

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

**GRADUATE CERTIFICATE  
INTELLIGENT REASONING SYSTEMS**

**Workshop Project Guide**

**Subject: Machine Reasoning**

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Singapore 119615



No description, website, or topics provided.

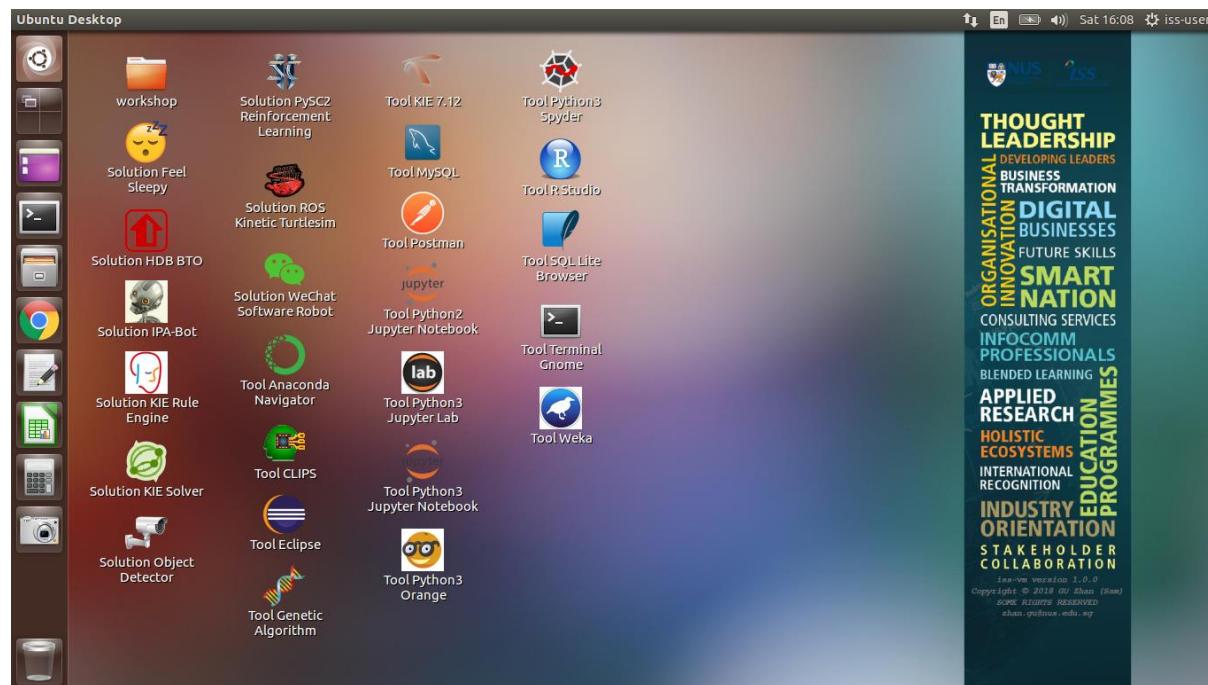
Branch: master New pull request

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

**Download ZIP** 11 days ago

File	Description	Last Modified
<a href="#">LICENSE</a>	S-MR-Workshop1/project-io/getting-started.zip	3 months ago
<a href="#">README.md</a>	uploaded S-MR Workshop Guide.pdf	2 months ago
<a href="#">README.md</a>		

