configuration in the KIE IDE. The 'ruleflow group' column is defined with a default value of 'MortgageMachineReasoningDT'. The 'Default value:' field contains this text, which is also highlighted with a red box.

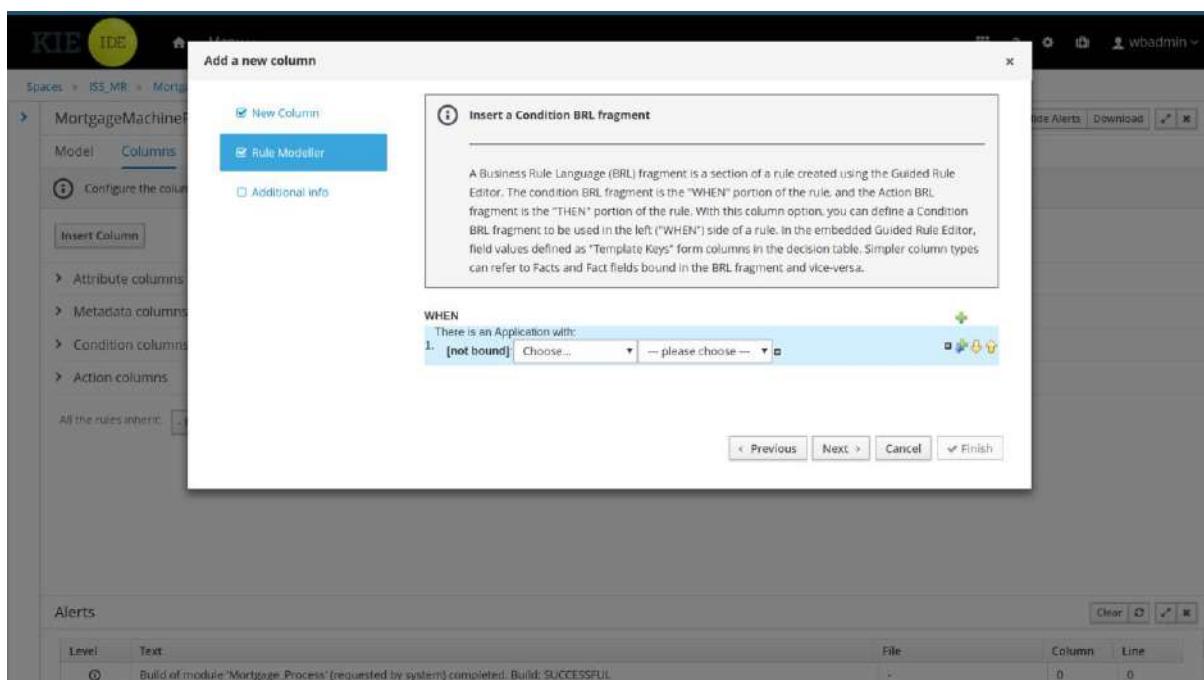
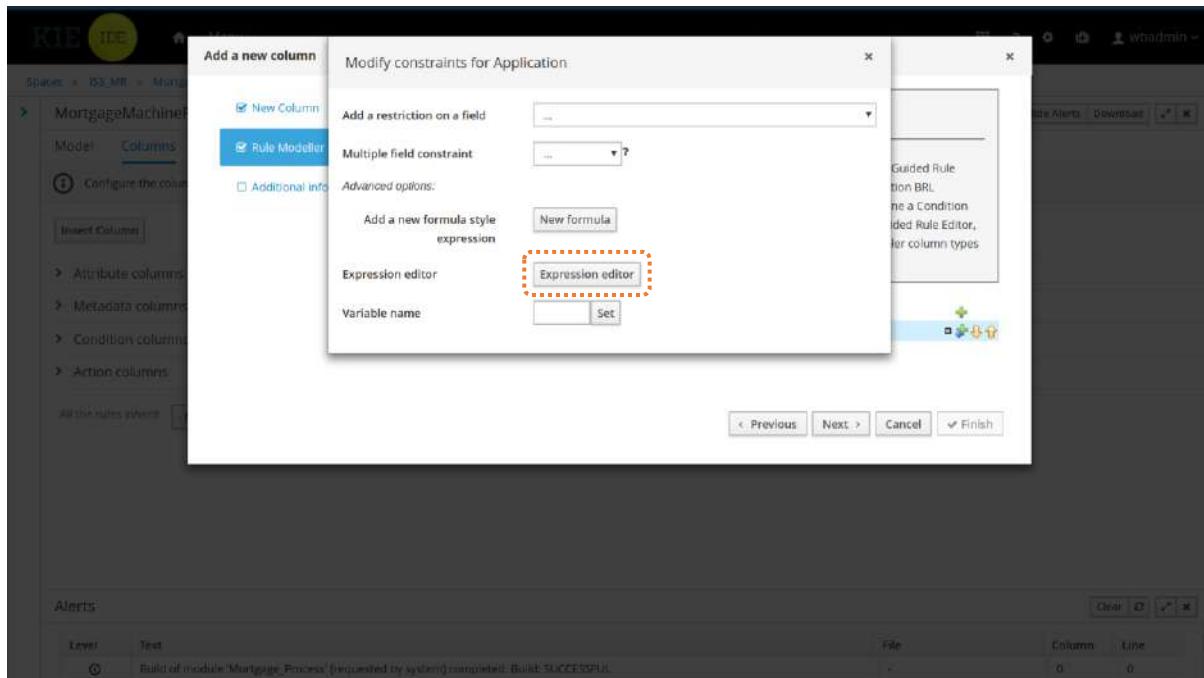
15) Add Decision Table Condition columns for *Applicant.ownHouse*; (WHEN part of Rule)

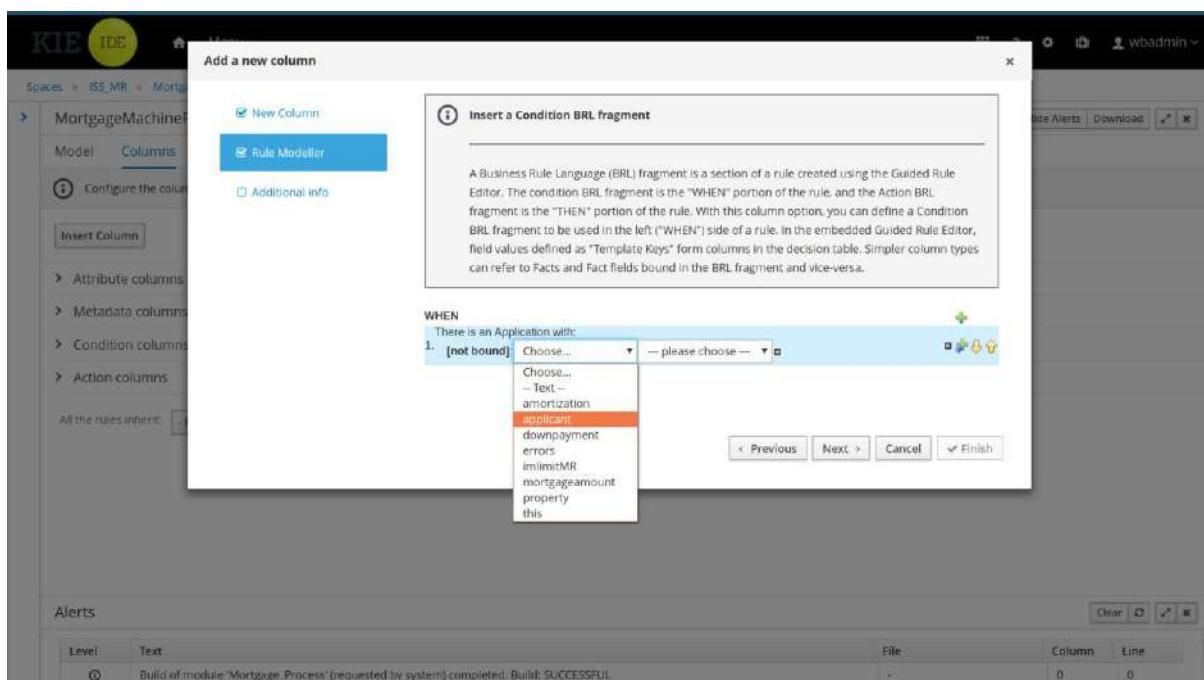
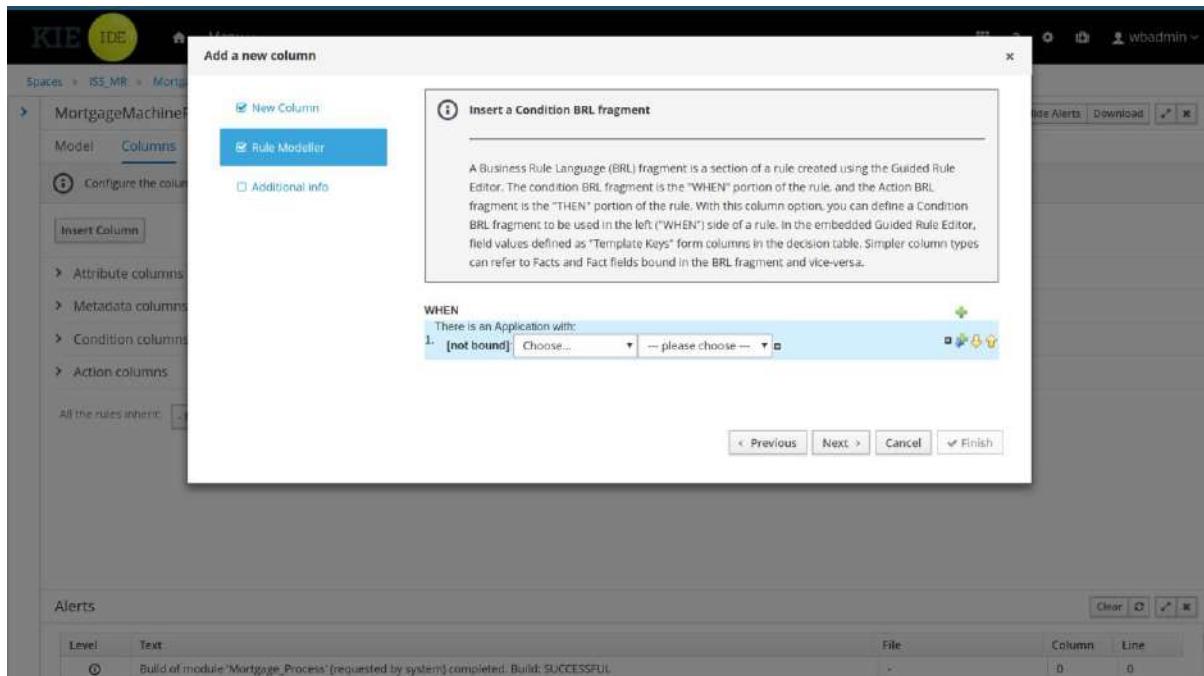




Click 'There is an Application with:'







The screenshot shows the KIE IDE interface with the 'Add a new column' dialog open. The 'Rule Modeller' tab is selected. In the 'WHEN' section, a dropdown menu is open, showing various field options. The option 'ownHouse' is highlighted in red.

The screenshot shows the KIE IDE interface with the 'Add a new column' dialog open. The 'Rule Modeller' tab is selected. In the 'WHEN' section, a dropdown menu is open, showing comparison operators. The option 'equal to' is highlighted in red.

Insert a Condition BRL fragment

A Business Rule Language (BRL) fragment is a section of a rule created using the Guided Rule Editor. The condition BRL fragment is the "WHEN" portion of the rule, and the Action BRL fragment is the "THEN" portion of the rule. With this column option, you can define a Condition BRL fragment to be used in the left ("WHEN") side of a rule. In the embedded Guided Rule Editor, field values defined as "Template Keys" form columns in the decision table. Simpler column types can refer to Facts and Fact fields bound in the BRL fragment, and vice-versa.

WHEN

There is an Application with:

1. [not bound]: applicant.ownHouse, Choose... equal to...

< Previous Next > Cancel ✓ Finish

Alerts

| Level | Text |
|-------|--|
| Info | Build of module 'Mortgage_Process' [requested by system] completed. Build: SUCCESSFUL. |

Field value

New Column Rule Modeller Additional info

Literal value Literal value

Template key **Template key**

Advanced options:

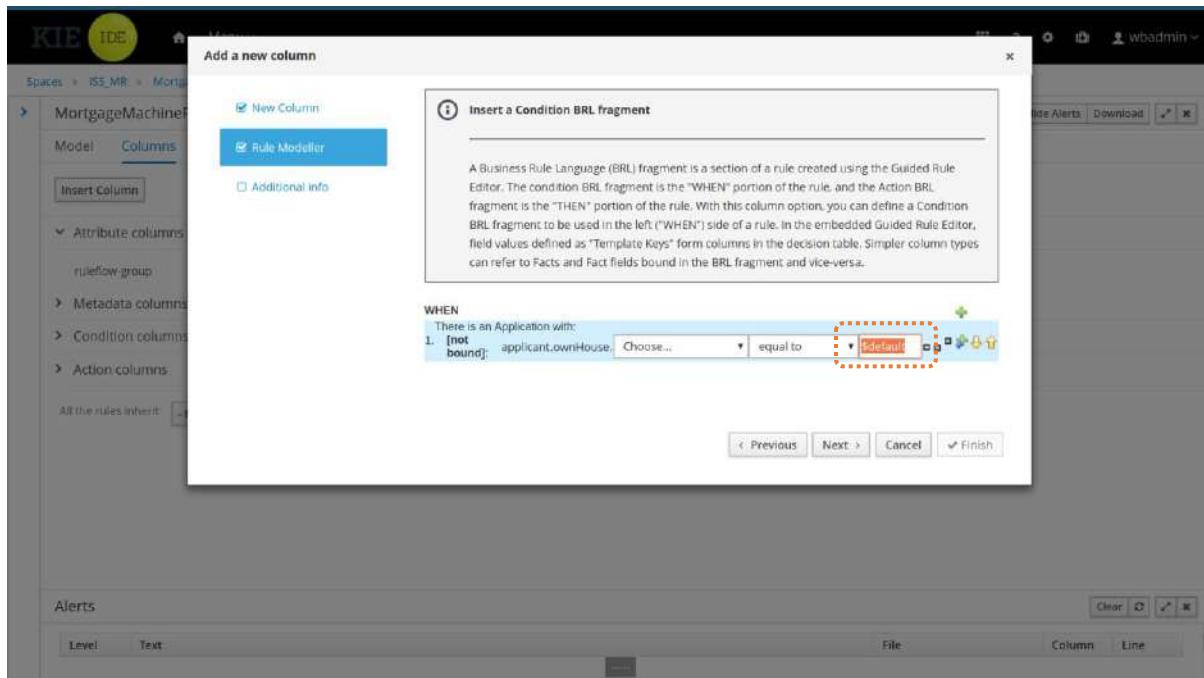
A formula New formula

Expression editor Expression editor

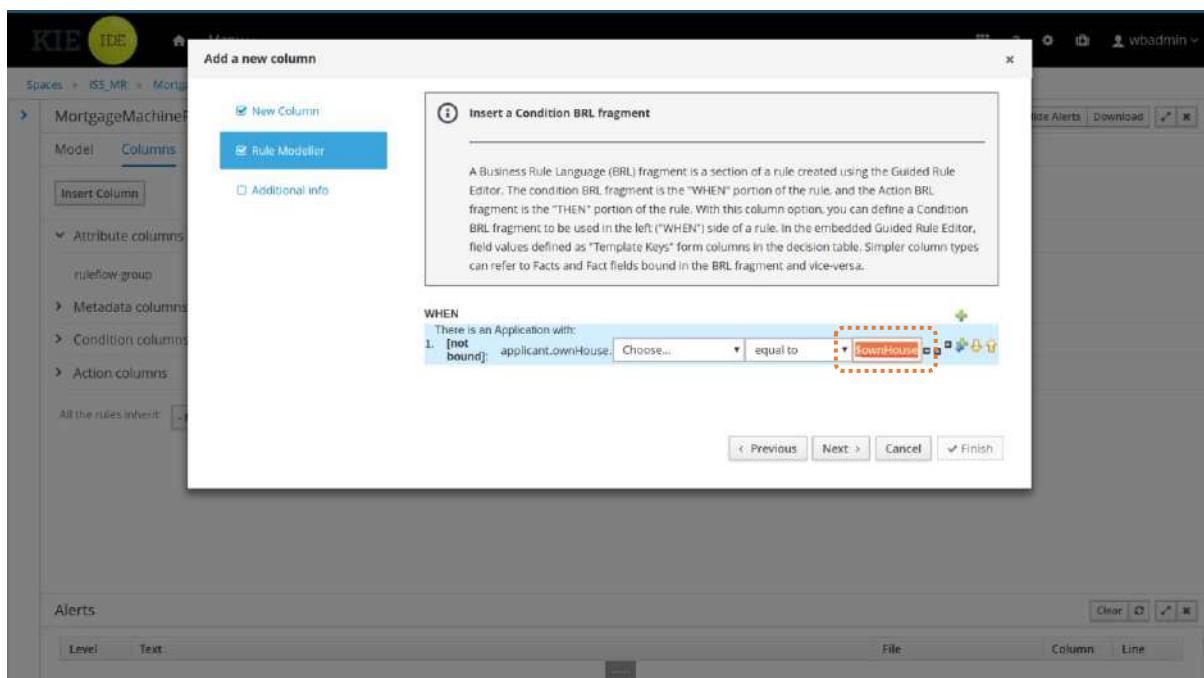
< Previous Next > Cancel ✓ Finish

Alerts

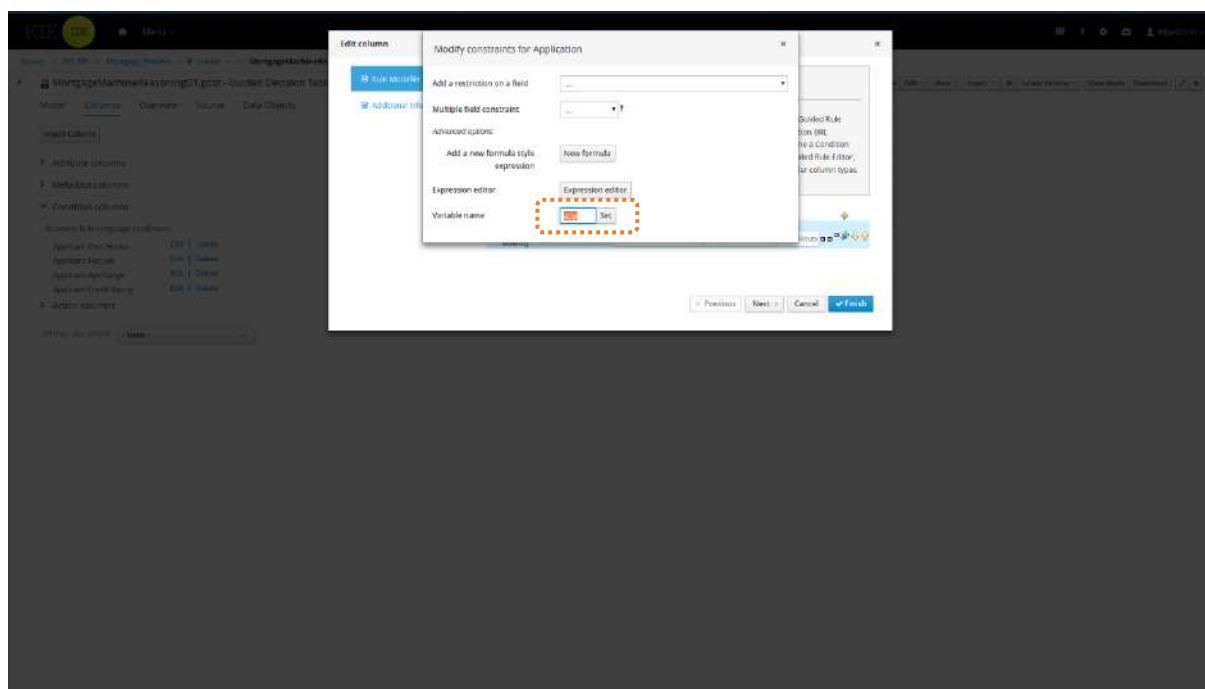
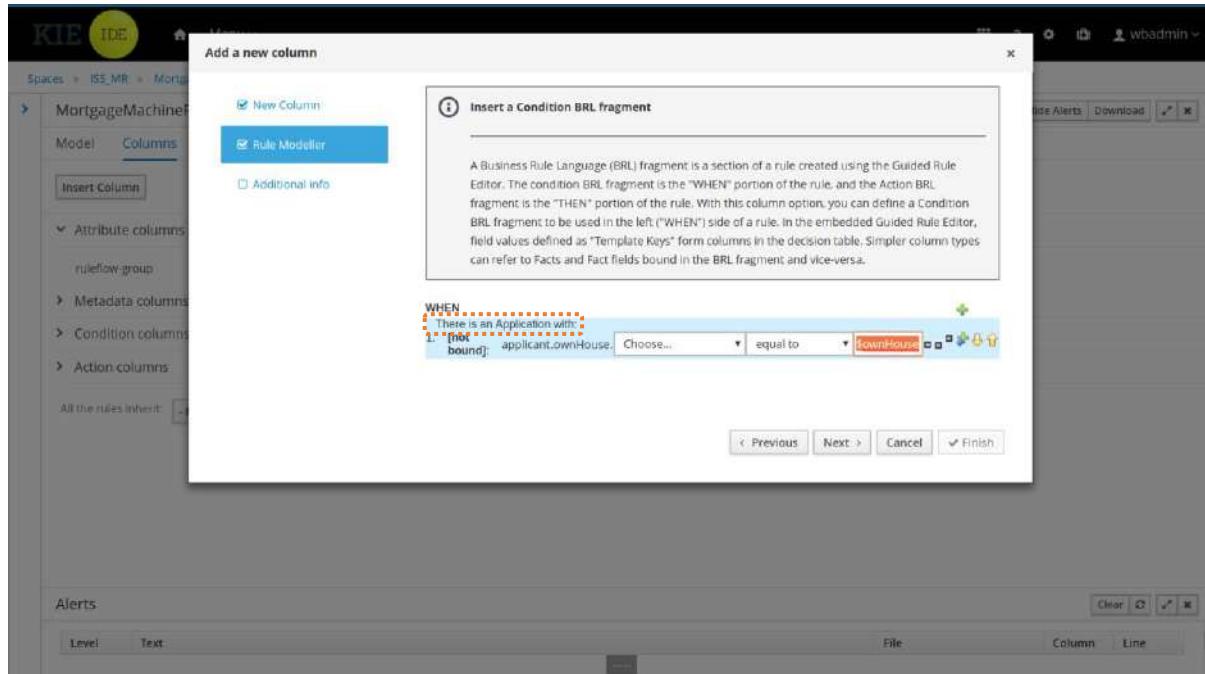
| Level | Text |
|-------|--|
| Info | Build of module 'Mortgage_Process' [requested by system] completed. Build: SUCCESSFUL. |