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



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

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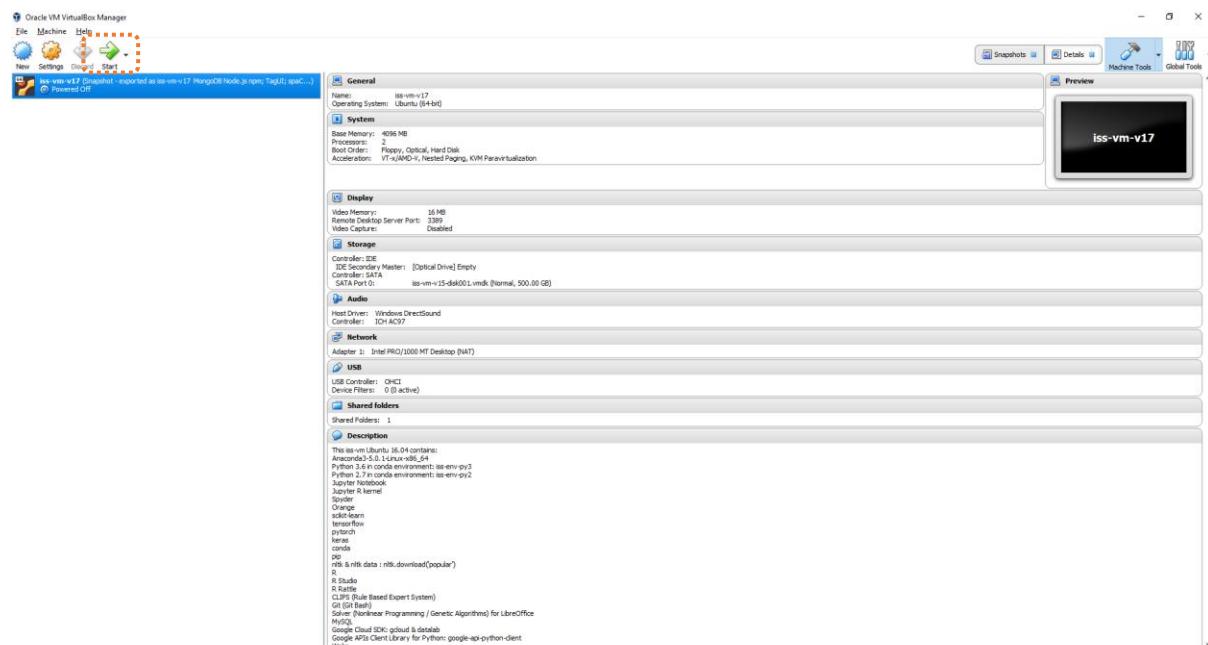
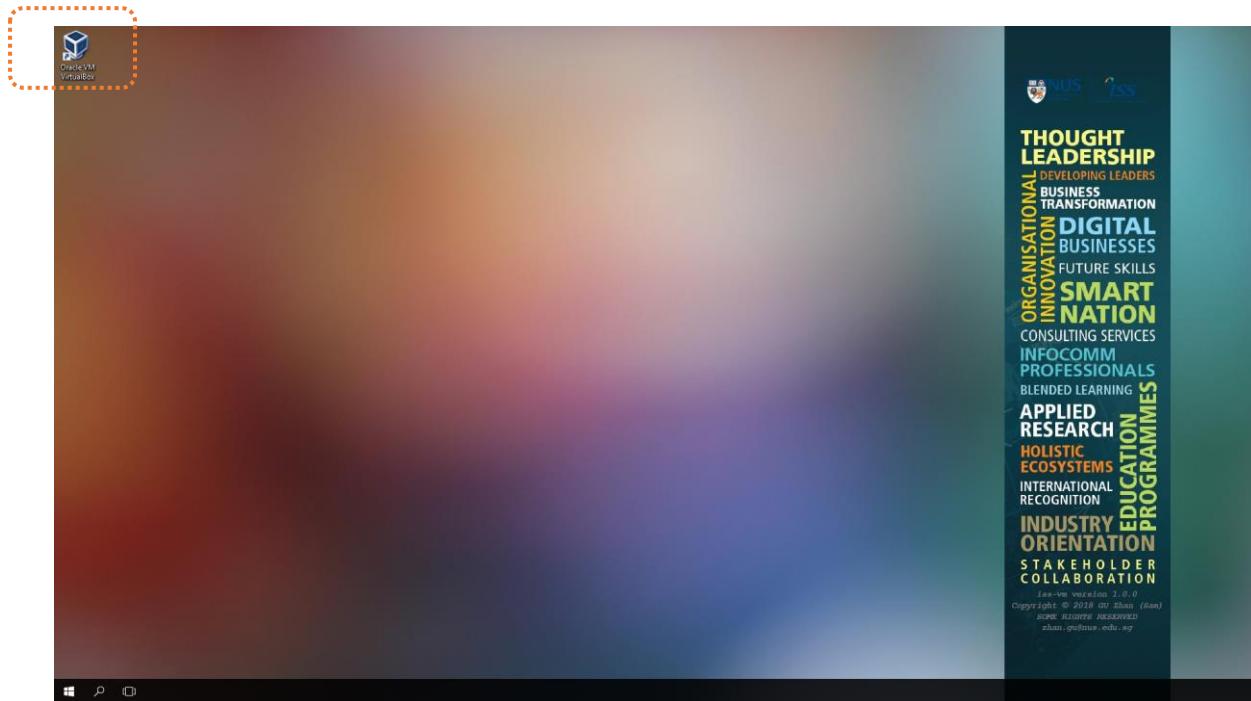
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## 1. Workshop 1 – Rule/Process Reasoning System

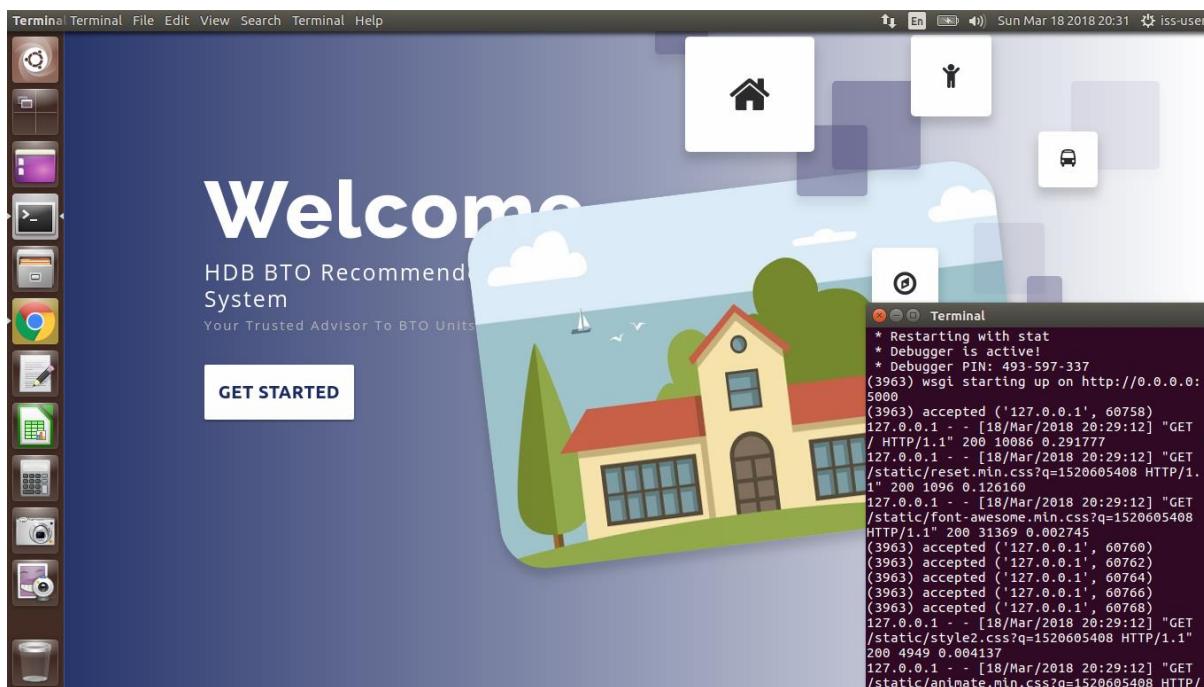
### 1.1. Case Study of HDB BTO Recommender