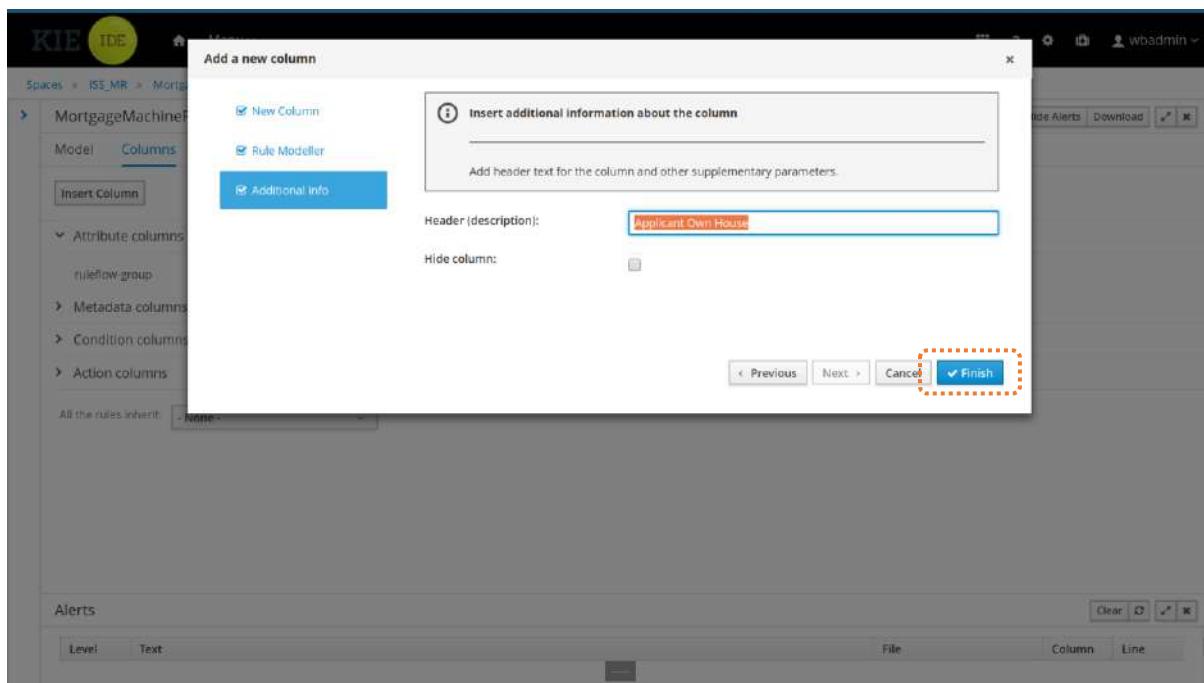
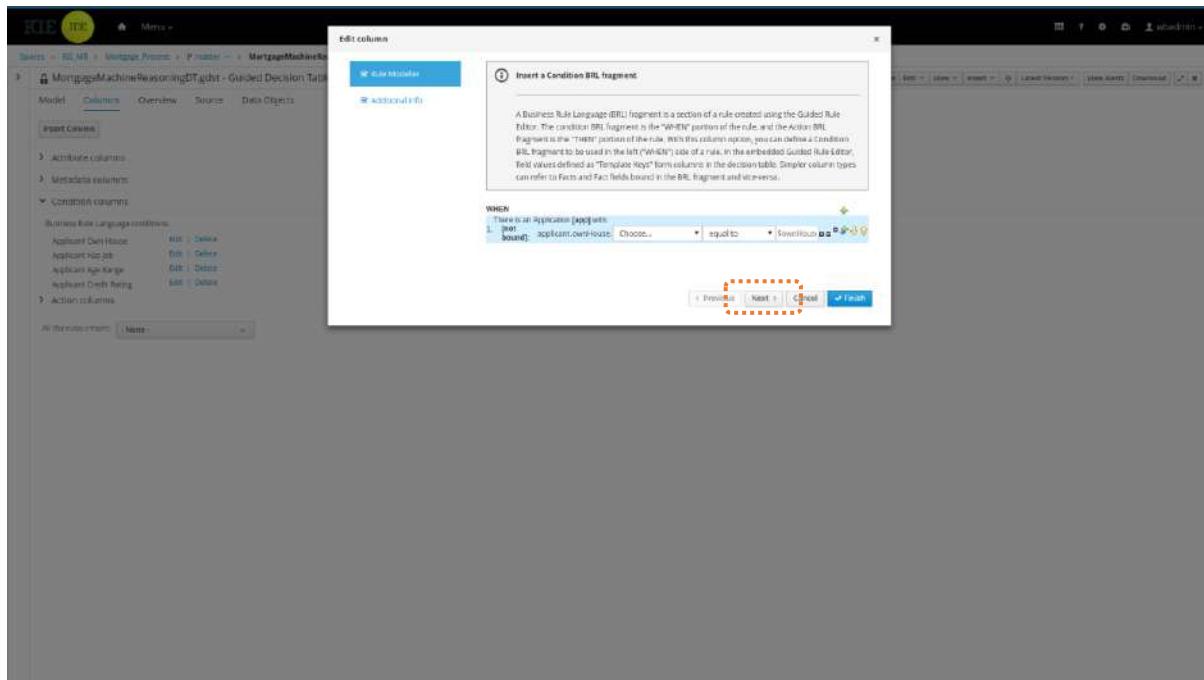


Update filed (**Template key**) value to: **\$ownHouse**



Click ‘**There is an Application with:**’ to assign (bind) the ***Application*** object instance (Java Bean) to Drools rule’s internal variable name: ***app***





KIE IDE

Spaces > ISS_MR > Mortgage_Process > MortgageMachineReasoningDT

MortgageMachineReasoningDT.gdst - Guided Decision Tables

Model Columns Overview Source Data Objects

Insert Column

Attribute columns

Metadata columns

Condition columns

Business Rule Language conditions

Applicant Own House [Edit | Delete](#)

Action columns

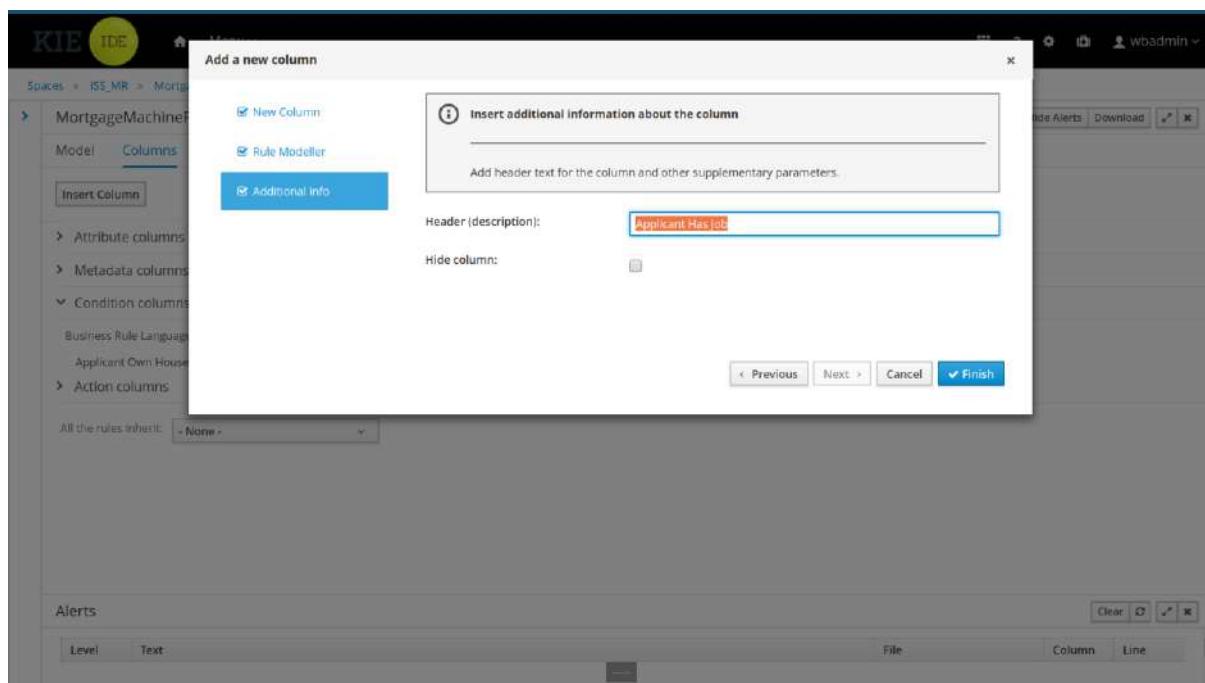
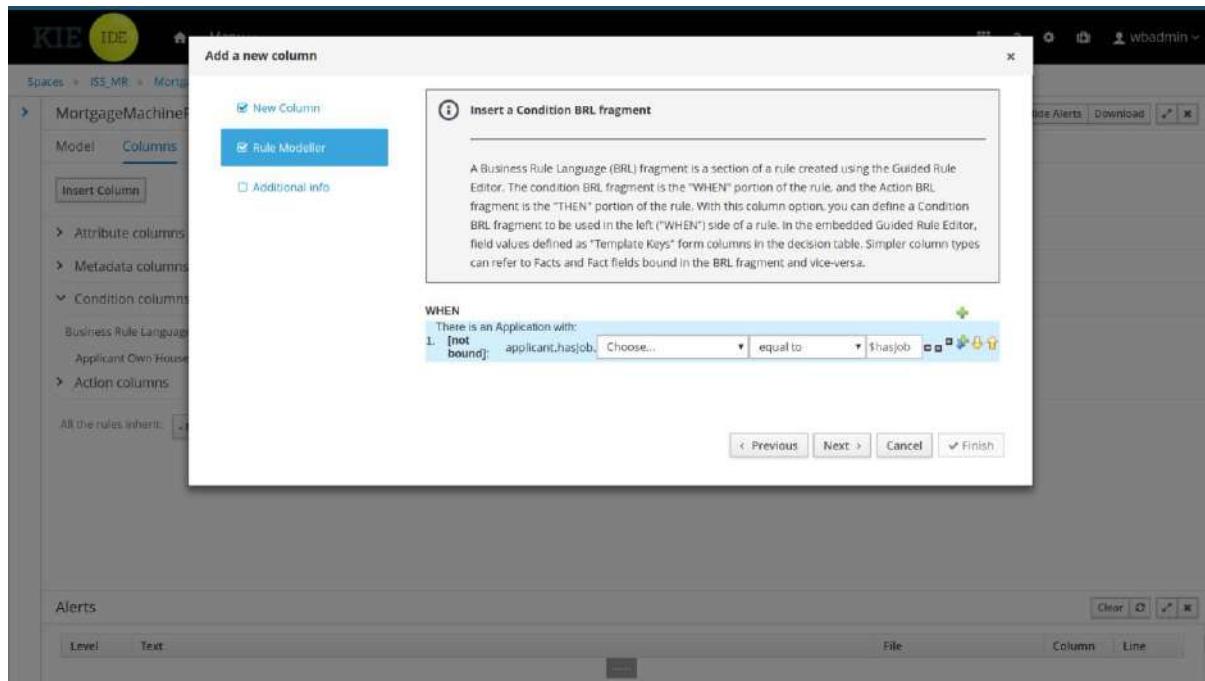
All the rules inherit: -None-

Alerts

Level Text

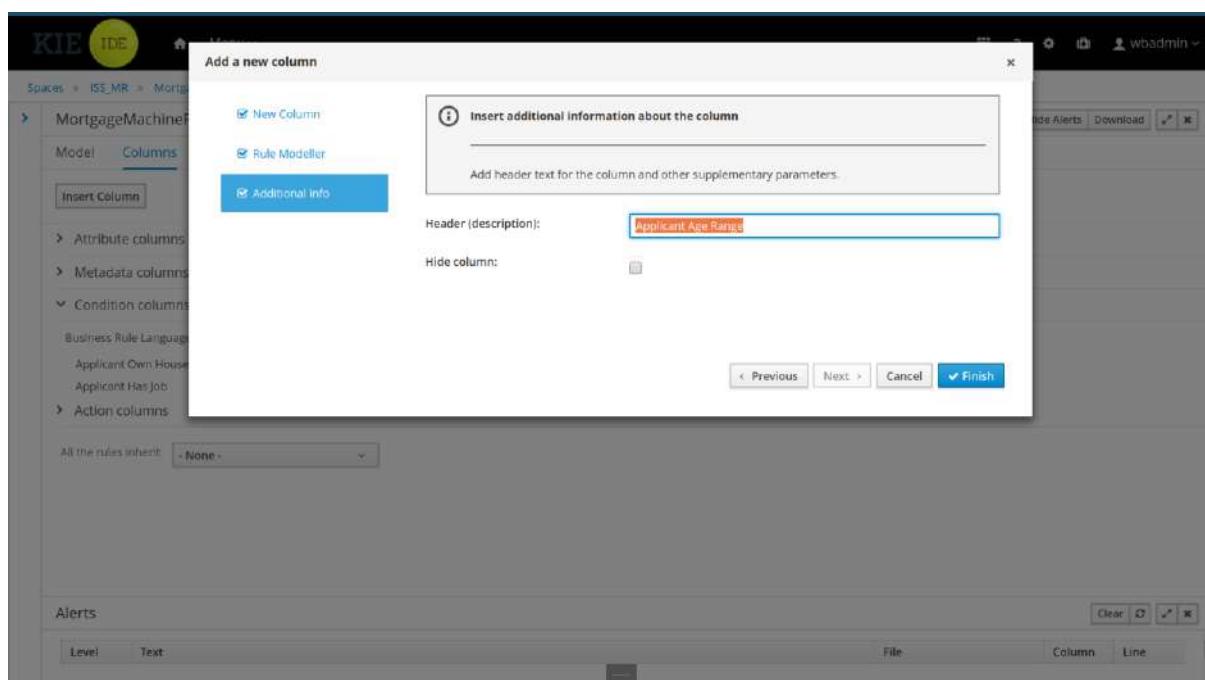
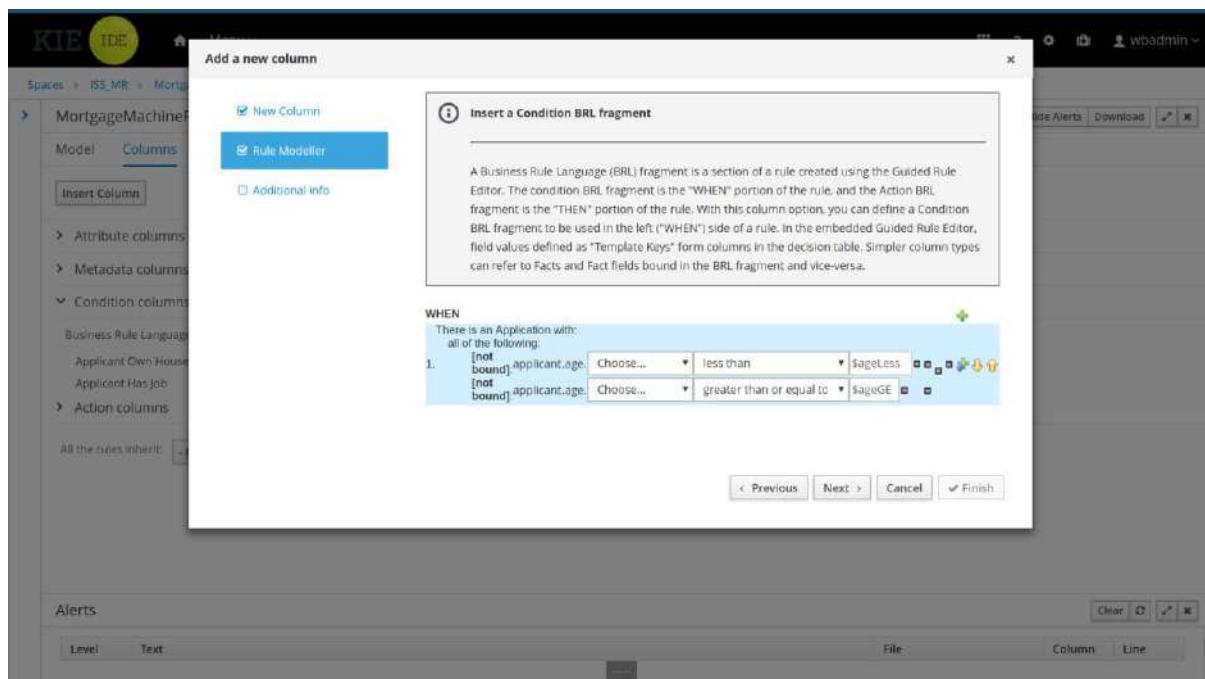
File Column Line

- 16) Similarly, add **Decision Table Condition columns** for ***Applicant.hasJob***; (WHEN part of Rule)
 Update filed (**Template key**) value to: **\$hasJob**

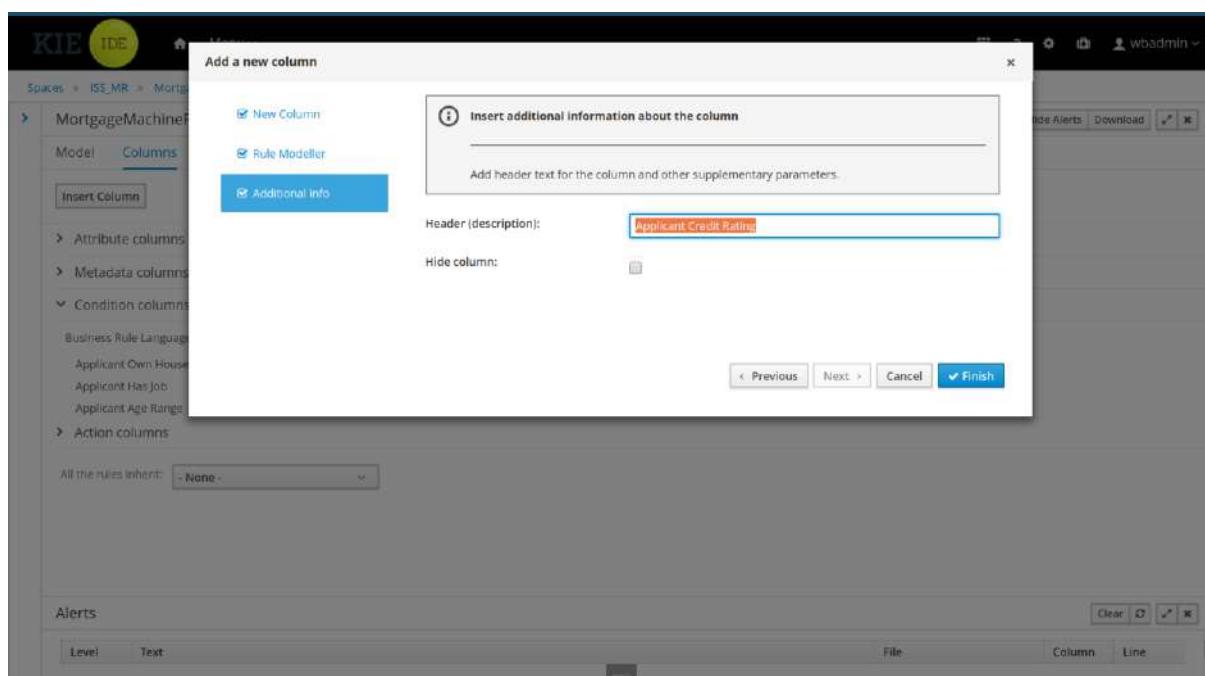
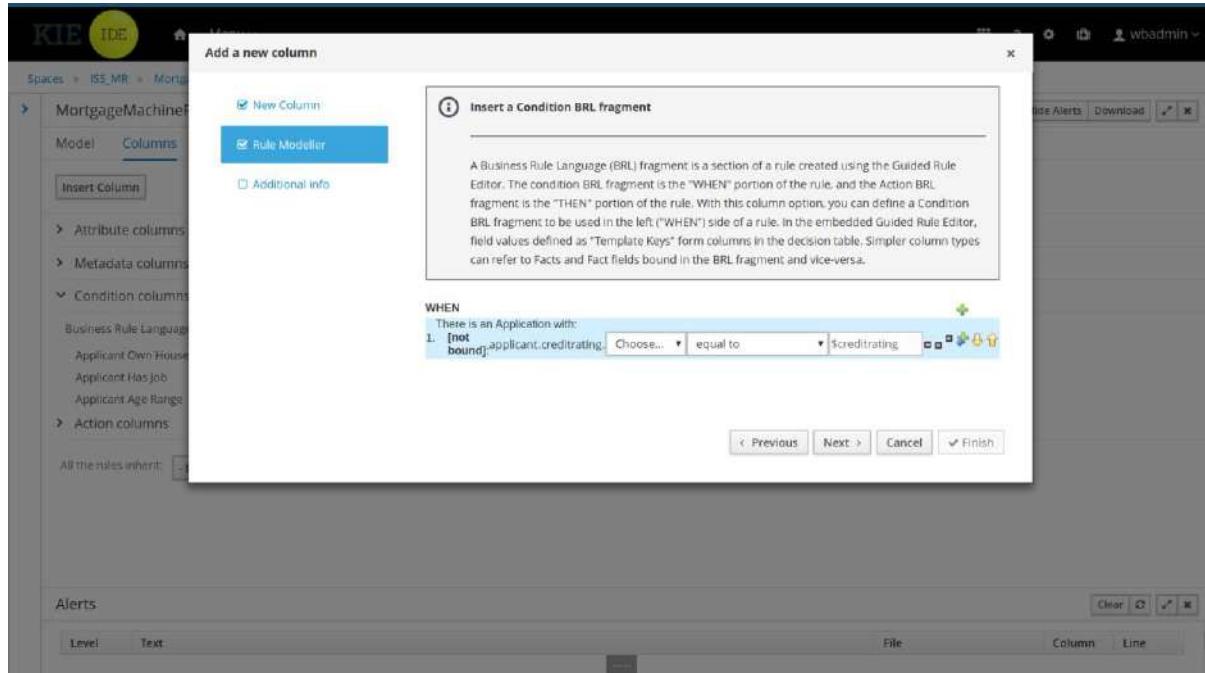