#### 1.1.1. Use case demo

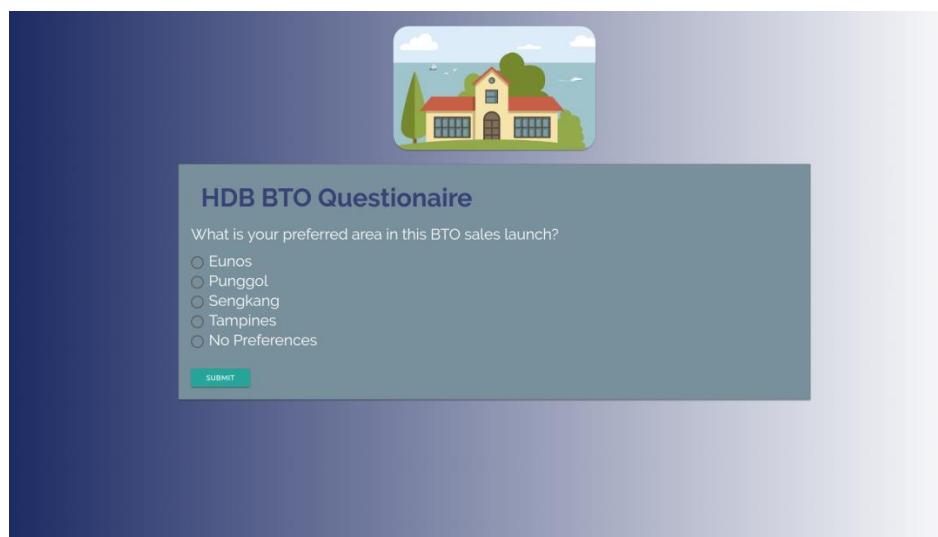
- 1) Start host computer → Oracle VM VirtualBox → iss-vm virtual machine



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.

Branch: master	New pull request
This branch is 1 commit ahead of telescopeuser:master.	
<a href="#">telescopeuser Merge pull request #1 from telescopeuser/master</a> ...	
Miscellaneous	Initial
ProjectReport	Initial
SystemCode/clips	Initial
UserGuide	Initial
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 redhat 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/>

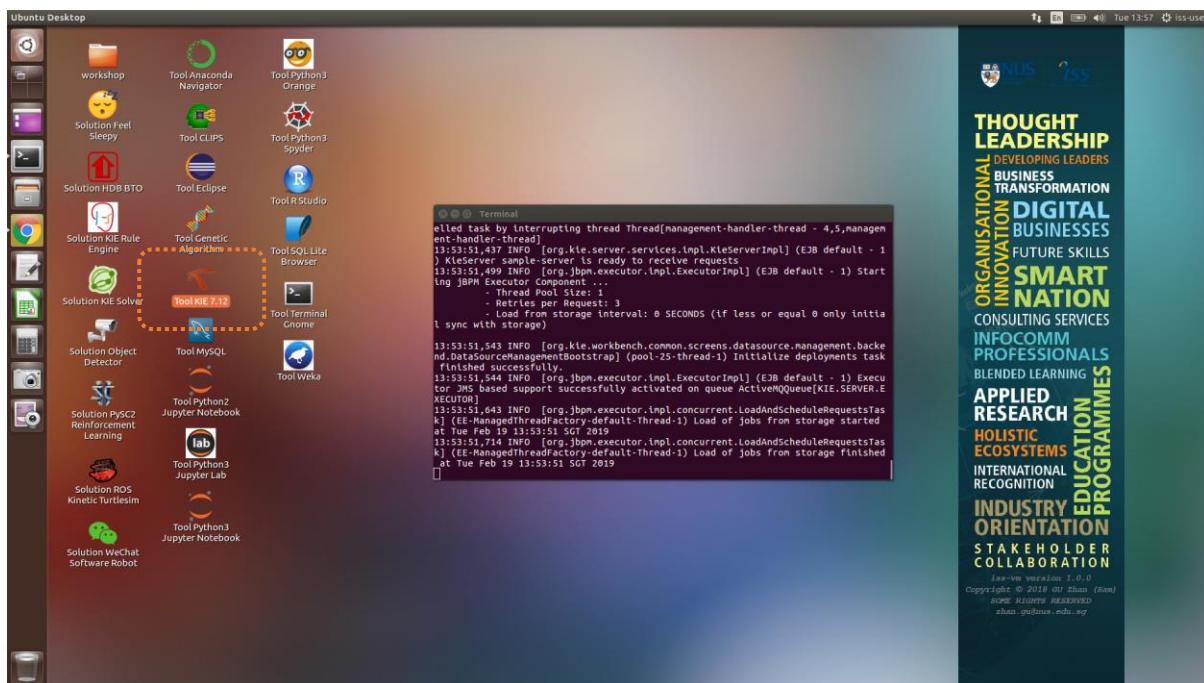
KIE BRMS: Drools

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

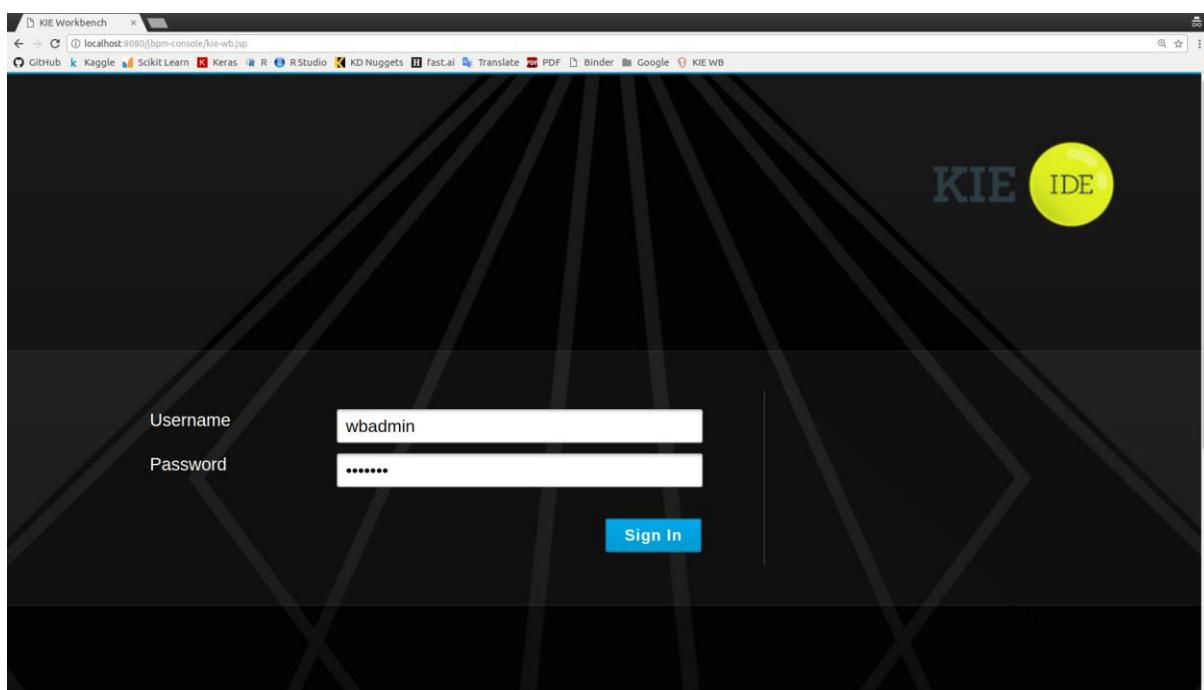
KIE BPMS: jBPM

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

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



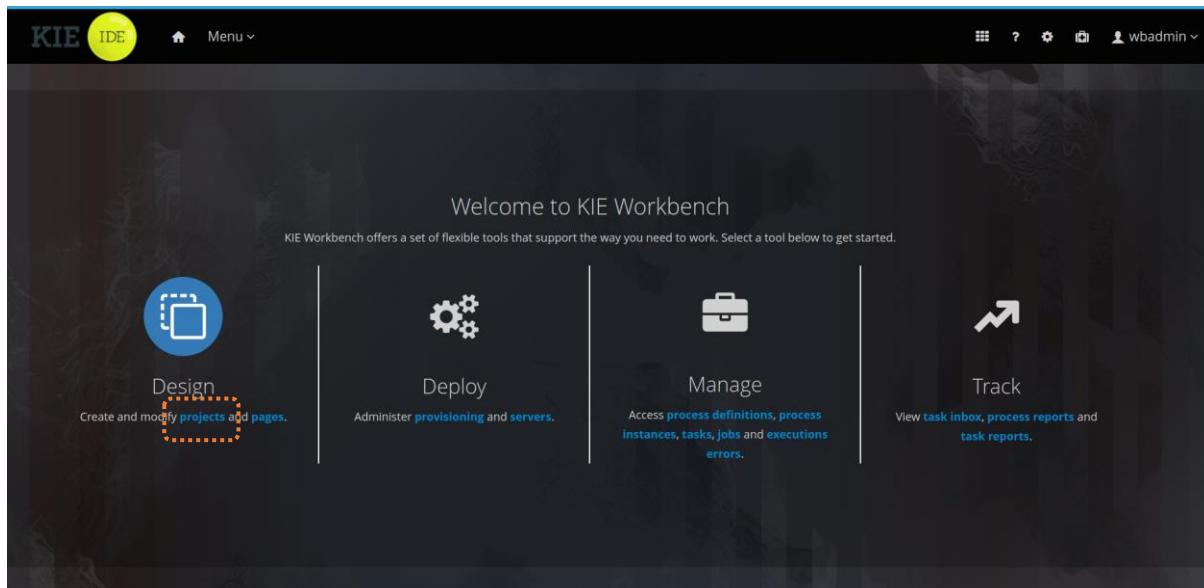
- Start 'Chrome' web browser; Go to web link:  
<http://localhost:8080/jbpn-console>



- Login using:

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

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



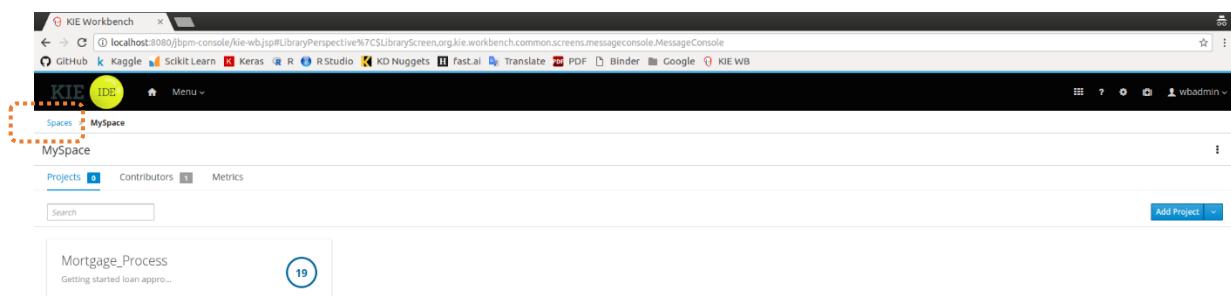
5) Click **projects** under Design

A screenshot of the KIE Workbench MySpace page. The URL in the address bar is "localhost:8080/bpm-console/kie-wb.jsp#LibraryPerspective%7C\$LibraryScreen.org.kie.workbench.common.screens.message.console.MessageConsole". The page header includes the KIE IDE logo, a home icon, a menu, and a user account (wbadmin). Below the header, it says "Spaces &gt; MySpace". Under "MySpace", there are tabs for "Projects" (which is selected and highlighted in blue), "Contributors", and "Metrics". A search bar is present. A single project card for "Mortgage\_Process" is shown, with the subtext "Getting started loan appro...". To the right of the project card is a blue circular badge with the number "19". At the bottom of the page, there's an "Alerts" section with a table showing one entry: "Completed indexing of MySpace/example-Mortgage\_Process/master" at Level "Info".