17)[Optional] Add **Decision Table Condition columns** for *Applicant.age*; (WHEN part of Rule)
 Update filed (**Template key**) value to: **\$ageLess**

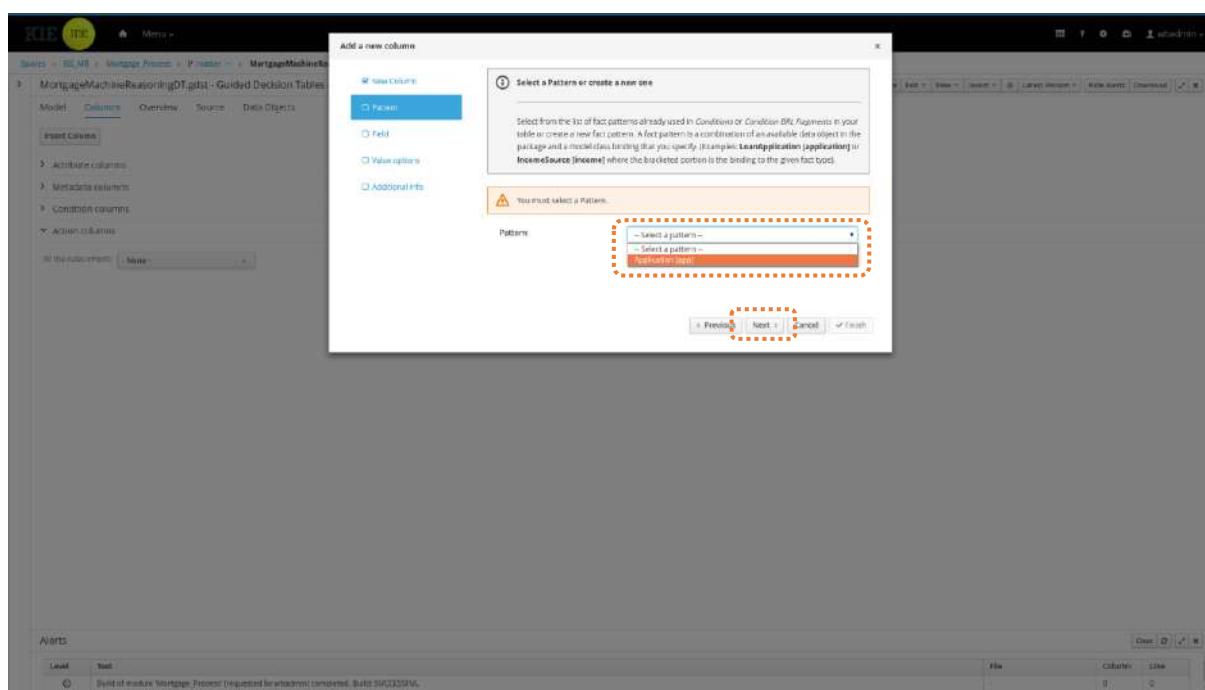
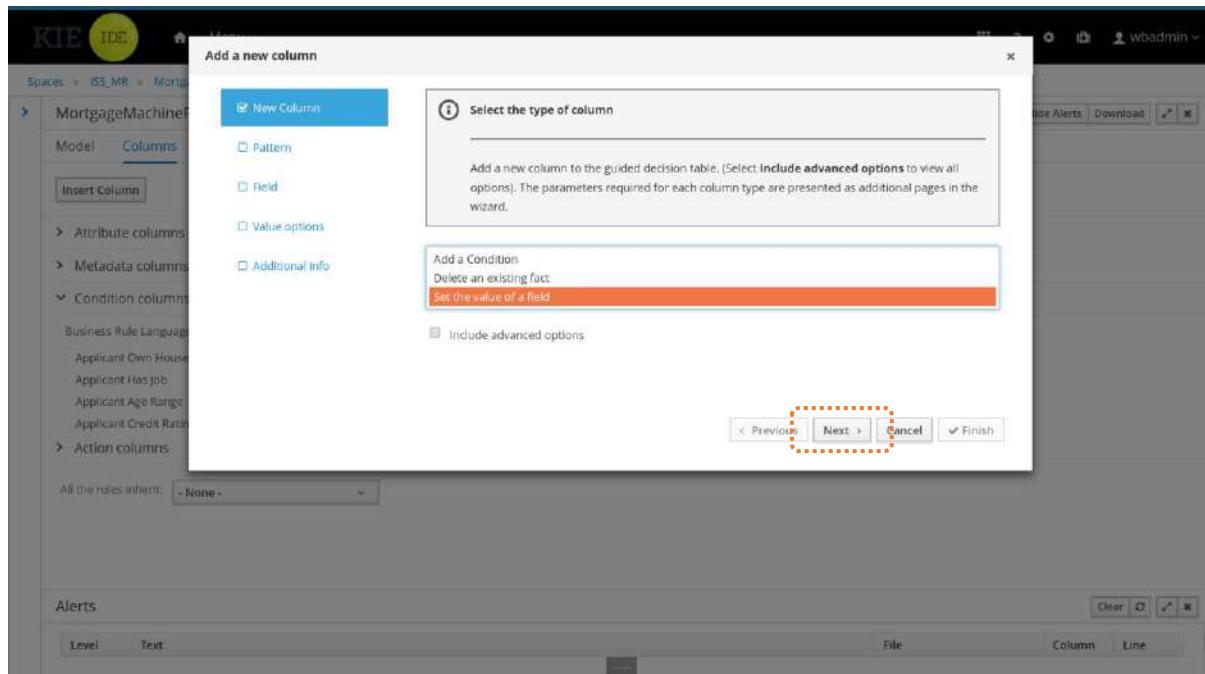
Update filed (**Template key**) value to: **\$ageGE**



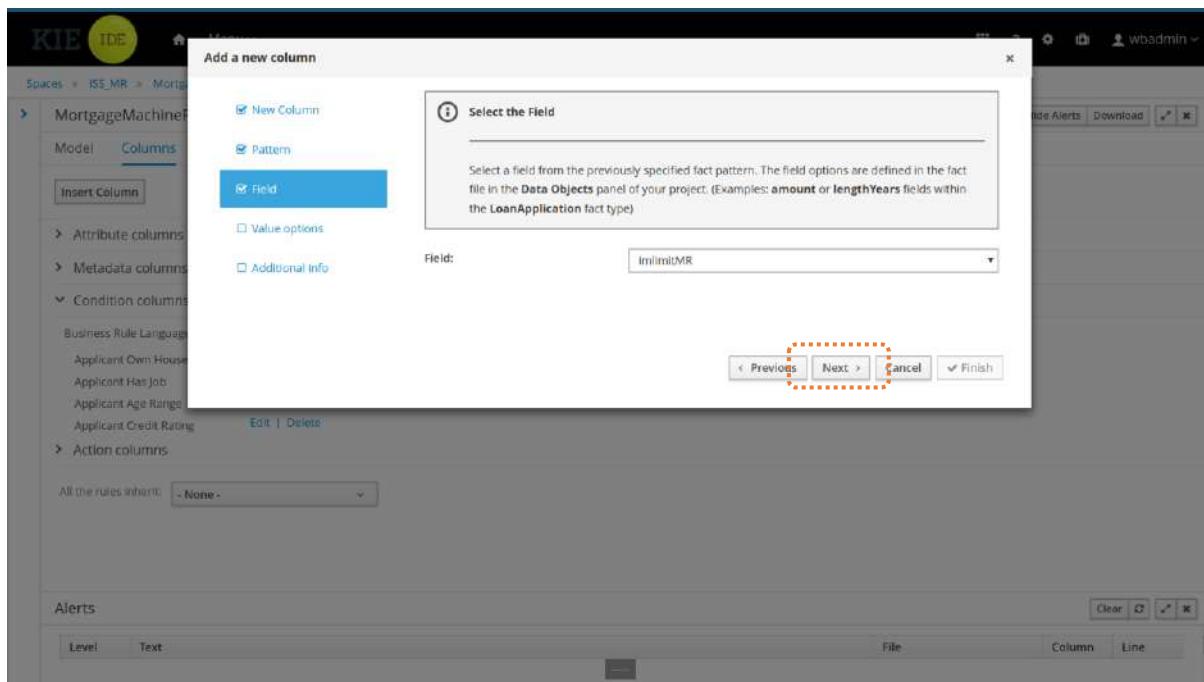
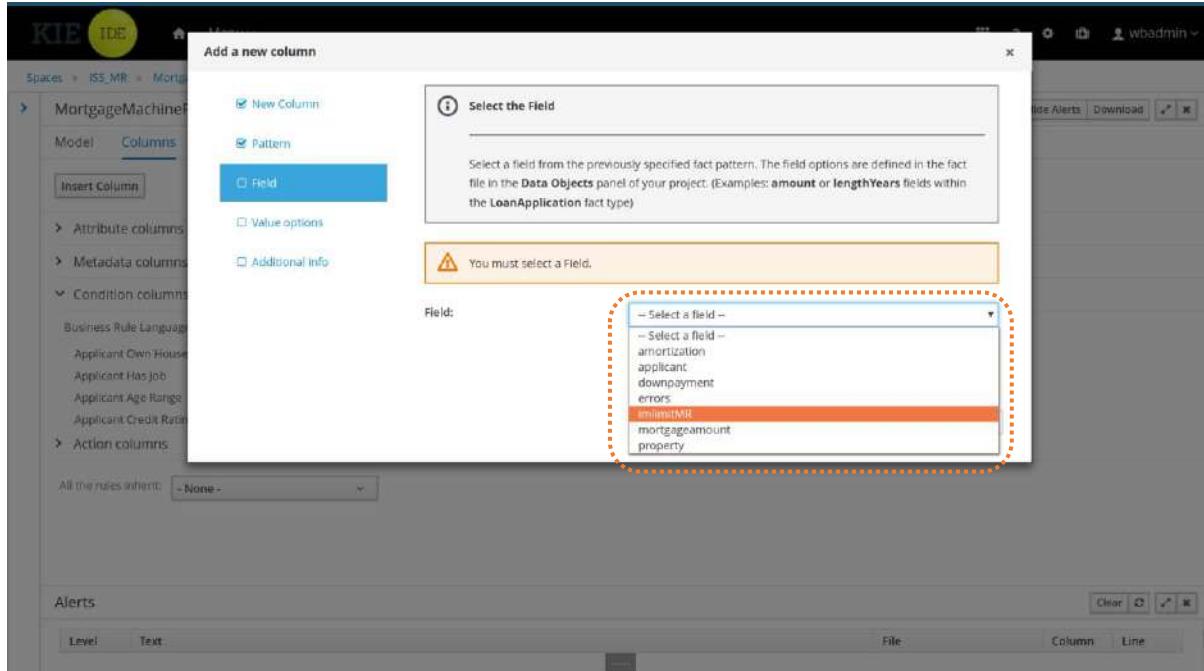
**18)[Optional] Add Decision Table Condition columns for
Applicant.creditrating; (WHEN part of Rule)
 Update filed (Template key) value to: **\$creditrating****

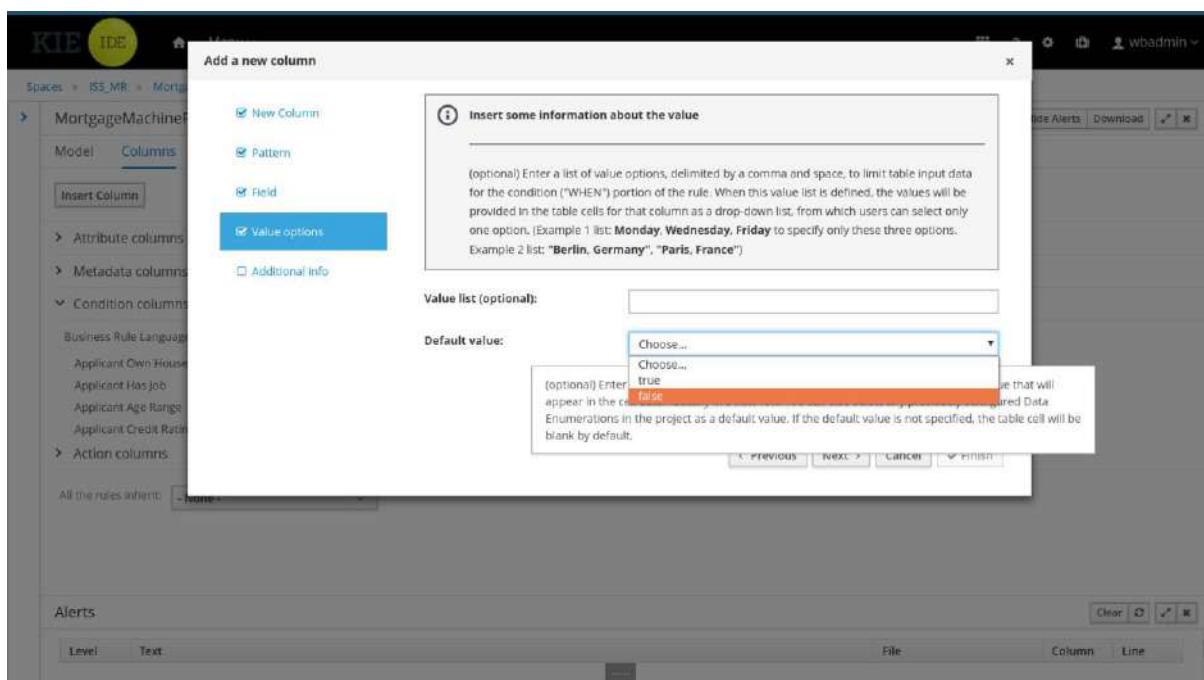
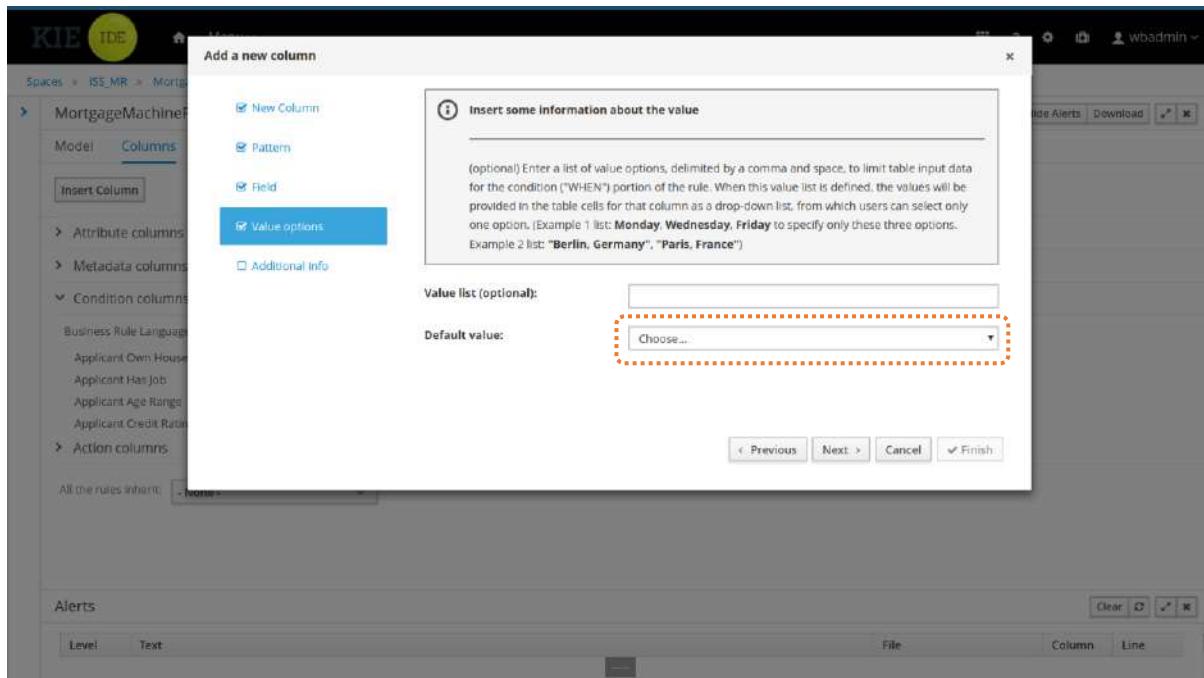


19) Set target decision value for ***Application.inlimitMR***; (THEN part of Rule)

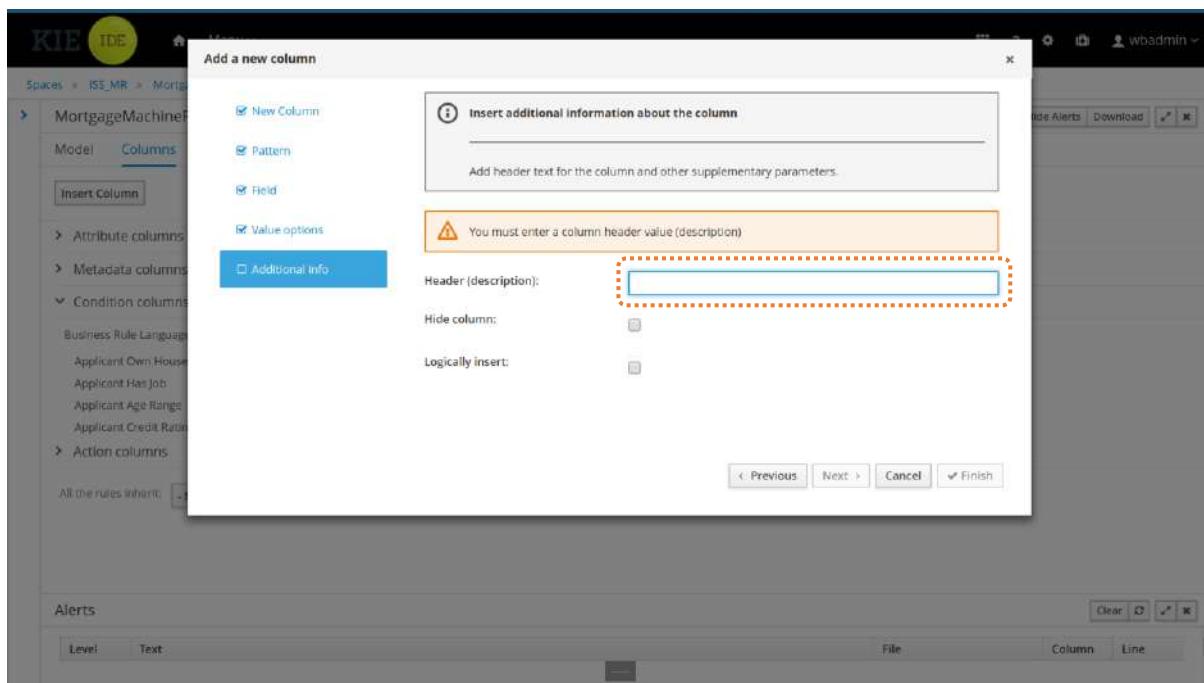
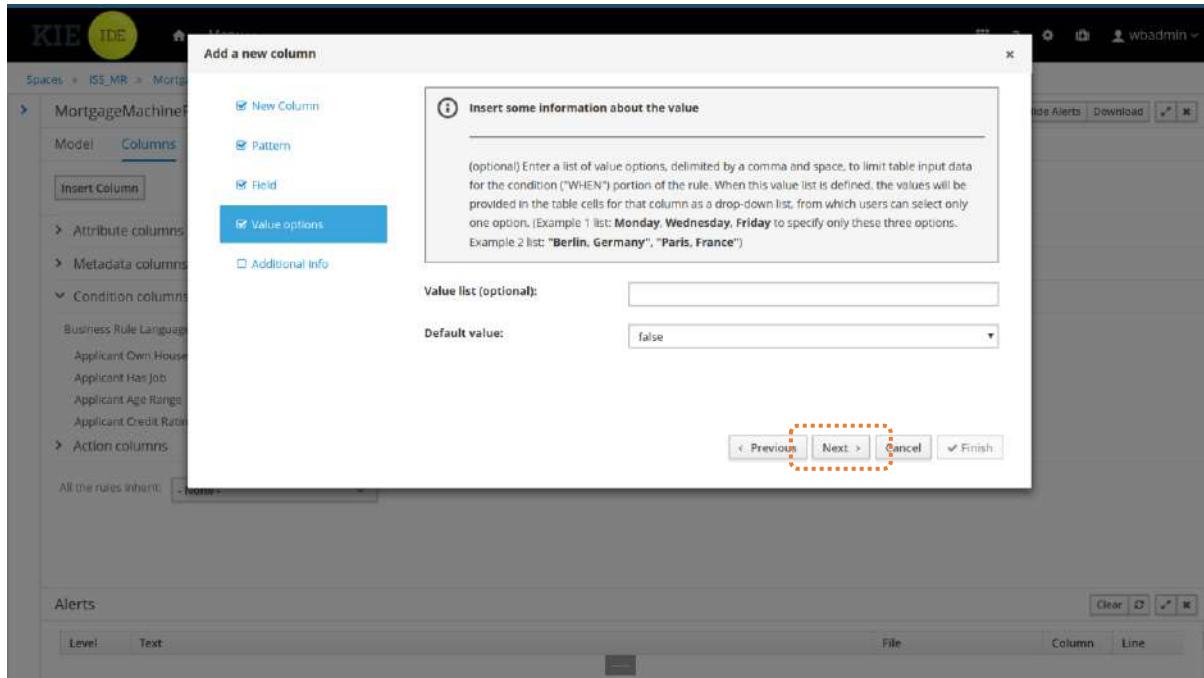


Select: ***inlimitMR***





Select default value: **false**



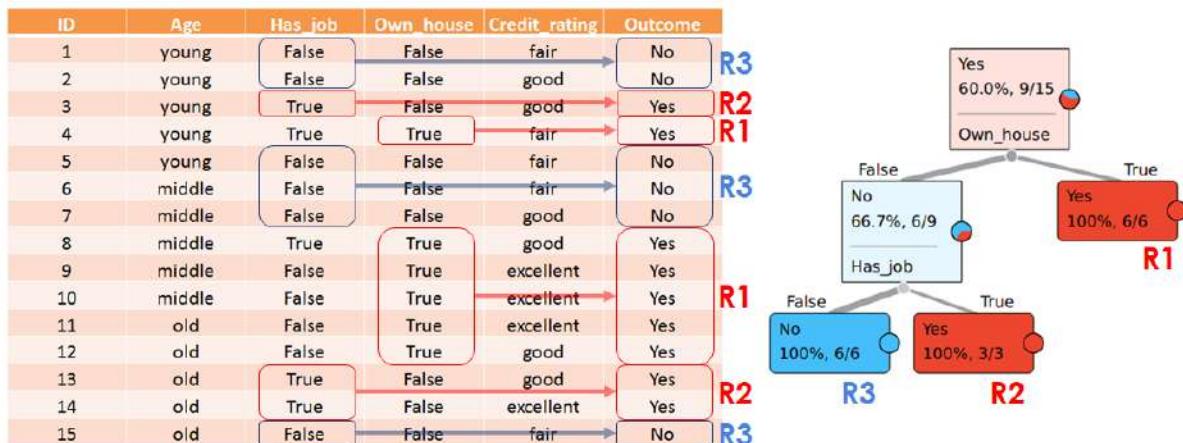
Key in Header (description): Approval In Limit

The screenshot shows the KIE IDE interface with the following details:

- Header:** KIE IDE, Menu, Spaces > ISS_MR > Mortgage_Process > master > MortgageMachineReasoningDT.
- Toolbar:** Save, Delete, Rename, Copy, Validate, Edit, View, Insert, Latest Version, Hide Alerts, Download.
- Submenu:** Model, Columns, Overview, Source, Data Objects. The Model tab is selected.
- Table:** MortgageMachineReasoningDT. It has columns: #, Description, ruleflow-group, Applicant Own Hou, Applicant Has job, Applicant Age Range, Applicant Credit Ratification, and Approval In Limit. The ruleflow-group column contains values: \$ownHouse, \$hasJob, \$ageLess, \$ageGE, \$crediting, and \$ApprovalInLimit.
- Context Menu:** Opened over the table, showing options: Append row, Insert row above, Insert row below, and Insert column.
- Alerts:** A table showing build logs:

| Level | Text | File | Column | Line |
|-------|---|------|--------|------|
| INFO | Build of module "Mortgage_Process" from master by wbadmin completed. Build: SUCCESSFUL. | - | 0 | 0 |

20) Update decision table based on discovered decision tree's rules;

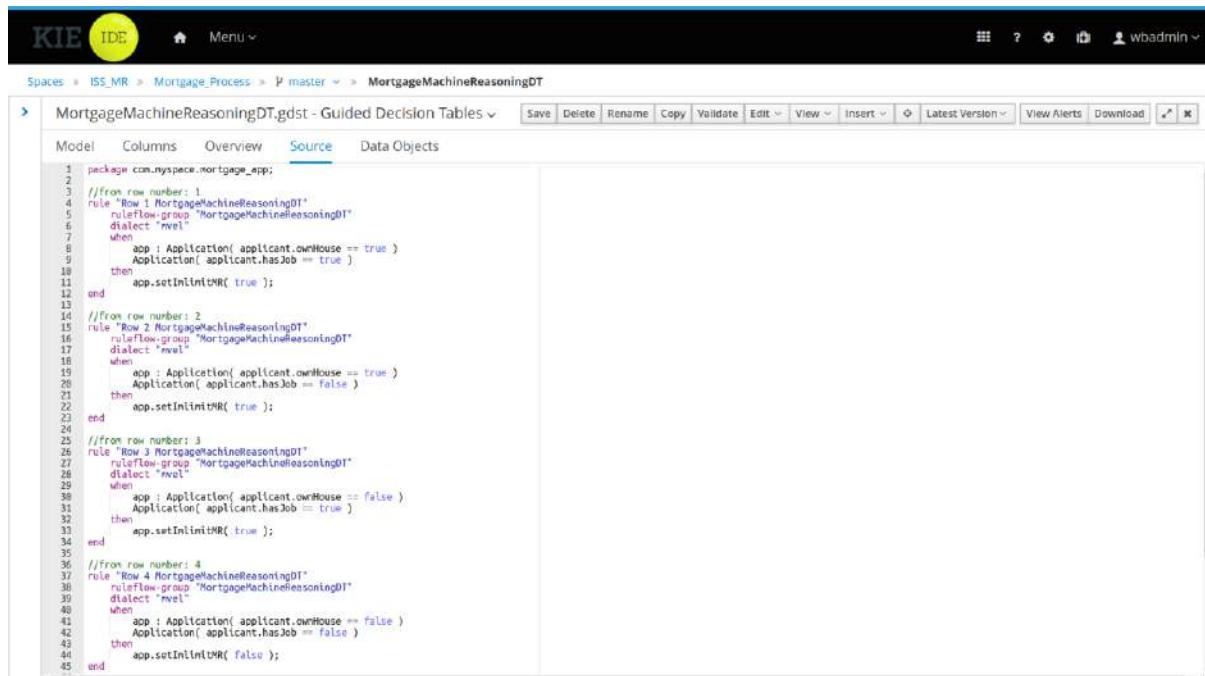


| # | Description | ruleflow-group | Applicant Own House | Applicant Has job | Applicant Age Range | Applicant Credit Rating | application : Application |
|---|----------------------------|-------------------------------------|-------------------------------------|-------------------------------------|---------------------|-------------------------|--|
| 1 | MortgageMachineReasoningDT | \$ownHouse | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | | <input checked="" type="checkbox"/> R1 |
| 2 | MortgageMachineReasoningDT | <input checked="" type="checkbox"/> | <input type="checkbox"/> | | | | <input checked="" type="checkbox"/> R1 |
| 3 | MortgageMachineReasoningDT | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | | | <input checked="" type="checkbox"/> R2 |
| 4 | MortgageMachineReasoningDT | <input type="checkbox"/> | <input type="checkbox"/> | | | | <input type="checkbox"/> R3 |

Alerts

| Level | Text | File | Column | Line |
|-------|--|------|--------|------|
| Info | Build of module 'Mortgage_Process' (requested by wbadmin) completed. Build: SUCCESSFUL | - | 0 | 0 |

21)[Optional] View rules in source code form;

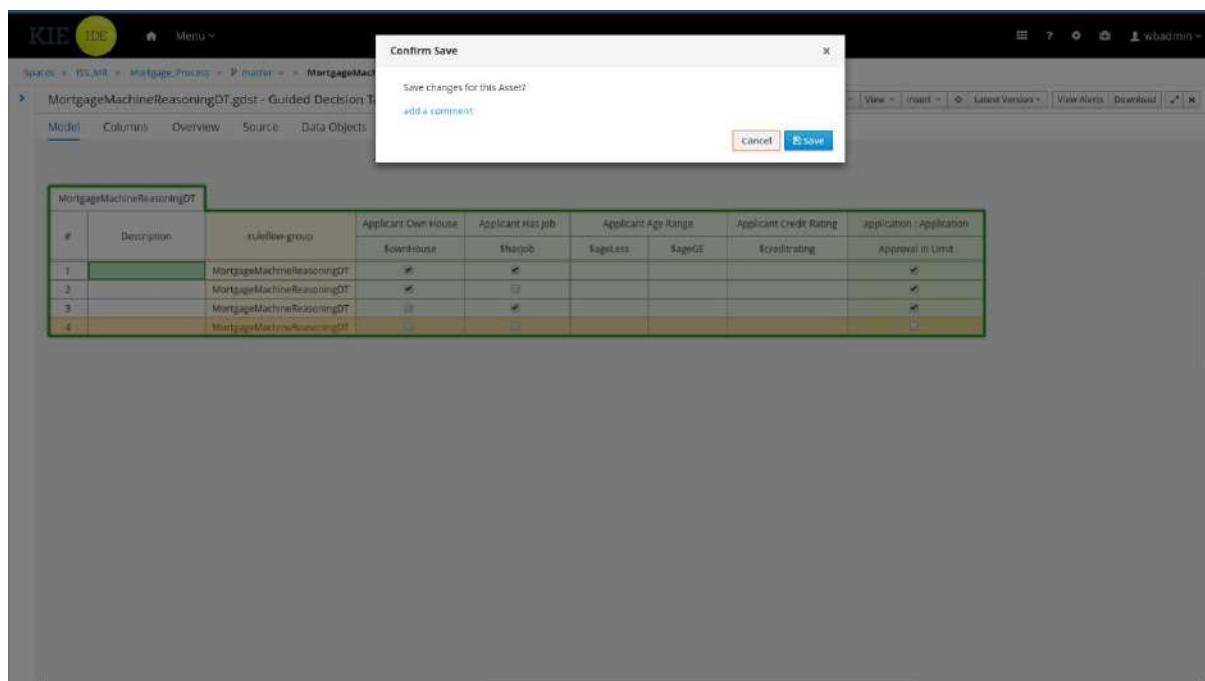


```

1 package com.nyspace.mortgage_app;
2
3 //From row number: 1
4 rule "Row 1 MortgageMachineReasoningDT"
5   ruleflow-group "MortgageMachineReasoningDT"
6   dialect "nfv1"
7   when
8     app : Application( applicant.ownHouse == true )
9     Application( applicant.hasJob == true );
10    then
11      app.setInLimitMR( true );
12    end
13
14 //From row number: 2
15 rule "Row 2 MortgageMachineReasoningDT"
16   ruleflow-group "MortgageMachineReasoningDT"
17   dialect "nfv1"
18   when
19     app : Application( applicant.ownHouse == true )
20     Application( applicant.hasJob == false );
21    then
22      app.setInLimitMR( true );
23    end
24
25 //From row number: 3
26 rule "Row 3 MortgageMachineReasoningDT"
27   ruleflow-group "MortgageMachineReasoningDT"
28   dialect "nfv1"
29   when
30     app : Application( applicant.ownHouse == false )
31     Application( applicant.hasJob == true );
32    then
33      app.setInLimitMR( true );
34    end
35
36 //From row number: 4
37 rule "Row 4 MortgageMachineReasoningDT"
38   ruleflow-group "MortgageMachineReasoningDT"
39   dialect "nfv1"
40   when
41     app : Application( applicant.ownHouse == false )
42     Application( applicant.hasJob == false );
43    then
44      app.setInLimitMR( false );
45  end

```

22)Save changes;

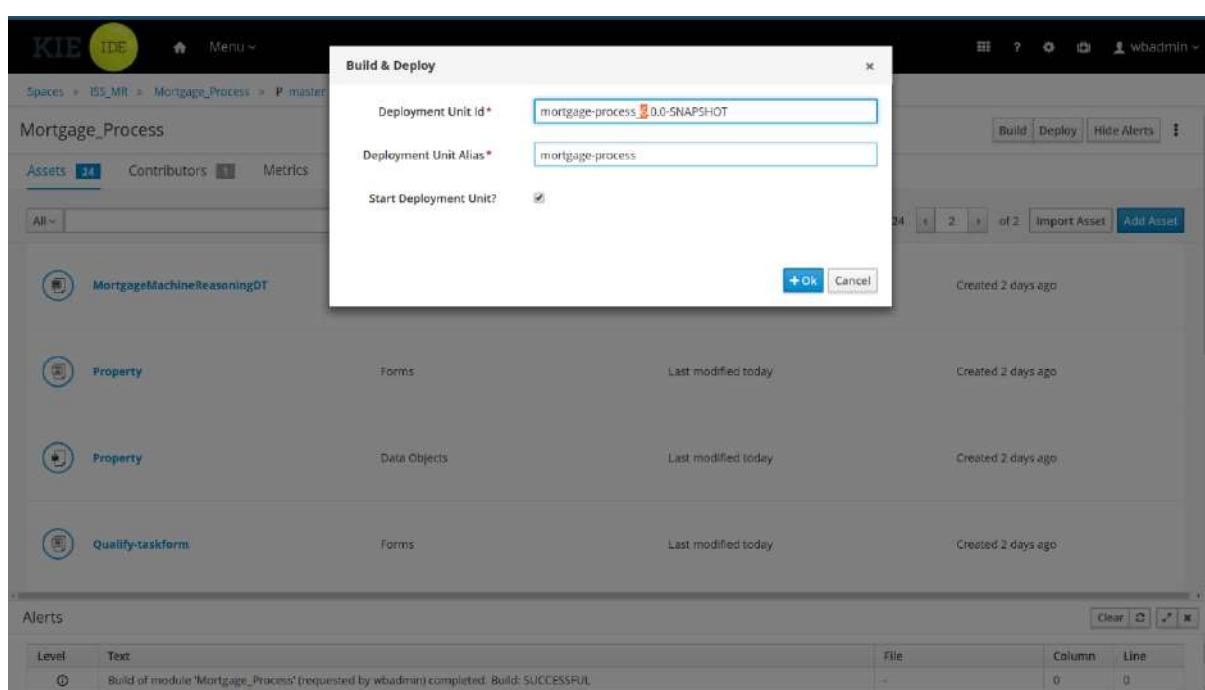


| # | Description | ruleflow-group | Applicant Own House | Applicant Has Job | Applicant Age Range | Applicant Credit Rating | application : Application |
|---|----------------------------|----------------|-------------------------------------|-------------------------------------|---------------------|-------------------------|-------------------------------------|
| 1 | MortgageMachineReasoningDT | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Sageless | SageWE | <input checked="" type="checkbox"/> |
| 2 | MortgageMachineReasoningDT | | <input checked="" type="checkbox"/> | <input type="checkbox"/> | | | <input checked="" type="checkbox"/> |
| 3 | MortgageMachineReasoningDT | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | | <input checked="" type="checkbox"/> |
| 4 | MortgageMachineReasoningDT | | <input type="checkbox"/> | <input type="checkbox"/> | | | <input type="checkbox"/> |

3.2.2. Business system enhancement [Deploy] v6.0.0

{ Objective } Deploy enhanced mortgage application: Start a new mortgage application, fill in application form to trigger business process and **InLimitMR** decision automation.

- 1) Deploy enhanced system onto KIE web server: **mortgage-process_6.0.0-SNAPSHOT**



The screenshot shows the KIE IDE interface. On the left, the 'SERVER CONFIGURATIONS' panel is open, showing a list of deployment units. The 'mortgage-process_6.0.0-SNAPSHOT' unit is selected. In the center, the 'mortgage-process' group is displayed with its status as 'sample-server@localhost:8080'. Below it, the URL http://localhost:8080/kie-server/services/rest/server/containers/mortgage-process_6.0.0-SNAPSHOT and version v1.0.0-SNAPSHOT are shown.

- 2) Select the mortgage system with intended version, e.g., ***mortgage-process_6.0.0-SNAPSHOT***, then click: **Start**

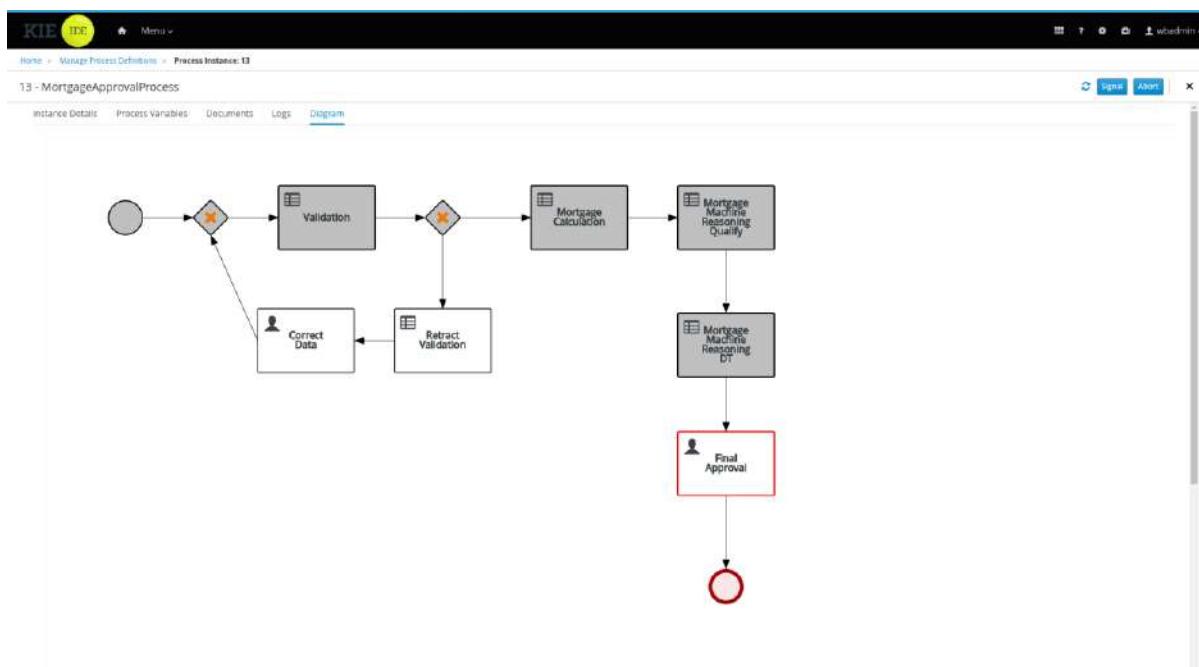
The screenshot shows the 'Manage Process Definitions' page. A context menu is open over the third row, which corresponds to the 'mortgage-process_6.0.0-SNAPSHOT' deployment. The menu items are 'Start' and 'View Process Instances'.

| Name | Version | Deployment | Actions |
|-------------------------|---------|---------------------------------|---------|
| MortgageApprovalProcess | 1.0 | mortgage-process_5.0.0-SNAPSHOT | ⋮ |
| MortgageApprovalProcess | 1.0 | mortgage-process_1.0.0-SNAPSHOT | ⋮ |
| MortgageApprovalProcess | 1.0 | mortgage-process_6.0.0-SNAPSHOT | ⋮ |
| MortgageApprovalProcess | 1.0 | mortgage-process_2.0.0-SNAPSHOT | ⋮ |
| MortgageApprovalProcess | 1.0 | mortgage-process_4.0.0-SNAPSHOT | ⋮ |
| MortgageApprovalProcess | 1.0 | mortgage-process_3.0.0-SNAPSHOT | ⋮ |

- 3) To validate the new business rules in [Decision Table], fill in the mortgage application form as shown in below **three** scenarios;

Use/Test Case 1: Applicant has job, but not owning a house.