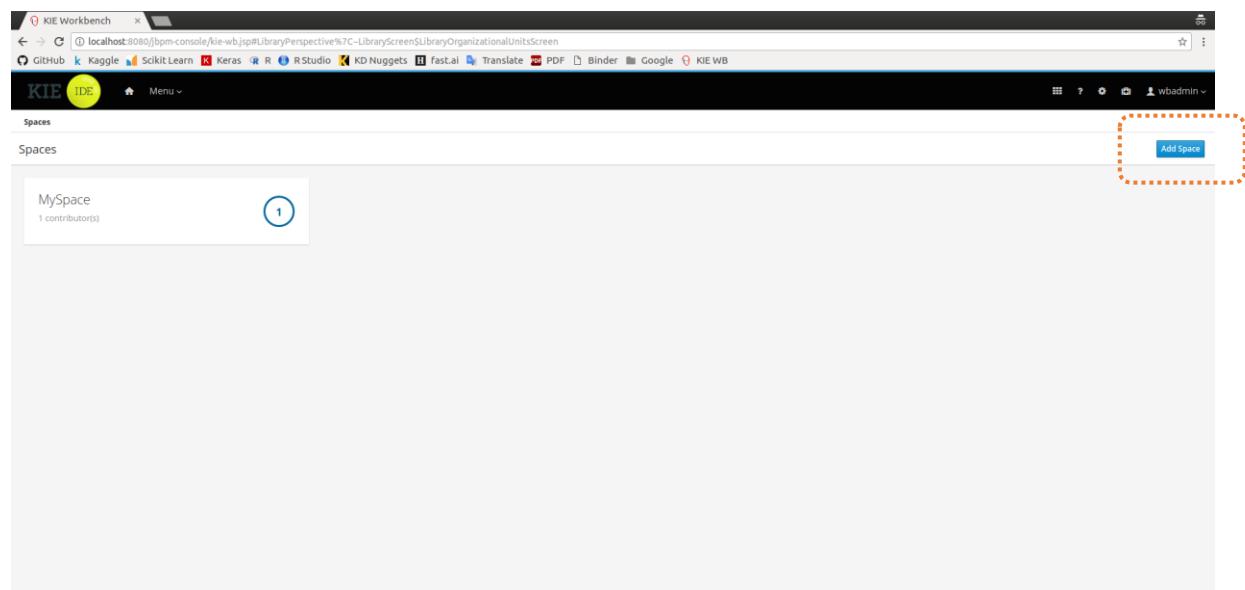
## 1.2.2. Business system: Mortgage application approval [ Deploy ] v2.0.0

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

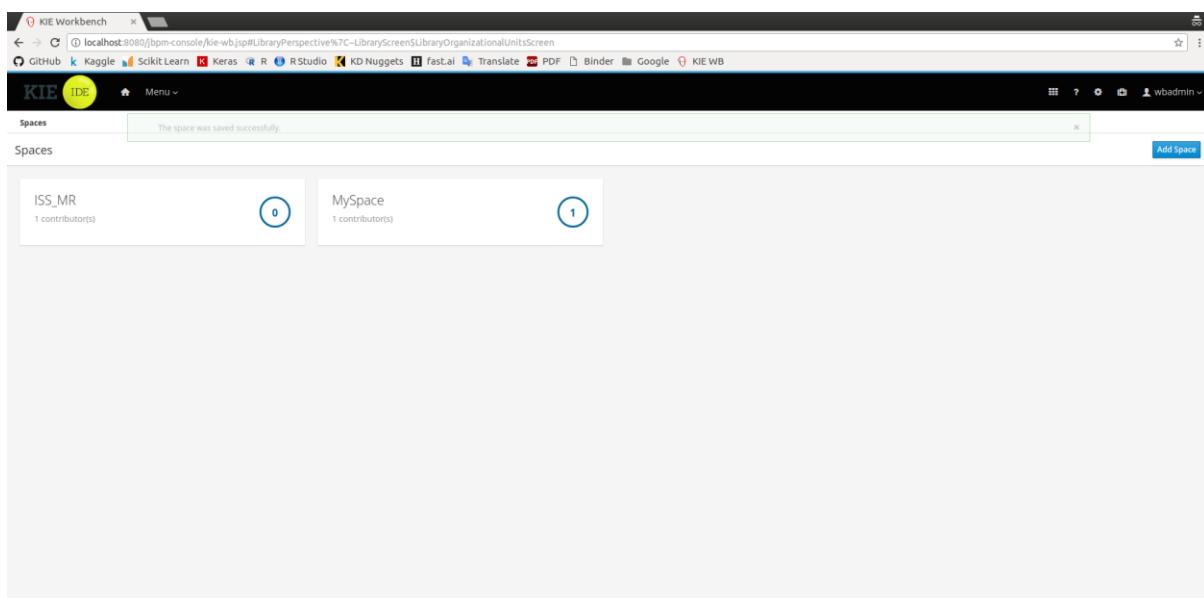
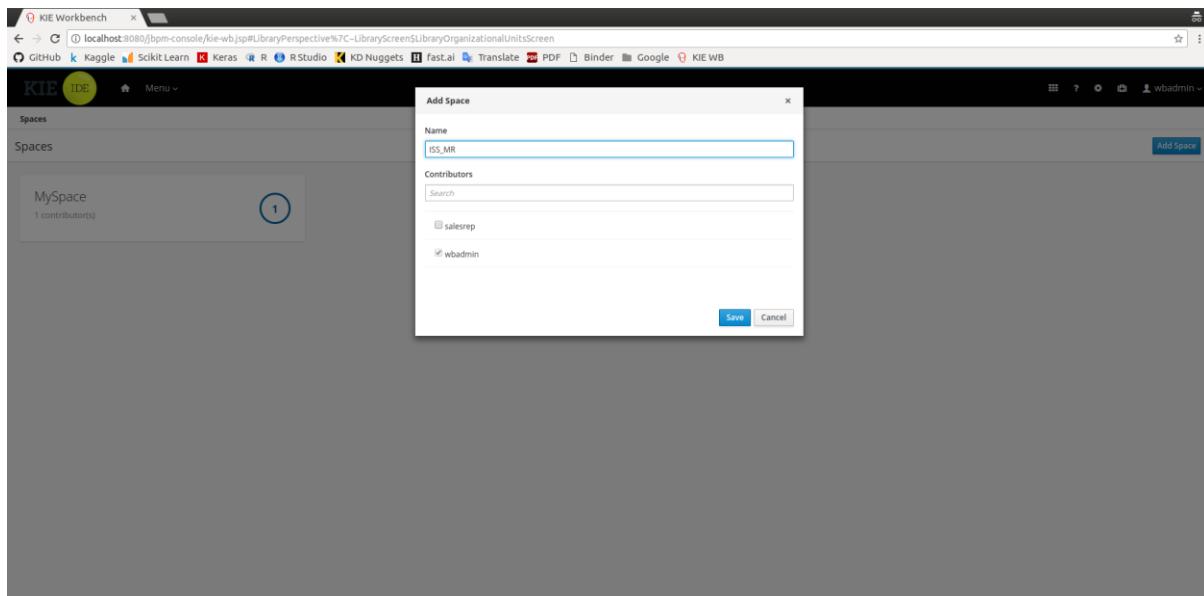
### 1) Click Spaces