The screenshot shows the 'MortgageApprovalProcess' application form. The 'Has job*' checkbox is checked, and the 'Own House*' checkbox is unchecked. Other fields include Name (Sam GL), Age (21), Credit Rating (123456), Annual Income (123456), SSN (123), and Property details (Age of property: 1, Address of property: 23 Raffles, Locale: Urban, Sale Price: 250000).



The screenshot shows a software interface for 'Task 14' titled '14 - Final Approval'. The 'Work' tab is selected. The form contains several input fields grouped under sections: 'Application' (Mortgage amount: \$200000, Down Payment: \$5000), 'Applicant' (Name: Sam QW, Age: 35, Annual Income: \$20000, SSN: 123456), and 'Property' (Age of property: 10 years, Address of property: 123 Main St, State: Florida, Sale Price: \$250000). A checkbox labeled 'inlimit Machine Reasoning' is located in the 'Applicant' section, which is highlighted with a red dashed box. Other checkboxes include 'Has job?' and 'Own House?'. At the bottom right of the form is a blue 'Save' button.

{ Tips }

1st stage Approved: \$200,000 Mortgage Amount: within limit ***mortgage amount 200,000 >= property sale price 250,000 – down payment 50,000***

2nd stage Approved: ***inlimitMR*** checked: applicant has job

Use/Test Case 2: Applicant is jobless, but owning a house.

MortgageApprovalProcess

Application

Down Payment: 50000 Years of amortization: 20

Applicant

Name: Sam GII case 2 Age: 21 Credit Rating: 123456

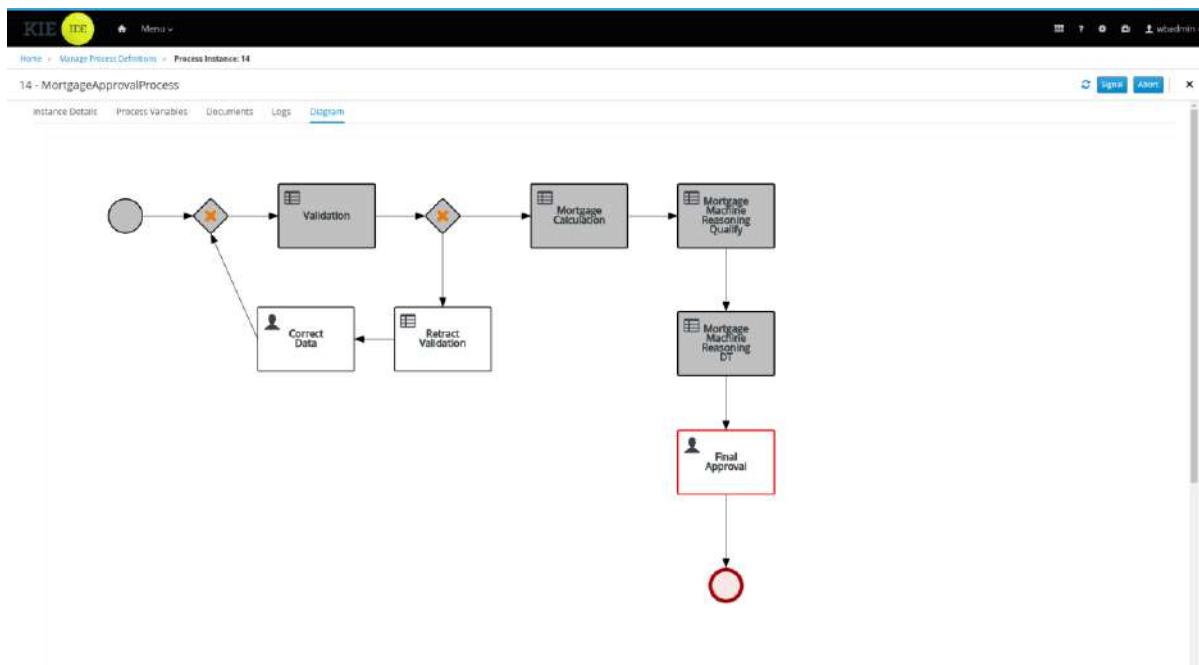
Has job* Own House*

Annual Income: 123456 SSN: 4321

Property

Age of property: 3 Address of property: 123 Main Locale: Urban Sale Price: 200000

Submit



KIE TS

Home > Task Queue > Task 15

15 - Final Approval

Work Details Assignments Comments Admin Logs

Inputs:

Application

Mortgage amount: inlimitMR

Down Payment: Years of amortization:

Applicant

Name: Own House*

Age: Credit Rating: Has job*

Annual income: Own House*

SSN:

Property

Age of property: Address of property: Sale Price:

Jobless inlimitMR

Save

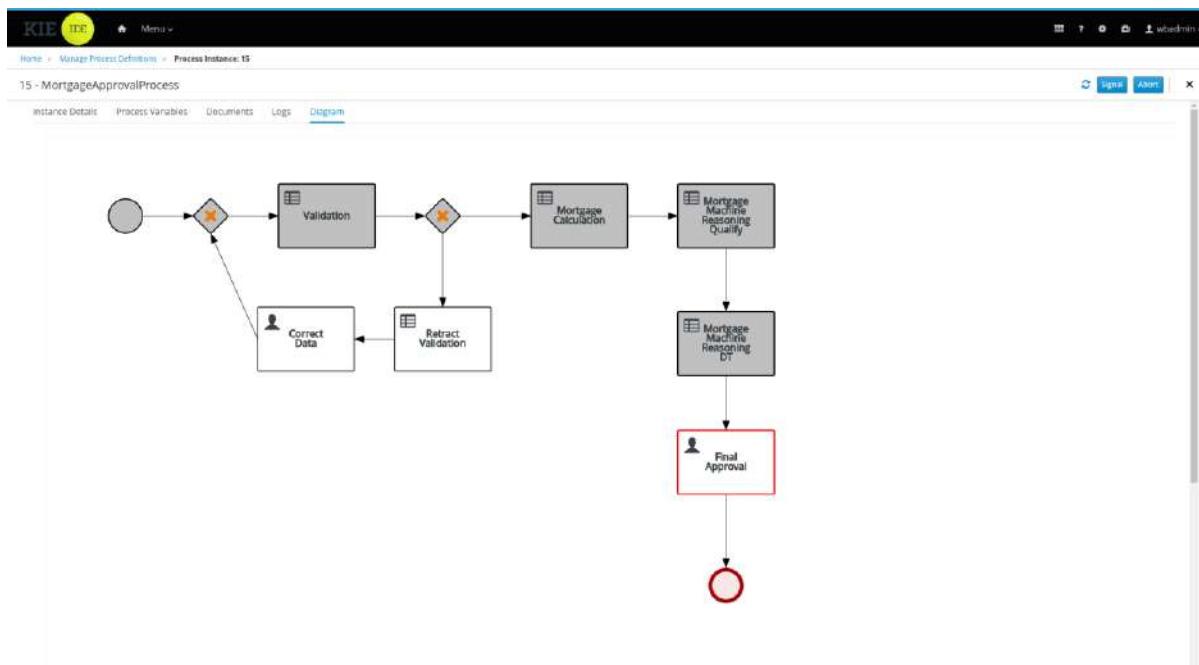
{ Tips }

1st stage Approved: \$200,000 Mortgage Amount: within limit **mortgage amount $\geq 200,000$** **\geq property sale price $250,000 - \text{down payment } 50,000$**

2nd stage Approved: **inlimitMR** checked: jobless applicant owning a house

Use/Test Case 3: Applicant has neither a job, nor a house.

The screenshot shows the KIE IDE interface with the 'MortgageApprovalProcess' form open. The 'Applicant' section contains fields for Name, Age, Credit Rating, Annual Income, SSN, and SSN. The 'Property' section contains fields for Age of property, Address of property, Locale, and Sale Price. Two specific fields, 'Has Job*' and 'Own House*', are highlighted with a red dashed box. A 'Submit' button is visible at the bottom right of the form.



KIE TS

Home > Task Queue > Task 16

16 - Final Approval

Work Details Assignments Comments Admin Logs

Inputs:

Application

Mortgage amount: \$200000

Down Payment: \$50000

Applicant

Name: Sam QU class 8

Age: 25

Credit Rating: 6

Has job?

Own House?

Annual Income: \$25000

GDI: \$10000

Property

Address of property: 25-1888

State: Unknown

Sob Price: \$00000

Inlimit

{ Tips }

1st stage Approved: \$200,000 Mortgage Amount: within limit **mortgage amount $\geq 200,000$** **\geq property sale price 250,000 – down payment 50,000**

2nd stage Disapproved: **inlimitMR** unchecked: jobless applicant not owning a house

😊 Congratulations!

You have completed today's challenging workshop!

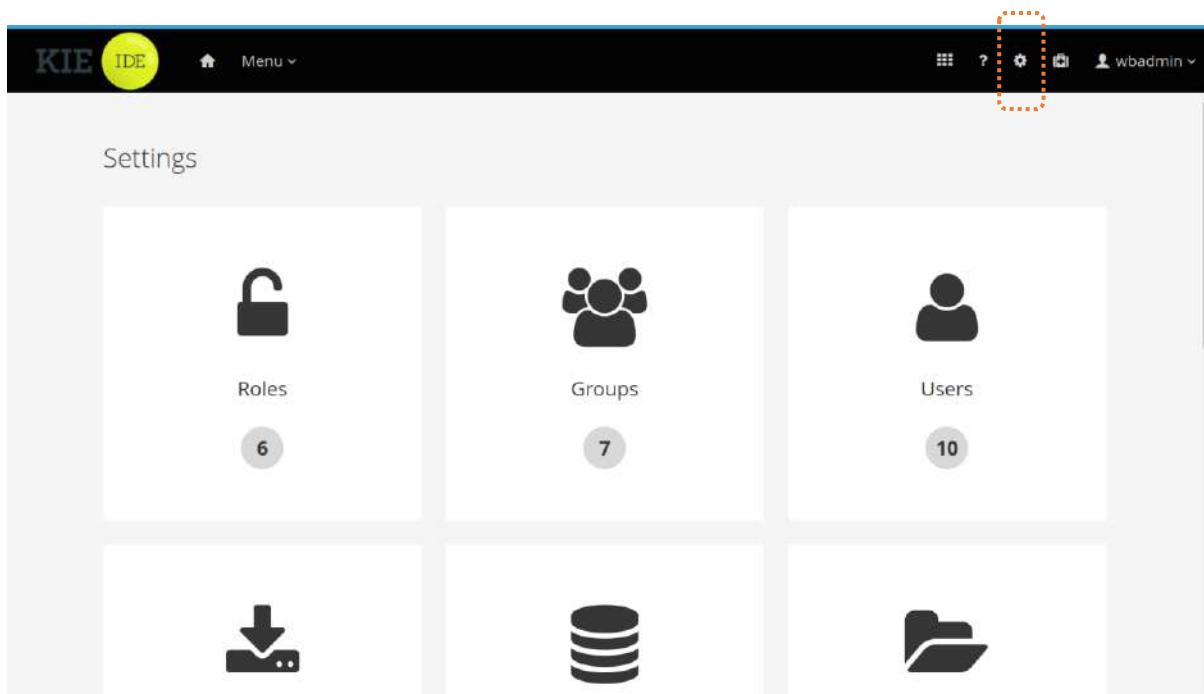
4. Workshop 4 – Minimum Viable Product (MVP)

{ Objective } Enhance and deliver bespoke mortgage application system as MVP.

- Define/Control user access for mortgage application system
- Prepare project report, e.g. Knowledge models; Use/Test cases
- Submit project deliverables. Refer to [Project Submission Template](#)
- [MTech Thru-Train group project] Prepare user guide
- [MTech Thru-Train group project] Prepare system demo & video presentation
- [MTech Thru-Train group project] Candidate Project: HDB BTO; Airport Gate Assignment System (AGAS); DoReMi; Or other relevant business domain;

4.1. KIE BPMS/BRMS Business System Enhancement

4.1.1. Access control [User/Group/Role]



Role controls user's access to KIE product suite (Workbench roles);

Group controls user's access to bespoke business system developed by KIE Workbench/product suit (Task roles);

New user creation procedure:

- Step 1 Create all new users, and assign them relevant **Roles** (No new **Group** is ready).
- Step 2 Create new **Group**, and link created new users.

Intended user access levels:

| | | |
|----------------------------------|---|------------------------|
| Business system developer | : | iss-admin |
| Business system user (requester) | : | iss-sam |
| Business system user (approver) | : | iss-barry |
| Business system user (manager) | : | iss-mk, iss-hy, iss-cm |

Use admin user: **wbadmin** to create new users and control access, based on below table:

| Default User Names | Password | Role (Workbench roles) | Group (Task roles) |
|--------------------|-------------|-------------------------------------|--|
| maciek | maciek | admin, analyst, user | HR, kie-server, PM |
| jack | jack | analyst | IT, kie-server |
| wbadmin | wbadmin | process-admin, admin, analyst, user | kie-server |
| john | john | analyst | Accounting, kie-server, PM |
| katy | katy | analyst | HR, kie-server |
| kie-server | kie-server1 | | kie-server |
| krisv | krisv | process-admin, admin, analyst, user | kie-server |
| mary | mary | analyst | HR, kie-server |
| salaboy | salaboy | admin, analyst | Accounting, rest-all, HR, IT, kie-server |
| sales-rep | sales-rep | analyst | kie-server, sales |
| | | | |
| Add-on User Names | Password | Role (Workbench roles) | Group (Task roles) |
| sales-rep | sales-rep | analyst | iss-group-requester, kie-server, sales |
| iss-sam | iss-sam | analyst | iss-group-requester, kie-server |
| iss-barry | iss-barry | analyst, user | iss-group-approver, kie-server |
| iss-mk | iss-mk | users, manager | iss-group-manager, kie-server |
| iss-hy | iss-hy | users, manager | iss-group-manager, kie-server |
| iss-cm | iss-cm | users, manager | iss-group-manager, kie-server |
| iss-admin | iss-admin | process-admin, admin, analyst, user | iss-group-manager, kie-server |

1) [Step 1] Select **Users; New user;**

The screenshot shows the KIE IDE Security management interface. On the left, there is a sidebar with 'Admin > Security' and tabs for 'Roles', 'Groups', and 'Users'. The 'Users' tab is selected. Below it, a list of users is shown: maciek, jack, wbadmin, john, katy, kieserver, krisy, mary, salaboy, and sales-rep. A 'New user' button is located at the top right of this list, with a red box highlighting it. The main panel on the right is titled 'Security management' and features a large lock icon. Below the lock, the title 'Security Management' is displayed, followed by the subtitle 'Control who can access the different features and resources available'.

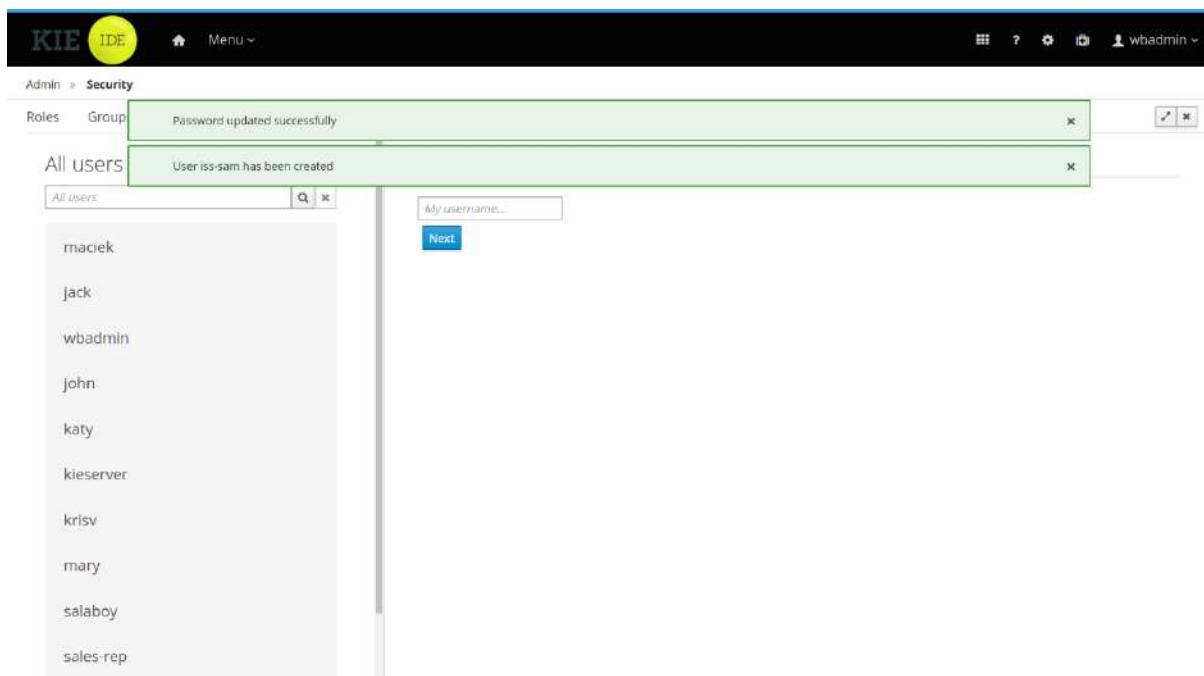
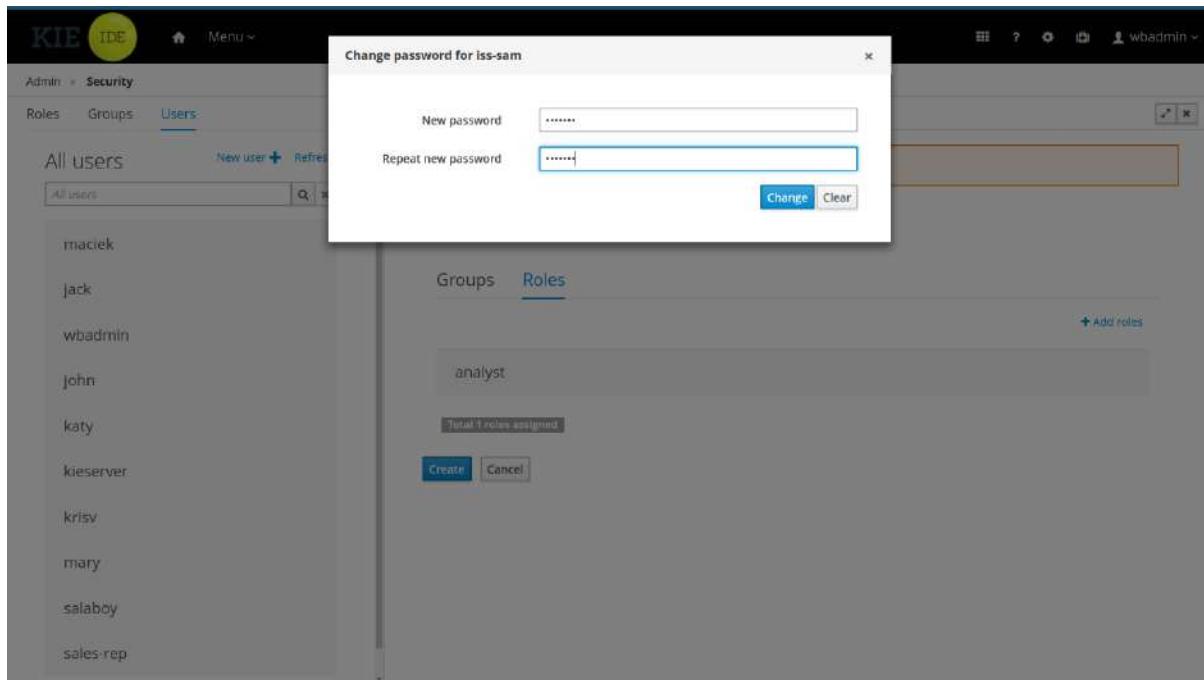
The screenshot shows the 'Create new user' wizard. The first step, 'Please introduce the user name', is displayed. In the input field, the text 'ss-sam' is entered. Below the input field is a 'Next' button. The background shows the same 'Security management' interface as the previous screenshot, with the 'All users' list visible on the left.

The screenshot shows the KIE IDE Security interface. On the left, a sidebar lists users: maciek, jack, wbadmin, john, katy, kieserver, krisv, mary, salaboy, and sales-rep. The main panel is titled 'Create new user' and shows 'iss-sam' has been entered. A warning message states: 'No assignments present, the user could be not able to log into the application'. Below this, there are tabs for 'Groups' and 'Roles'. The 'Groups' tab is selected, showing a message: 'There are no entities'. The 'Roles' tab is also present. At the bottom are 'Create' and 'Cancel' buttons.

The screenshot shows the KIE IDE Security interface with the role selection dialog open for user 'iss-sam'. The dialog title is 'Role selection for iss-sam'. It lists 'All roles' with checkboxes next to them. The roles listed are: process-admin, manager, admin, analyst (which is checked), developer, and user. A message at the bottom of the list says 'Total 6 roles'. At the bottom of the dialog are 'Add to selected roles' and 'Cancel' buttons. The background shows the same user list as the previous screenshot.

The screenshot shows the KIE IDE Security interface. On the left, a sidebar lists users: maciek, jack, wbaadmin, john, katy, kieserver, krisv, mary, salaboy, and sales-rep. The main panel is titled 'Create new user' and shows a warning message: 'User iss-sam has been modified. Please save your changes to apply them.' It displays the username 'iss-sam' and tabs for 'Groups' and 'Roles'. Under 'Groups', there is one entry: 'analyst'. A button '+ Add roles' is visible. At the bottom are 'Create' and 'Cancel' buttons.

The screenshot shows the same KIE IDE Security interface as above. A modal dialog box titled 'Please confirm the action' is displayed in the center. The message inside says 'Do you want to set a password now?'. There are two buttons at the bottom: a blue 'Yes' button and a red 'No' button.



2) [Step 1] Repeat the above process to create the rest user accounts;

The screenshot shows the KIE IDE Security interface. On the left, there's a search results panel for users starting with 'iss'. A red dashed box highlights the search input field containing 'iss' and the resulting list of users: iss-barry, iss-mk, iss-hy, iss-cm, iss-admin, and iss-sam. Below this list is a button labeled 'Total 6 users'. On the right, a 'Create new user' form is displayed with a search bar containing 'My username...' and a 'Next' button.

3) [Step 2] Create new **Group**, and link created new users.

The screenshot shows the KIE IDE interface with the 'Security' tab selected. On the left, a list of existing groups is shown: Accounting, rest-all, HR, IT, kie-server, PM, and sales. A 'New group' button is visible. On the right, a 'Create new group' dialog is open, prompting for a group name. The input field contains 'My group...' and the 'Next' button is visible below it. Both the 'Groups' tab in the sidebar and the 'Create new group' dialog are highlighted with red dashed boxes.

The screenshot shows the KIE IDE interface with the 'Security' tab selected. On the left, a list of existing groups is shown: Accounting, rest-all, HR, IT, kie-server, PM, and sales. A 'New group' button is visible. On the right, a 'Create new group' dialog is open, prompting for a group name. The input field is empty and has a red border. An error message 'Esgroup-requested' is displayed above the input field. The 'Next' button is visible below the input field. Both the 'Groups' tab in the sidebar and the 'Create new group' dialog are highlighted with red dashed boxes.

The screenshot shows the KIE IDE Security interface. On the left, under 'All groups', there is a list of groups: Accounting, rest-all, HR, IT, kie-server, PM, and sales. A total of 7 groups are listed. On the right, a modal window titled 'Create new group' is open, showing a search results list for 'sa'. It includes 'salaboy' (unchecked), 'sales-rep' (checked), and 'iss-sam' (checked). Below the list, it says 'Total 3 users' and has buttons for 'Add selected users' and 'Cancel'.

The screenshot shows the KIE IDE Security interface. On the left, under 'Users', a search results list for 'iss' is shown, including iss-barry, iss-mk, iss-hy, iss-cm, iss-admin, and iss-sam. The 'iss-sam' entry is highlighted with a blue selection bar at the bottom. On the right, a modal window titled 'Showing user iss-sam' is open, displaying the user details for 'iss-sam'. It shows tabs for 'Groups' (selected), 'Roles', and 'Permissions'. Under the 'Groups' tab, it lists 'iss-group-requester' and 'Total 1 groups assigned!'. There is also an 'Edit' link next to 'iss-sam'.

The screenshot shows the KIE IDE Security interface. On the left, there's a search results panel for users containing 'iss'. On the right, the 'Editing user iss-sam' dialog is open. It shows the user 'iss-sam' with tabs for Groups, Roles, and Permissions. Under Groups, the 'iss-group-requester' group is assigned. A button '+ Add to groups' is highlighted with a red dashed box. Buttons for 'Save' and 'Cancel' are at the bottom.

This screenshot shows the 'Group selection for iss-sam' dialog. It lists all groups: Accounting, HR, IT, sales, iss-group-requester (selected), rest-all, kie-server, and PM. The 'Add to selected groups' button is highlighted with a red dashed box. The background shows the same KIE IDE Security interface as the previous screenshot.

The screenshot shows the KIE IDE Security interface. On the left, there's a sidebar with tabs for Admin, Roles, Groups, and Users. The Users tab is selected, showing a search results panel with a search bar containing 'iss' and a list of users: iss-barry, iss-mk, iss-hy, iss-cm, iss-admin, and iss-sam. A message at the bottom of this panel says 'Total 6 users'. On the right, a main panel titled 'Editing user iss-sam' shows the user details for 'iss-sam'. It has tabs for Groups, Roles, and Permissions, with Groups being the active tab. Under Groups, two groups are listed: 'iss-group-requester' and 'kie-server'. A message at the top of this panel says 'User iss-sam has been modified. Please save your changes to apply them.' At the bottom of the Groups section, there are 'Save' and 'Cancel' buttons, both of which are highlighted with red circles.

This screenshot shows the same KIE IDE Security interface after the user 'iss-sam' has been saved. The Groups tab is still active, showing the same group assignments. A green success message at the top of the main panel says 'User iss-sam has been saved'. The rest of the interface is identical to the previous screenshot, including the sidebar and the list of other users.

- 4) [Step 2] Repeat the above process to create the rest new groups, and link user accounts;

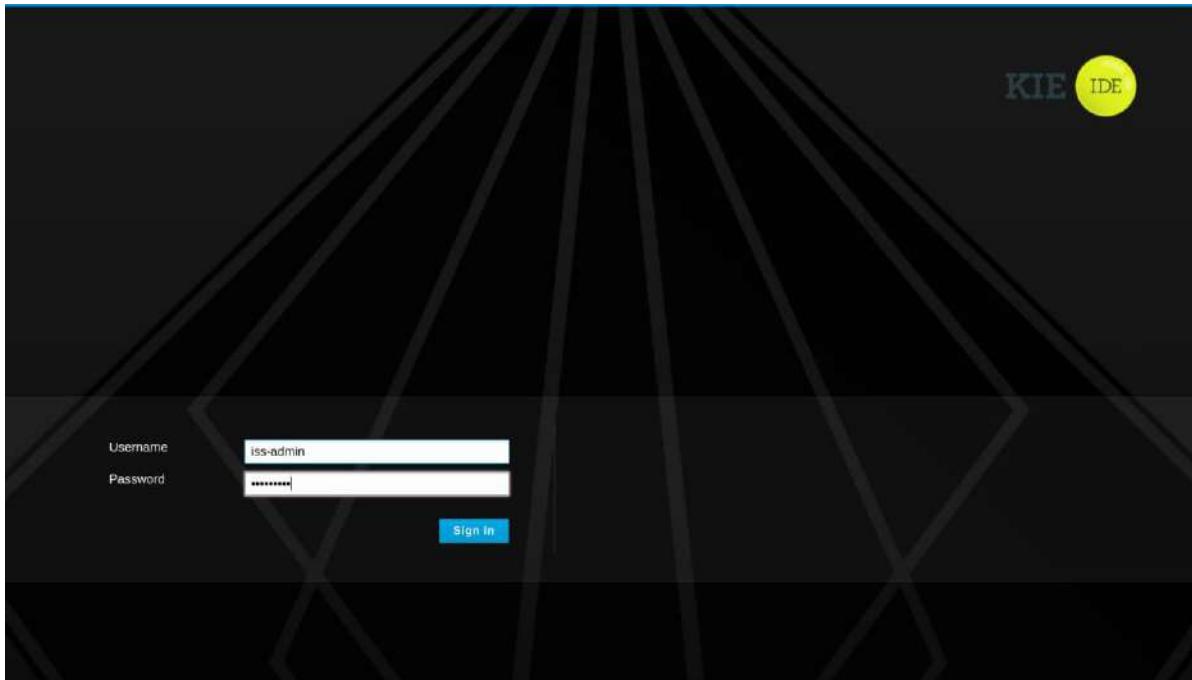
The screenshot shows the KIE IDE Security interface. On the left, there's a search results panel for groups, with a search bar containing 'iss' and a list of three groups: 'iss-group-manager', 'iss-group-requester', and 'iss-group-approver'. A red dotted box highlights this list. On the right, a 'Create new group' form is open, with a text input field containing 'bldy group...' and a 'Next' button below it.

The screenshot shows the KIE IDE Security interface. On the left, there's a search results panel for users, with a search bar containing 'iss-' and a list of six users: 'iss-barry', 'iss-mk', 'iss-hy', 'iss-cm', 'iss-admin', and 'iss-sam'. A red dotted box highlights this list. On the right, a 'Showing user iss-admin' details page is open. It shows the user 'iss-admin' with an 'Edit' link. Below it, under the 'Groups' tab, are two assigned groups: 'iss-group-manager' and 'kie-server'. A message at the bottom states 'Total 2 groups assigned'.

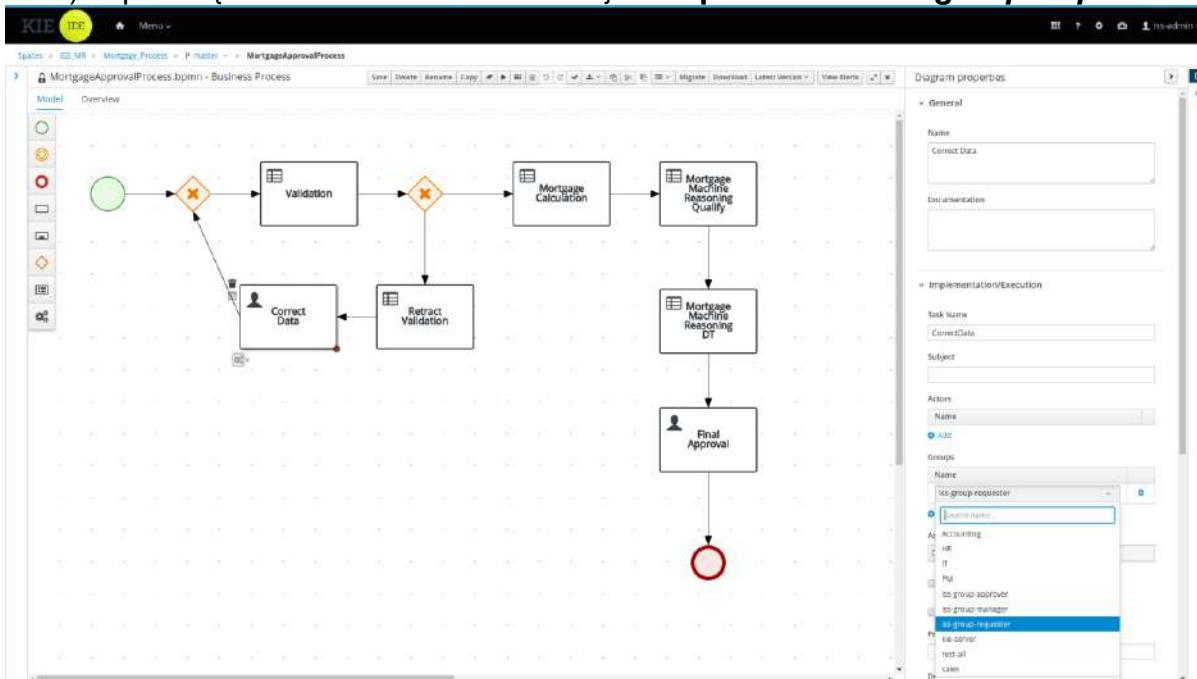
4.1.2. Business system enhancement [Group]

{ Objective } Assign different User Groups to perform different user tasks in Mortgage application process. (Access control)

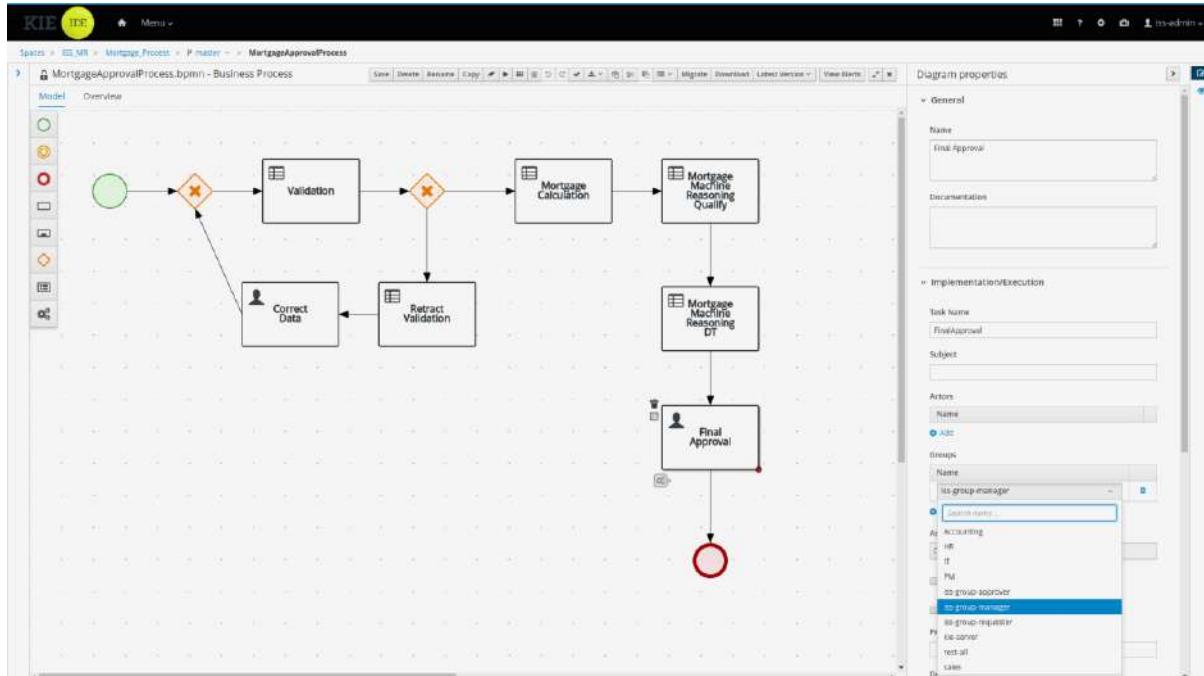
- 1) Re-login as Username : *iss-admin*
 Password : *iss-admin*



- 2) Update { User Task: Correct Data } Groups name to: *iss-group-requester*



3) Update { User Task: ***Final Approval*** } Groups name to: ***iss-group-manager***



{ Tips } Before decision automation, the **User Task: Qualify** was once performed manually by ***iss-group-approver***, who was ***iss-barry***.

Barry Adrian SHEPHERD

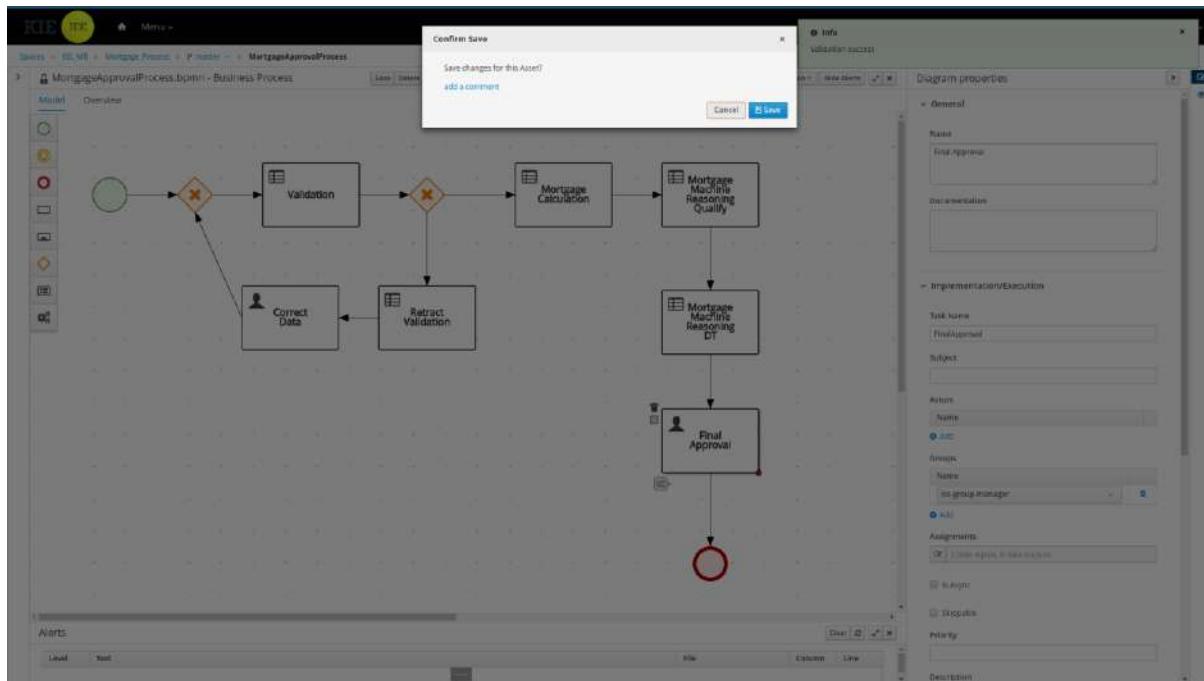


Chief, MTech Knowledge
Engineering Programme /
Chief, MTech Intelligent
Systems Programme

✉ issbas@nus.edu.sg

But since converting **User Task** to **Rule Task**, we have gotten rid of Barry, hence we now enabled Barry to focus on more value-added work.

4) **Save** the changes; Re-Deploy the system;

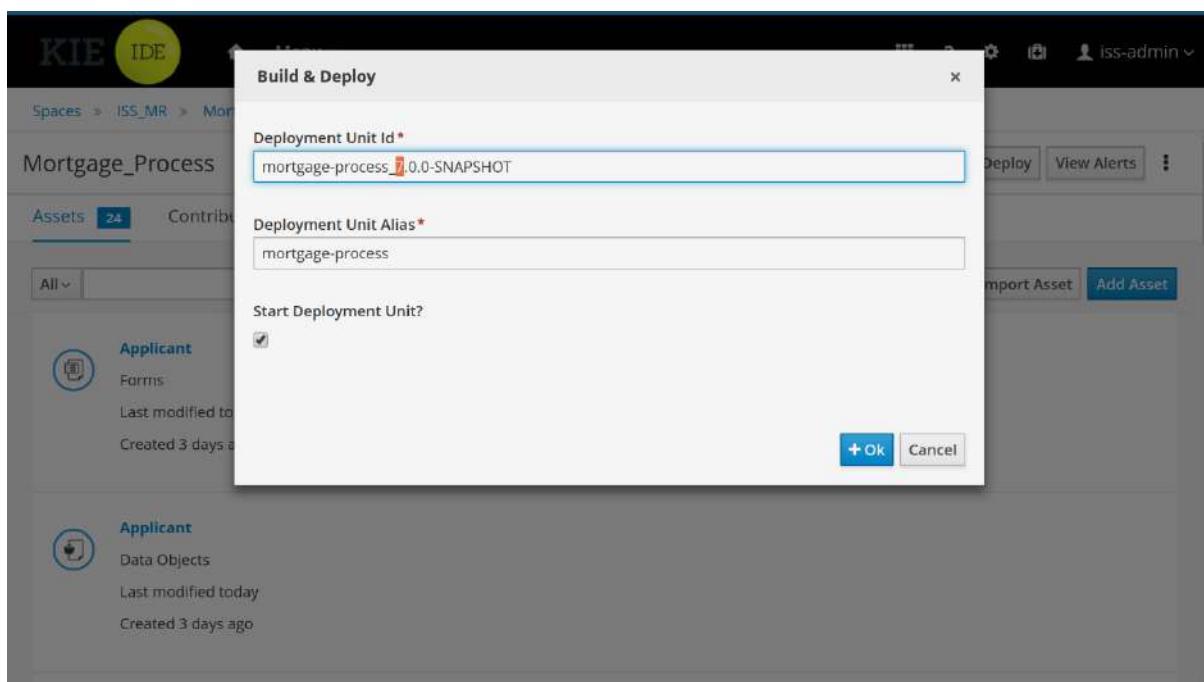


4.1.3. Business system enhancement [Deploy] v7.0.0

{ Objective } Deploy enhanced mortgage application: Start a new mortgage application, fill in application form to trigger business process; Note the visibility/access change in user's **Task Inbox**.