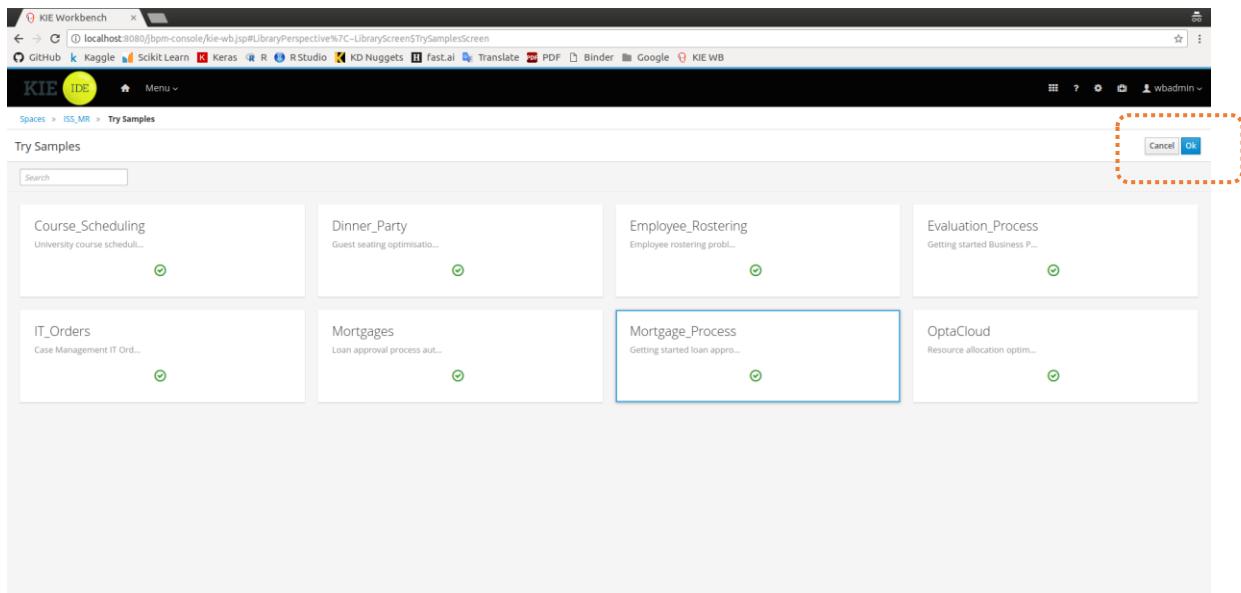
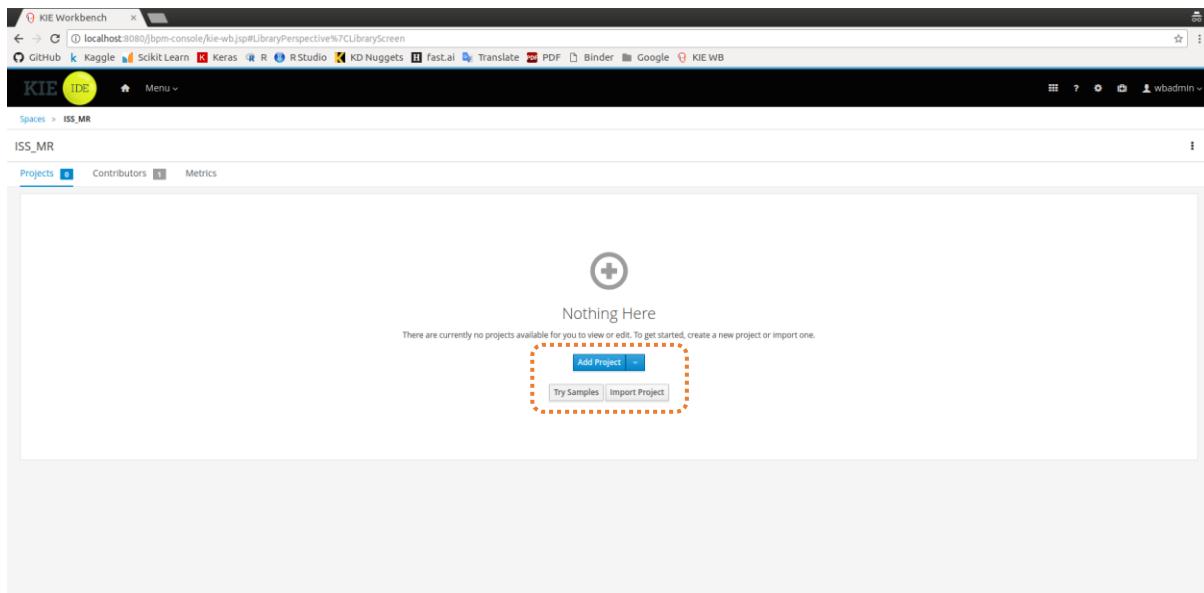
### 2) Create a new space: Click blue button: **Add Space**; Key in field Name: **ISS\_MR**



### 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 running in a browser window. The title bar indicates the URL is `localhost:9080/bpm-console/kie-wb.jsp#LibraryPerspective%7C-LibraryScreen$ProjectScreen`. The top navigation bar includes links for GitHub, Kaggle, Scikit Learn, Keras, R, R Studio, KD Nuggets, fast.ai, Translate, PDF, Binder, Google, and KIE WB. The user is logged in as `wbadmin`.

The main content area displays the "Mortgage\_Process" project under the "Assets" tab. A search bar and a pagination control (1-15 of 22) are visible at the top of the asset list. The list contains the following items:

Category	Type	Last modified	Created
Applicant	Forms	Today	Today
Applicant	Data Objects	Today	Today
Application	Forms	Today	Today
Application	Data Objects	Today	Today
ApplicationError	Forms	Today	Today
ApplicationMortgage	Forms	Today	Today

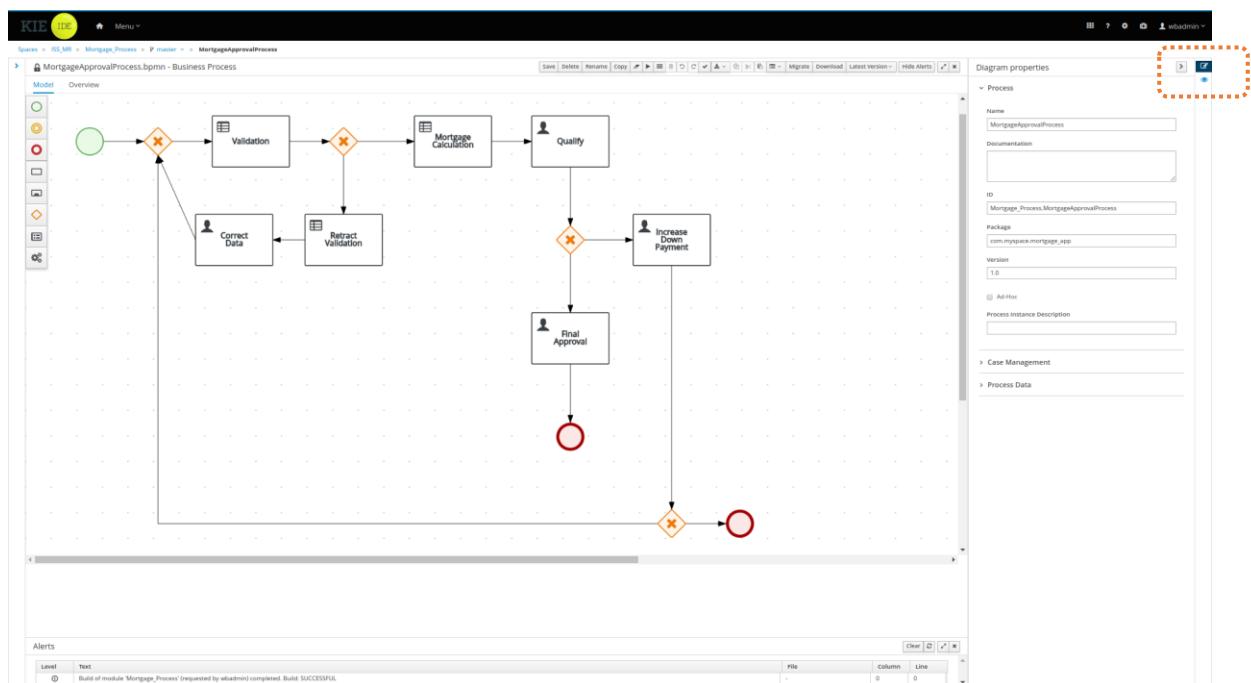
5) Scroll down Assets list; Click to edit **Business Processes: MortgageApprovalProcess**