- 1) Use user: **iss-admin** to deploy enhanced system onto KIE web server:

mortgage-process_7.0.0-SNAPSHOT



2) Re-log in as user: **iss-sam**; Start process [case 1] below;

KIE IDE

Home > Manage Process Definitions > MortgageApprovalProcess

MortgageApprovalProcess

Form

Application

Loan Payment: 30000 Years of amortization: 20

Applicant

Name: Sam GU T.0 case 1

Age: 21 Credit Rating: Has job* Own House*

Annual Income: 123456

SSN: 23456

Property

Age of property: 5

Address of property: 23 HDBRT

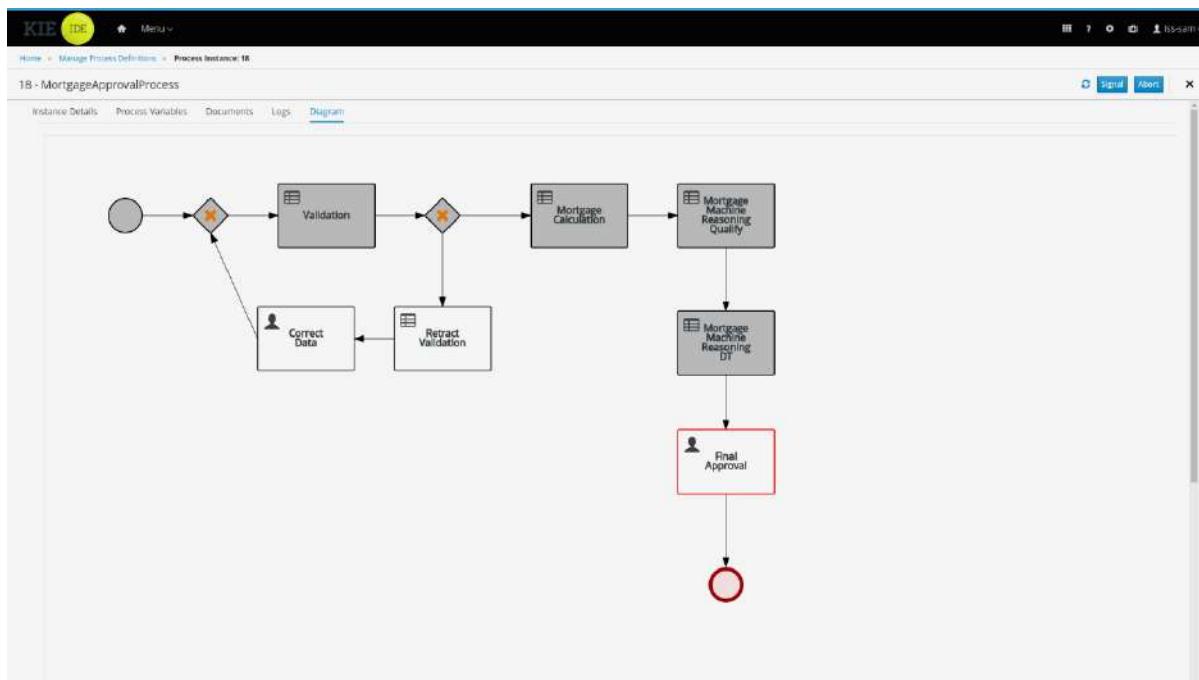
Locality: Urban

Sale Price: 250000

Submit

Actions

110 of over 10



A screenshot of the KIE IDE Task Inbox interface. The left sidebar contains a 'Filters' section with a tree view of status categories: Status (Completed, Created, Error, Failed, InProgress, Obsolete, Ready, Reopened, Suspended). Below it are 'Filter By' fields for Id, Process Definition Id, and Created On, each with dropdown menus and 'Apply' buttons. The main area is titled 'Task Inbox' and shows a table header with columns: Task, Process Definition Id, Status, Created On, and Actions. A message 'No tasks found.' is displayed below the table. At the top right, there are buttons for 'Save Filters' and 'Clear All'. The top bar includes the KIE IDE logo, a menu, and user information for 'iss-sam'.

{ Quiz } There is no task in **iss-sam's Task Inbox**. Why?

The reason is:

{ Quiz } Which user could see and claim the task: **Final Approval!**

The user is:

- 5) Re-log in as the user with right access; Complete the task of **Final Approval** for [case 1];

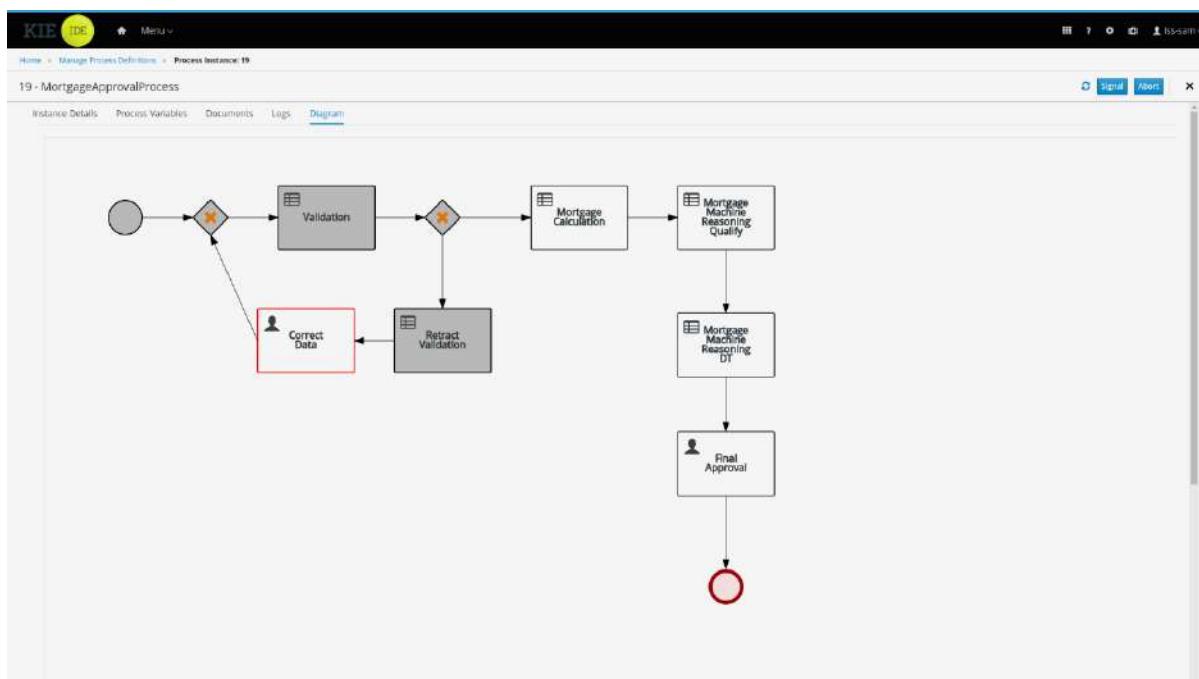
The screenshot shows the KIE Task Inbox interface. On the left, there is a sidebar with 'Filters' and 'Status' sections. The 'Status' section has several options like Completed, Created, Error, etc., with 'InProgress' and 'Ready' checked. Below it are 'Filter By' and 'Process Definition Id' fields. The main area is titled 'Task Inbox' and shows a table with one row for 'Final Approval'. The table columns are Task, Process Definition Id, Status, Created On, and Actions. The 'Actions' column for the first row contains a small icon.

| Task | Process Definition Id | Status | Created On | Actions |
|----------------|-----------------------|--------|----------------------|---------|
| Final Approval | Mortgage_Process.M... | Ready | 22-Feb-2019 19:11:08 | |

The screenshot shows the '19 - Final Approval' task form. It has sections for 'Application' (Mortgage amount: 220000, Down Payment: 50000), 'Applicant' (Name: Sam Ooi Tze Loon, DOB: 01/01/1980, NRIC: S123456789, Annual Income: 120000, SIN: 123456789), and 'Property' (Age of property: 10 years, Address of property: 123 Main St, Locality: Aljun, Sale Price: 220000). At the bottom, there are buttons for 'Initiat', 'Save', 'Release', and 'Complete'.

- 6) Re-log in as user: **iss-sam**; Start process [case 2] below; (Down Payment = \$0, which require data correction)

The screenshot shows the 'MortgageApprovalProcess' form in the KIE IDE. The 'Down Payment' field is set to 0. The 'Submit' button is visible at the bottom right.



{ Quiz } Which user could see and claim the task: **Correct Data?**

The user is:

- 7) Re-log in as the user with right access; Complete the task of **Correct Data** for [case 2];

The screenshot shows the KIE IDE interface with the title bar "KIE IDE". The main window is titled "Task Inbox". On the left, there is a sidebar with "Filters" expanded, showing various status options like Completed, Created, Error, Exited, Failed, InProgress, Obsolete, Ready, Reserved, and Suspended. Under "Filter By", there is an "Id" dropdown and a "Filter By Id..." input field with placeholder text "Filter By Id...". Below that is a "Process Definition Id" dropdown labeled "Select". The main area is titled "Task Inbox" and contains a table with one item:

| Task | Process Definition Id | Status | Created On | Actions |
|--------------|-----------------------|--------|----------------------|---------|
| Correct Data | Mortgage_Process.M... | Ready | 22-Feb-2019 19:21:13 | |

At the bottom of the table, it says "10 Items" and "1 of 1".

The screenshot shows the KIE IDE interface with the title bar "KIE IDE". The main window is titled "Task: 20" and "20 - Correct Data". The top navigation bar includes "Home", "Task Inbox", and "Task: 20". Below the title, there is a breadcrumb trail: "Home > Task Inbox > Task: 20". The main content area has tabs: "Work" (which is selected), "Details", "Assignments", "Comments", "Admin", and "Logs".

Outputs:
Application

Error details

Error and cause
Down payment cannot be 0, greater than, or equal to the property sale price.

Down Payment 0 **Years of amortization** 20

Applicant

Name Sam GU 7.0.0 case 2

Age 21 **Credit Rating** 0 Has Job* Own House*

Annual Income 123456

KIE IDE Home Menu > Task Inbox > Task: 20

20 - Correct Data

Work Details Assignments Comments Admin Logs

Outputs:
Application

Error details

Error and cause

Down payment cannot be 0, greater than, or equal to the property sale price.

| | |
|--------------|-----------------------|
| Down Payment | Years of amortization |
| 56789 | 20 |

Applicant

Name
Sam GU 7.0.0 case 2

Age Credit Rating Has Job* Own House*
21 0

Annual Income
123456

KIE IDE Home Task Inbox

Task Inbox

Active filters: Status: Ready, InProgress, Reserved

| Task | Process Definition Id | Status | Created On | Actions |
|----------------|-----------------------|--------|------------|---------|
| No tasks found | | | | |

10 Items 0 of 0

- 8) Re-log in as the user with right access; Complete the task of **Final Approval** for [case 2];

The screenshot shows the KIE Task Inbox interface. On the left, there is a sidebar with 'Filters' expanded, showing various status options like Completed, Created, Error, etc., with 'InProgress' and 'Ready' checked. Below it are sections for 'Filter By' (Id and Filter By Id..) and 'Process Definition Id' (Select). The main area is titled 'Task Inbox' and displays a table with one row:

| Task | Process Definition Id | Status | Created On | Actions |
|----------------|-----------------------|--------|----------------------|---------|
| Final Approval | Mortgage_Process.M... | Ready | 22-Feb-2019 19:26:04 | [Edit] |

At the bottom, it says '10 Items' and has navigation buttons.

The screenshot shows the '21 - Final Approval' task form. It has three main sections: 'Application', 'Applicant', and 'Property'. The 'Application' section contains fields for 'Mortgage amount' (200000), 'Down Payment' (50000), and 'Years of amortization' (20). The 'Applicant' section contains fields for 'Name' (John Doe), 'Age' (30), 'Annual income' (100000), and 'SSN' (123456). The 'Property' section contains fields for 'Age of property' (10), 'Address of property' (123 Main St), 'Locale' (Alvin), and 'Sale Price' (200000). There are also 'Credit rating' and 'Open House' dropdowns.

4.1.4. Workshop project submission [Export/Import]

- 1) Consolidate the workshop work to create a functional mortgage approval system enhanced by decision automation;
- 2) Refer to Annex 2 to export project from KIE Workbench;
- 3) Compress the exported project folder to a Zip file;
- 4) Refer to Annex 3 to prepare other project deliverable and submission;

😊 Congratulations!

You have completed today's challenging workshop!

We hope you enjoyed the challenging learning and found this course useful!

We also hope to bring your more learning experiences in the near future!

See you soon!

Course Manager



issgz@nus.edu.sg



- GU Zhan 顾瞻 (Sam) lectures Master of Technology programme in the areas of data science, machine intelligence, and soft computing. Prior to joining ISS, he was in New Zealand running start-up, delivering artificial intelligence training programs. Sam had also spent many years in financial and engineering sector wearing versatile hats: data scientist, project manager, consultant, system manager and software engineer.
- He devotes himself into pedagogy, and is very passionate in inspiring next generation of artificial intelligence lovers and leaders.

5. ANNEX

5.1. ANNEX 1 – Workshop Project Candidate

5.1.1. Workshop Project Candidate One

Airport Gate Assignment System (AGAS)

Faced with intense competition from major airports in the region, **The Best Airport (TBA)** needs to enhance the quality and efficiency of its airport services so that planes can have a faster turn-around. This improved throughput will definitely make its customers (the airlines) happy and to be firmly rooted to TBA. With some 5,000 flight arrivals each week, the assignment of aerobridges (or simply “gates”) is becoming increasingly complex and time consuming. Efficiency in gates assignment is crucial for TBA to remain as the airport of choice for all major airlines. You are a TBASU (TBA Strategic Unit) project specialist who is tasked to work on this important assignment.

The following is a transcript from your interview with Mr. Lim, the domain expert in gates scheduling:

You: Mr. Lim, what is the first step in the assignment of a gate to an incoming flight?

Mr. Lim: Well, flight information sends me a schedule of all incoming and outgoing flights for a particular day, at least 24 hours in advance for me to assign gates and service units to all flights. My first step is to prioritize all the flights, according to type - international or domestic, number of passengers and refueling needs. The number of passengers and refueling needs will determine how much time is needed, and thus how long the gate will be occupied. Another constraint is the amount of time before the plane has to depart. The top priority flight will be taken care of first. My job is to match a gate to an incoming flight for disembarkation of passengers and providing services for the aircraft.

You: Is there a systematic procedure that you use for gate assignment?

Mr. Lim: I'm not sure what you mean by systematic, but what I do is, I determine the services required by an aircraft, and assign a service unit (SU) which is able to provide those services, to a gate. Obviously, both the SU and the gate must be free or available. I get this information from the Gates Operation System which is updated in real-time. But this assignment is not as simple as it sounds. Each gate has a max passenger handling capacity, so we need to know the number of passengers coming in. A gate is also reserved for either domestic or international flights. A gate is also limited by its capability of supporting the required services.

You: Could you clarify this further with an example?

Mr. Lim: OK, suppose that an aircraft needs catering and cleaning. Then we must look for a gate that is capable of supporting those 2 services. However, we also try to minimize wastage, in the sense that we do not want to assign a gate which is capable of supporting all 3 services, when only 2 are needed. We should try to save that gate for the time when all 3 services are needed.

You: Let me recap: An SU can provide one or more services, like cleaning, catering and refueling depending on the needs of the aircraft. And the gate must be able to support the chosen SU.

Mr. Lim: Correct.

You: So you are assigning SUs to a gate, and a gate to an aircraft?

Mr. Lim: You got it!

You: Do all aircraft need the same services?

Mr. Lim: No. But if a particular service is needed, then it is mandatory that a gate providing that service is assigned to the aircraft.

You: Can you give me an example?

Mr. Lim: Certainly. Suppose that cleaning, refueling and catering are needed. The ideal situation would be to assign SU-101, for example, which provides all 3 services. But suppose SU-101 is not available, then we need to look for free SU, say SU-104 which provides catering and cleaning, and SU-105 which provides refueling and cleaning. SU-104 would be assigned to provide the catering and cleaning, but refueling can come from SU-105. In this case there is a redundancy, which cannot be avoided. An SU can only be assigned to one flight and hence one gate only at any one time.

You: How do you find out what services are required by an incoming flight?

Mr. Lim: Cleaning is always needed. Refueling is determined by the remaining fuel level, and catering of meals depends on the duration of the next outgoing flight.

You: And how do you compute how much fuel the aircraft needs for the flight out?

Mr. Lim: We have a set of tables (pointing to the laminated papers) to refer to. We also use the tables to determine catering needs as well as to do the prioritization of flights that I mentioned earlier.

You: I think I've taken too much of your time. Can I come back to you tomorrow to verify my understanding of what we discussed today? Thank you, Mr. Lim.

[End of Interview]

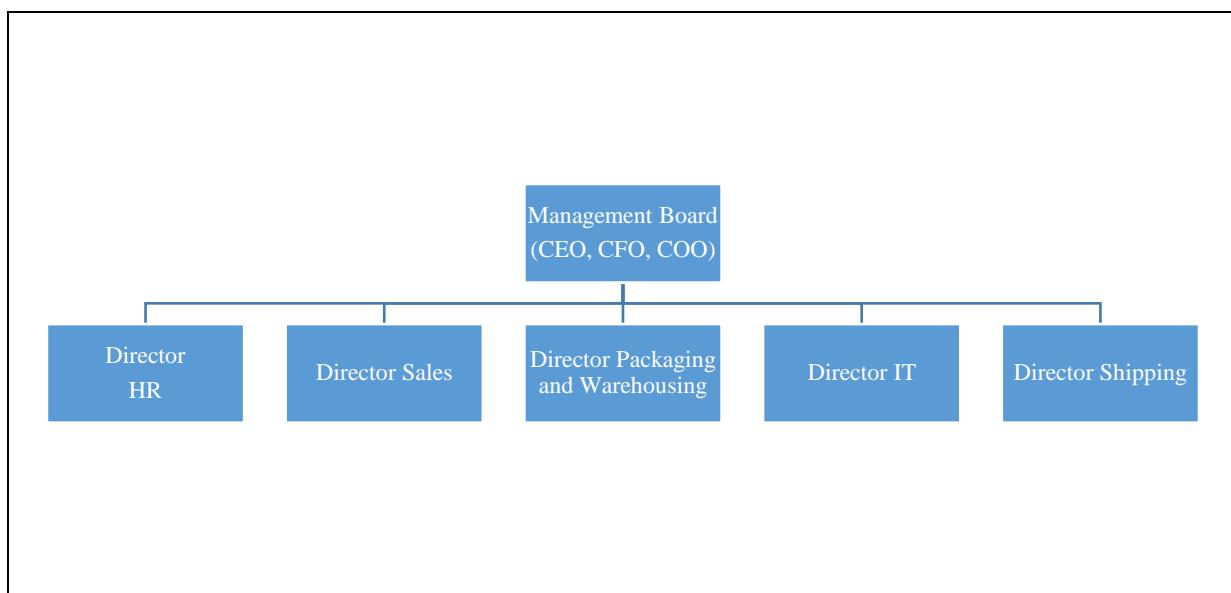
5.1.2. Workshop Project Candidate Two

DoReMi Books Inc.

Background

DoReMi Books is a company that specializes in the supply and sale of classical music scores and music books in the USA with subsidiaries in the major cities of each of the 50 states. An important line of business for the company is the supply of music books to music schools. These schools buy books in bulk for their students and are given special bulk-package discounts. Sales to music schools constitute 30% of the annual revenue of **DoReMi**.

The organization structure of the company is shown below.



Business Process & Improvement

As the company started in 1955 (and is now 57 years old), some of its business processes are manual and rather traditional. The company is now facing strong competition from its competitors (both new and old), who have embraced online and internet sales as the new way of interacting and transacting with their customers.

In response to the new challenges brought on by online sales transactions, the Chief Executive Officer (CEO), Peter Lee, asked a consultant to conduct a business process improvement exercise to revamp their music books sale transaction and order handling process as well as introduce improved stock and inventory planning and management capabilities. One of the key outcomes of this exercise was a new order handling process and the introduction of an internet sales transaction system, including an advanced business intelligence module for optimal stock inventory and warehousing forecasting.

After a period of process analysis and redesign, a new streamline process for online purchase from individual customers were defined. For bulk purchase, an automated workflow with automated inventory checks and approval was also established that can simplify the sales orders from music schools ordering in bulk. The process for handling orders from this client segment is simpler to implement as they have standard needs and also credit facilities already well established with **DoReMi**. The company is now ready to implement the new process and system.

Planning Implementation and Rollout

In considering the plans for the implementation and rollout of the new process and system, the CEO asked all his department heads (Directors) to gather some informal feedback on this major business process change initiative. The following feedback was shared in the weekly management board meeting:

| | |
|--|--|
| HR Director: | I am sensing some discomfort among the staff. The union has also mentioned about some talk of a rumour going around that the company is going on a down-sizing exercise and people will be made redundant once the new process and system is operationalised. This revamp thing that we are planning needs to be handled with care. I am hearing of head-hunters enquiring about our top-performing sales people. |
| Director Sales: | I am not aware about the rumour. But in my informal checks with my team leaders, some are asking why are we doing this? We are in the music books industry, and as you know, this is a rather niche area, with our product being mainly in the classical genre and highly specialized stuff. Why should we be bothered with this online talk? Our customers are likely to be in the adult age-group and would not be keen in online transactions anyway. |
| Director Packaging and Warehousing: | A high proportion of our workers in my department are of the older generations and they are also some of our most loyal and experienced workers. As you know, we do need some classical music background knowledge in our business. The new IT-enable process and business intelligent system may pose a technology challenge to my people. There is worry that the high-tech stuff will actually slow them down. |
| Director IT: | We have a lean team in our IT department and it is a constant struggle to keep up with the demands and expectations of the business units across the various geographically dispersed subsidiaries. Any introduction of new large IT systems will need to be carefully planned as it may cause a degradation of the IT support service. On a more positive note, the IT staff members are actually looking forward to learning and working with new tools and technologies. They |

| | |
|--|---|
| | are asking how they can find out more on process improvement and redesign concepts and methodologies. |
|--|---|

DoReMi Books Order Handling Process

1. The customer service representative receives a call from the customer.
2. Determine if the customer has an existing account.
 - 2.1. If the customer has an existing account:
 - 2.1.1. Record the account number.
 - 2.1.2. Record the order information.
 - 2.1.3. If the order is not within the auto-approval limit, send the order to Account Department for review. Otherwise, approve the order.
 - 2.2. If the customer does not have an account:
 - 2.2.1. Record customer information.
 - 2.2.2. Assign account number.
 - 2.2.3. Record order information.
 - 2.2.4. If the order is not within the auto-approval limit, send the order to Account Department for review. Otherwise, approve the order.
3. If the order is auto-approved, the followings activities are performed in sequential order.
 - 3.1. Send the order information to the packaging department in warehouse.
 - 3.2. Packaging department packages the goods.
 - 3.3. Packaging department arranges for delivery.
 - 3.4. Packaging department informs the customer service representative.
4. If the order is sent for review:
 - 4.1. Account Department reviews the order manually.
 - 4.2. Determine if the order is an acceptable credit risk.
 - 4.2.1. If the order is an acceptable credit risk:
 - 4.2.1.1. Send the order information to the packaging department in warehouse.
 - 4.2.1.2. Packaging department packages the goods.
 - 4.2.1.3. Packaging department arranges for delivery.
 - 4.2.1.4. Packaging department informs the customer service representative.
 - 4.2.2. If the order is not an acceptable credit risk:
 - 4.2.2.1. Account Department cancels the order.
 - 4.2.2.2. Notify the customer about the cancellation through the customer service representative.

Business Issues to Be Considered in System Design

- A. **DoReMi** have an existing logistics application system but the users are not sure of the details of the process it carries out. This is because the logistics system is a **black box** since there is no documentation and the original IT/user project managers have left the company.
- B. There are many common tasks across the different departments in **DoReMi**. For example, there are common tasks to collect customer particulars, to collect their orders, to check their credit worthiness etc. Currently, the different departments in **DoReMi** do not always carry out these tasks in the same manner. **DoReMi** management would like to standardise and streamline these tasks so that they are carried out in the most productive way.
- C. **DoReMi** have many HR internal forms that need to be automated. Some have simple processes, e.g. fill in by applicant, and review by his supervisor and approval by the supervisor's manager. Others were more complicated, e.g. fill in by applicant, and then route to different approving persons depending on the dollar amount.
- D. **DoReMi** is thinking of implementing a **Print-On-Demand** business process for the school bulk ordering of music scores (e.g. for music band use). This new business process will not need to keep an inventory of music scores. Instead, the Print-on-Demand process will perform high-volume in-house printing of the music scores as and when orders come in. This will help reduce warehouse storage space and costs.
- E. Many of the **DoReMi** managers gave the requirement that they wanted a tool that could help them with delegation of tasks and tracking of the task status for the various small projects that they need to manage.
- F. For music books, **DoReMi** purchases books from many different publishers. The processing of the publisher's invoices currently takes a lot of manual effort and **DoReMi** management is hoping to automate this process.
- G. There are many sales promotions (such as Christmas Sale, New Year Sale etc.) and the price of the books can change often depending on many factors. The IT department currently takes too long to make the changes to the system to cater for the frequent price changes.
- H. During peak hours, the cashier is not able to cope with the large number of customers as each payment takes some time (eg: credit card slip printing and signing) and this adds up when there are many customers.

5.1.3. Workshop Project Candidate Three

Housing & Development Board Build-To-Order Recommender

Convert and implement HDB BTO system using KIE product suite, e.g. Drools, jBPM, Task, Form user interface, and other relevant programming modules.

5.2. ANNEX 2 – Project Code Export & Import Using KIE Workbench

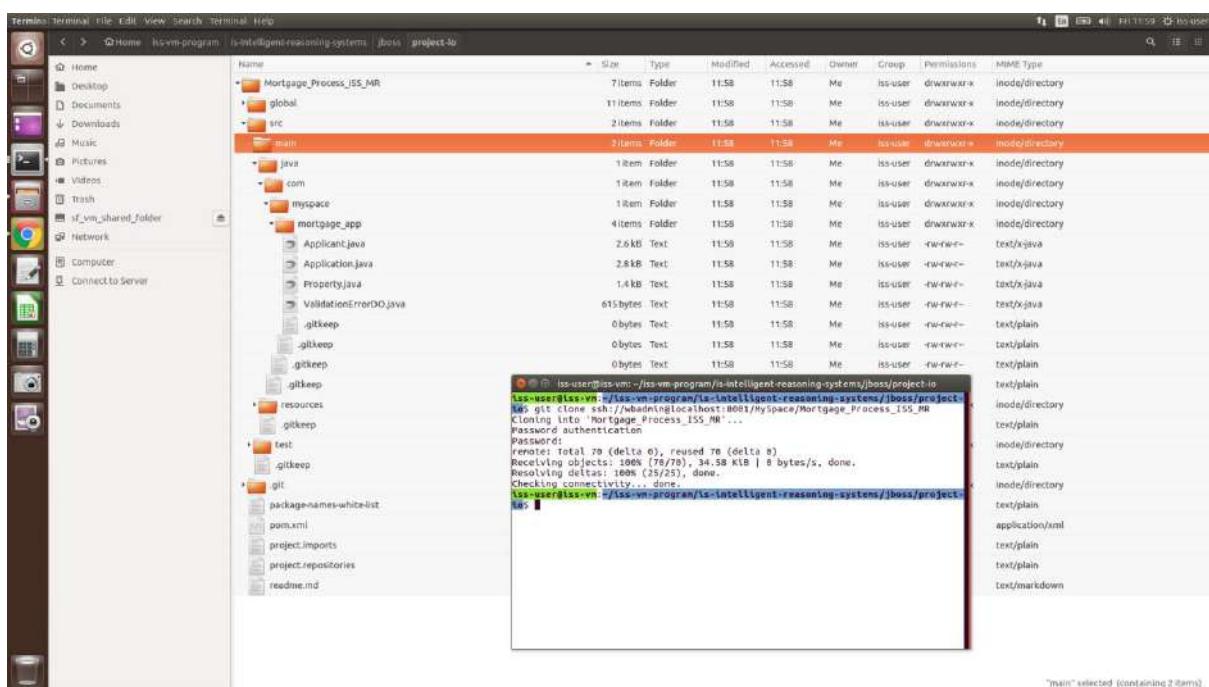
Example: export KIE project **Mortgage_Process_ISS_MR** from work space **MySpace**

Review project settings to obtain project URL link

The screenshot shows the KIE Workbench interface with the 'Settings' tab selected. The left sidebar lists project components: General Settings, Dependencies, KIE Beans, External Data Objects, Validators, Deployments, Persistence, and a 'Save' button. The main panel displays the 'General Settings' section. It includes fields for 'Name' (Mortgage_Process_ISS_MR), 'Description' (Getting started loan approval process in BPMN2, decision table, business rules, and forms), 'URL' (set to 'ssh' with the value 'ssh://localhost:8080/kieSpace/Mortgage_Process_ISS_MR'), and checkboxes for 'Delete GAV conflict check' and 'Allow child GAV addition'. Below these are fields for 'Group ID' (mortgage-process), 'Artifact ID' (Mortgage_Process_ISS_MR), and 'Version' (1.0.0-SNAPSHOT). The 'Save' button is highlighted in blue at the bottom left.

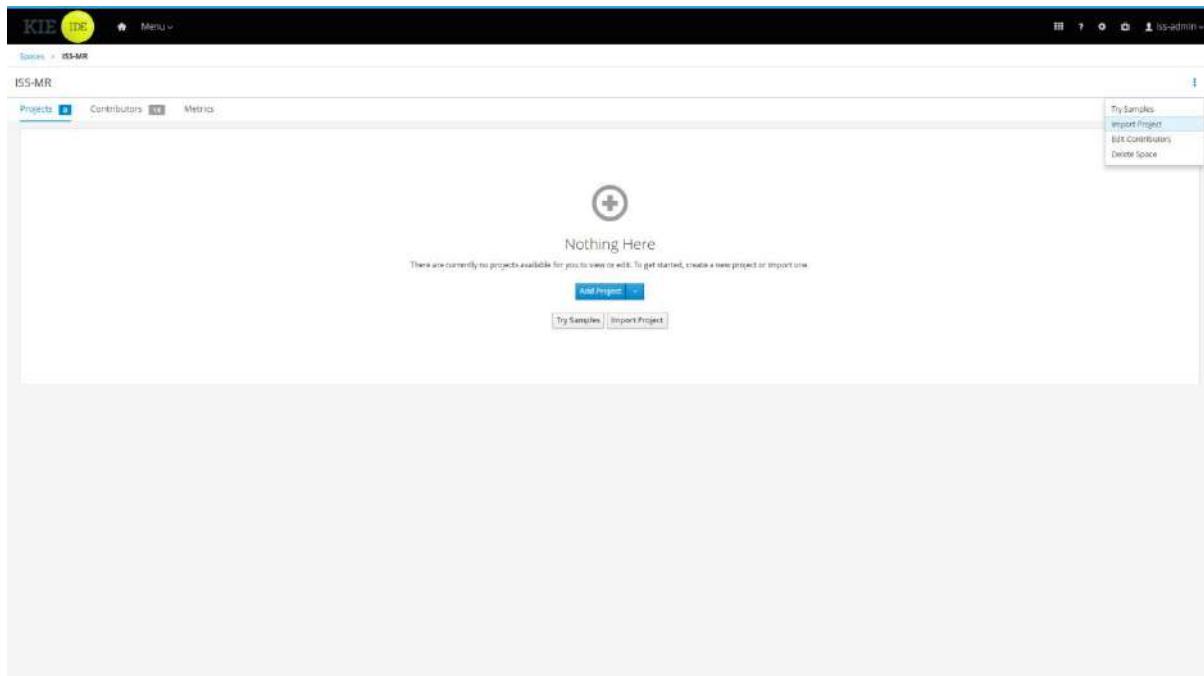
5.2.1. Export project from KIE Workbench

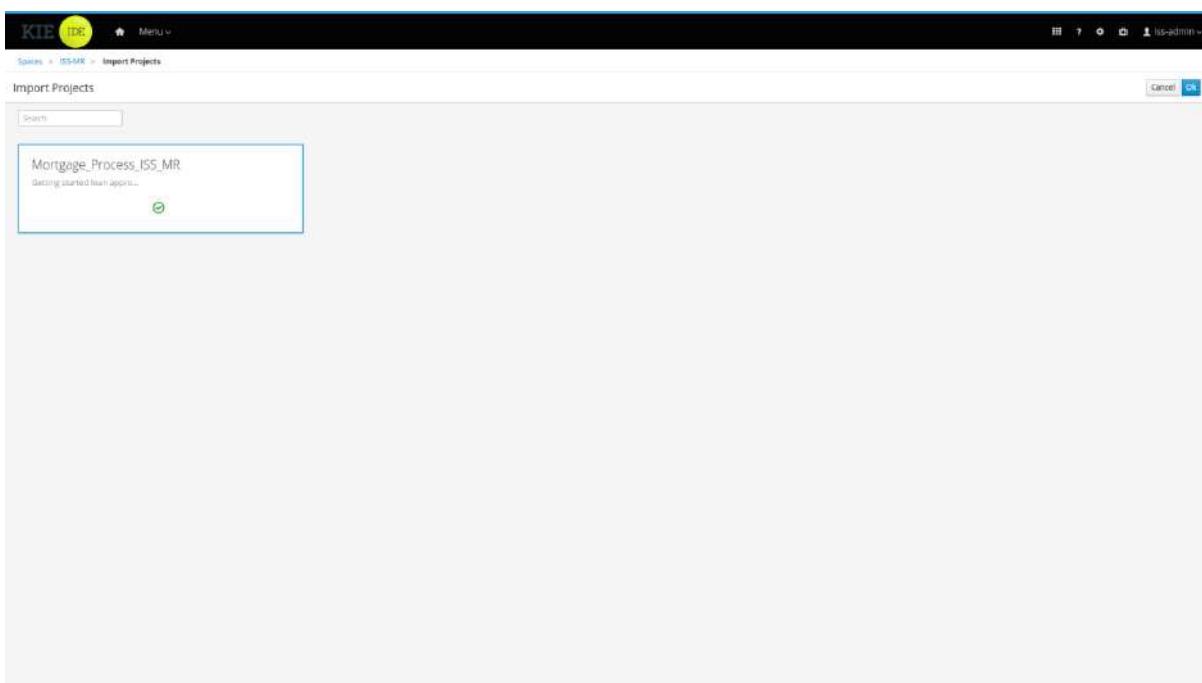
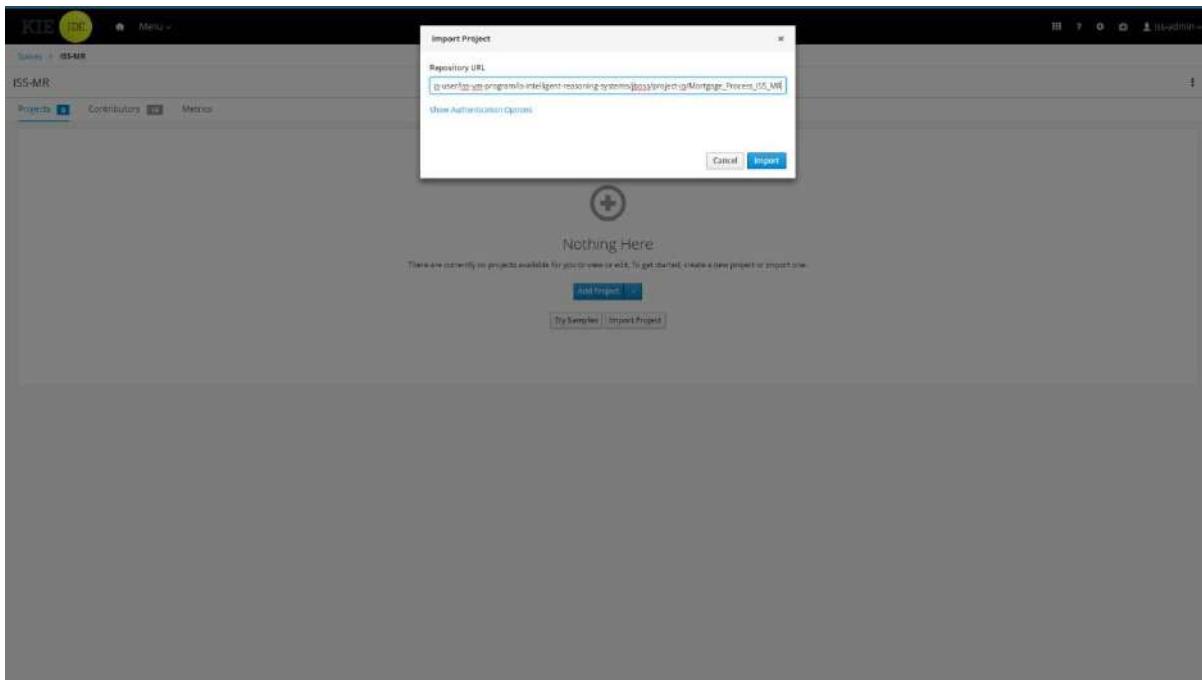
- 1) Select a folder for exporting, example here uses **/home/iss-user/iss-vm-program/is-intelligent-reasoning-systems/jboss/project-io**
- 2) Start a **Terminal or Command line tool** there, key in: **git clone ssh://wbadmin@localhost:8001/MySpace/Mortgage_Process_ISS_MR**
 { Tips } Note the modified project URL with wbadmin@.
 { Tips } Key in 'yes' to trust your computer if prompted a message.
- 3) Key in password '**wbadmin**' for user wbadmin

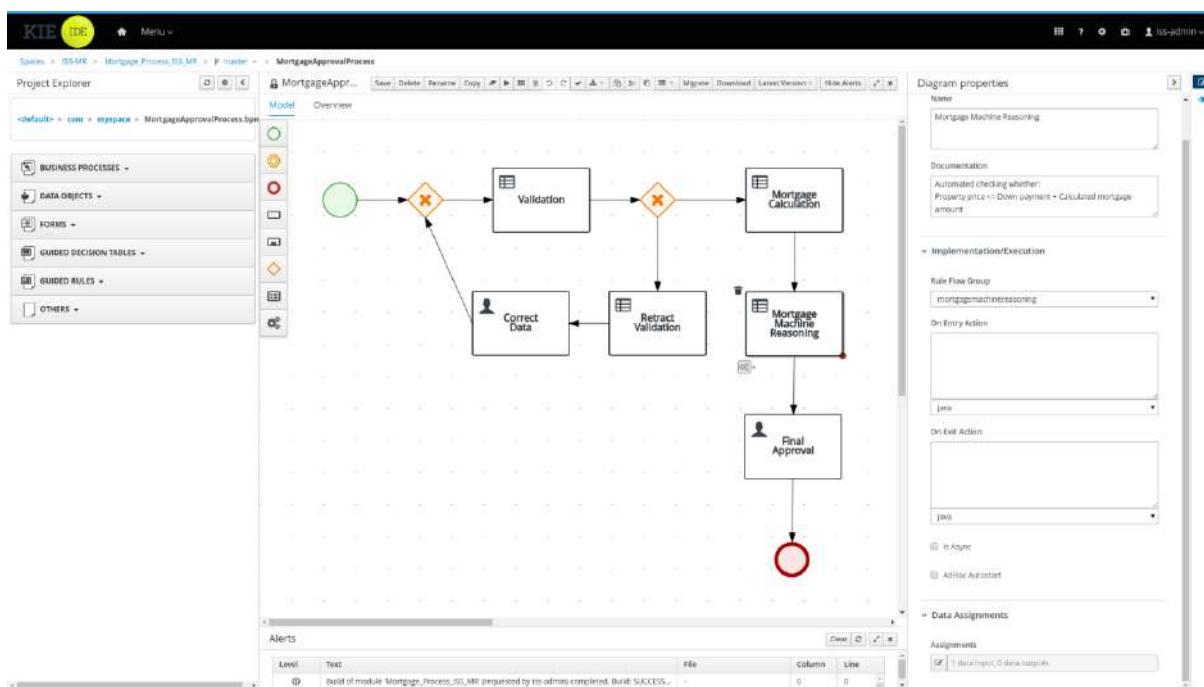
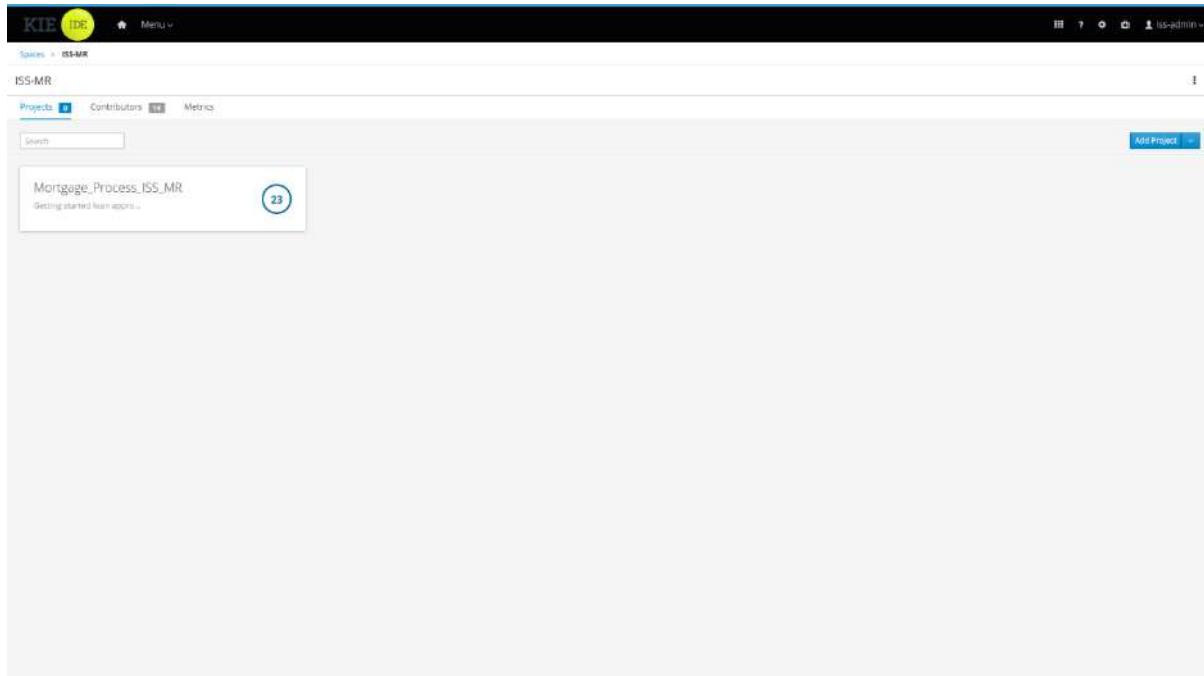


5.2.2. Import project into KIE Workbench

- 1) In KIE workbench, select/create a project Space, example here uses ***ISS-MR***
- 2) Click menu function '***Import Project***'
- 3) For Repository URL, key in: ***file:///home/iss-user/iss-vm-program/is-intelligent-reasoning-systems/jboss/project-io/Mortgage_Process_ISS_MR***







Reference

<https://developer.jboss.org/thread/269991>

<https://developer.jboss.org/thread/237411>

<https://developer.jboss.org/thread/252588>

5.3. ANNEX 3 – Workshop Project Submission

- 1) Create Github repository for project submission;
- 2) Download Github repository as a ZIP file, then upload to NUS LumiNUS;

Reference

<https://github.com/IRS-PM/Workshop-Project-Submission-Template>

Machine Reasoning Rule Engines in various programming languages:

| | |
|-----------------------|---|
| CLIPS | http://www.clipsrules.net/ |
| Node.js, Python, Ruby | https://github.com/jruizgit/rules |
| Python | https://github.com/buguroo/pyknow |
| Node.js | https://github.com/primaryobjects/knowledgebase |

The End of Workshop Project Guide