KIE Workbench

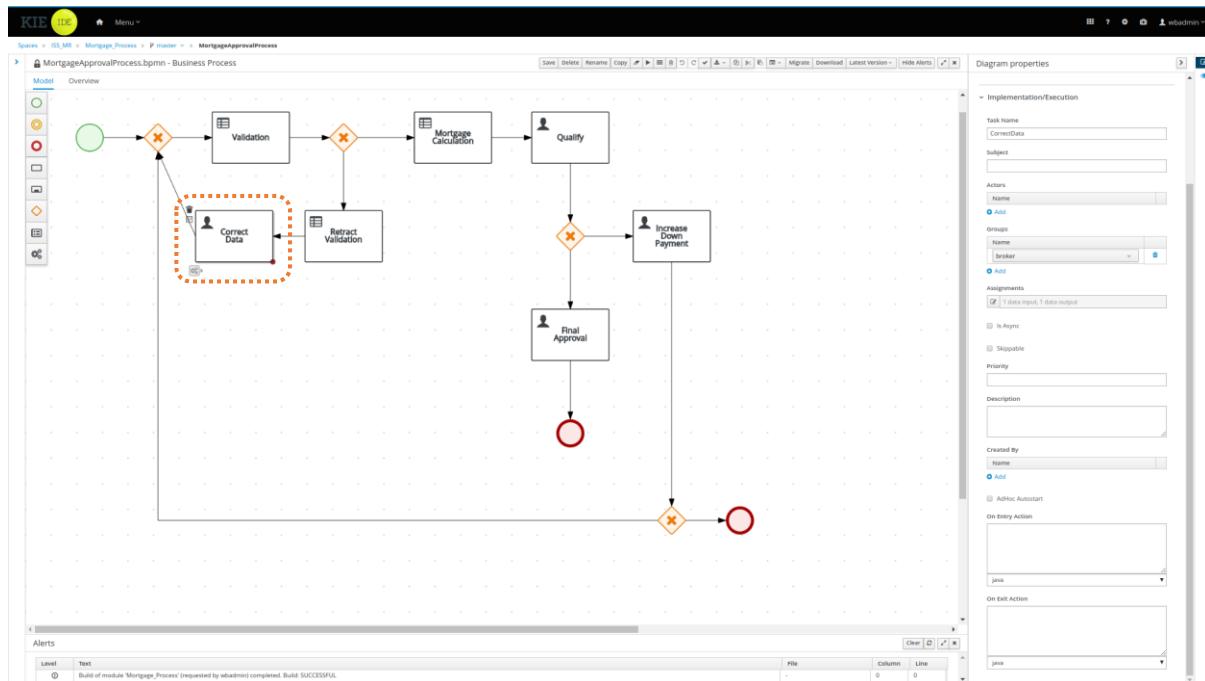
Spaces > ISS\_MR > Mortgage\_Process > master >

Name	Type	Last modified	Created
ApplicationMortgage	Forms	Last modified today	Created today
CorrectData-taskform	Forms	Last modified today	Created today
FinalApproval-taskform	Forms	Last modified today	Created today
IncreaseDownPayment-taskform	Forms	Last modified today	Created today
mortgage-app.MortgageApprovalProcess-taskform	Forms	Last modified today	Created today
Mortgage_Process.MortgageApprovalProcess-taskform	Forms	Last modified today	Created today
<b>MortgageApprovalProcess</b> src/main/resources/com/myspace/mortgage_app/MortgageApprovalProcess.bpmn	Business Processes	Last modified today	Created today
MortgageDecisionTable	Guided Decision Tables	Last modified today	Created today
Property	Forms	Last modified today	Created today

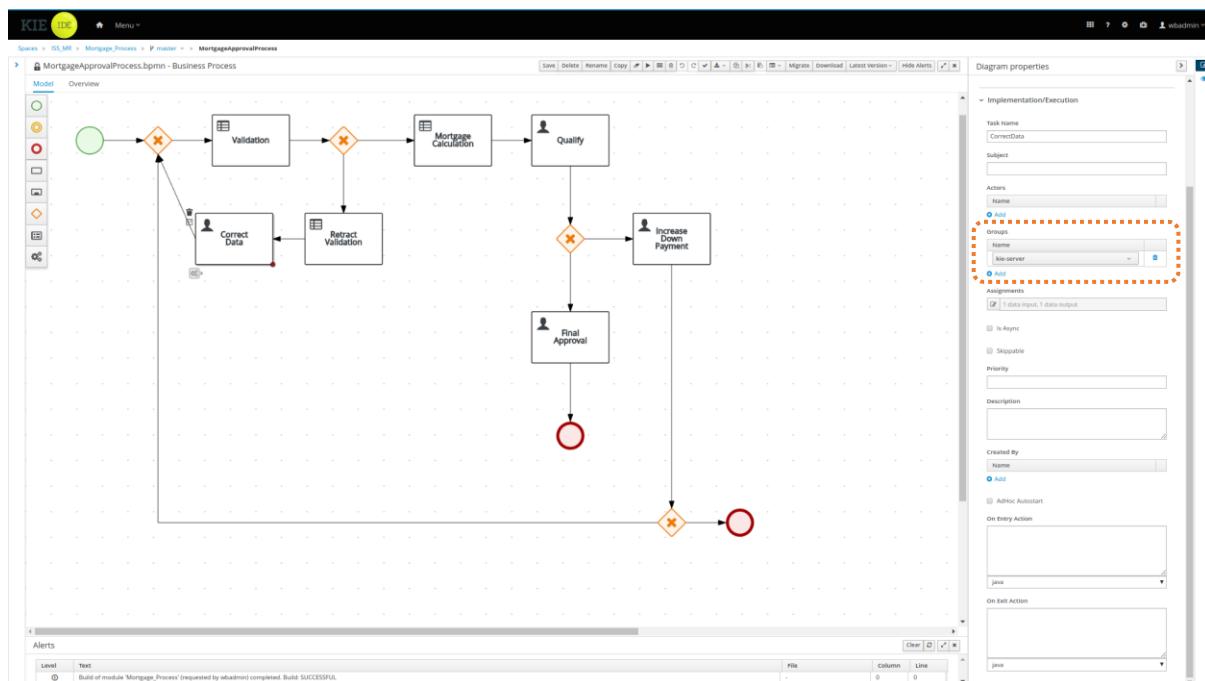
6) Click upper right corner icon: **Diagram properties**



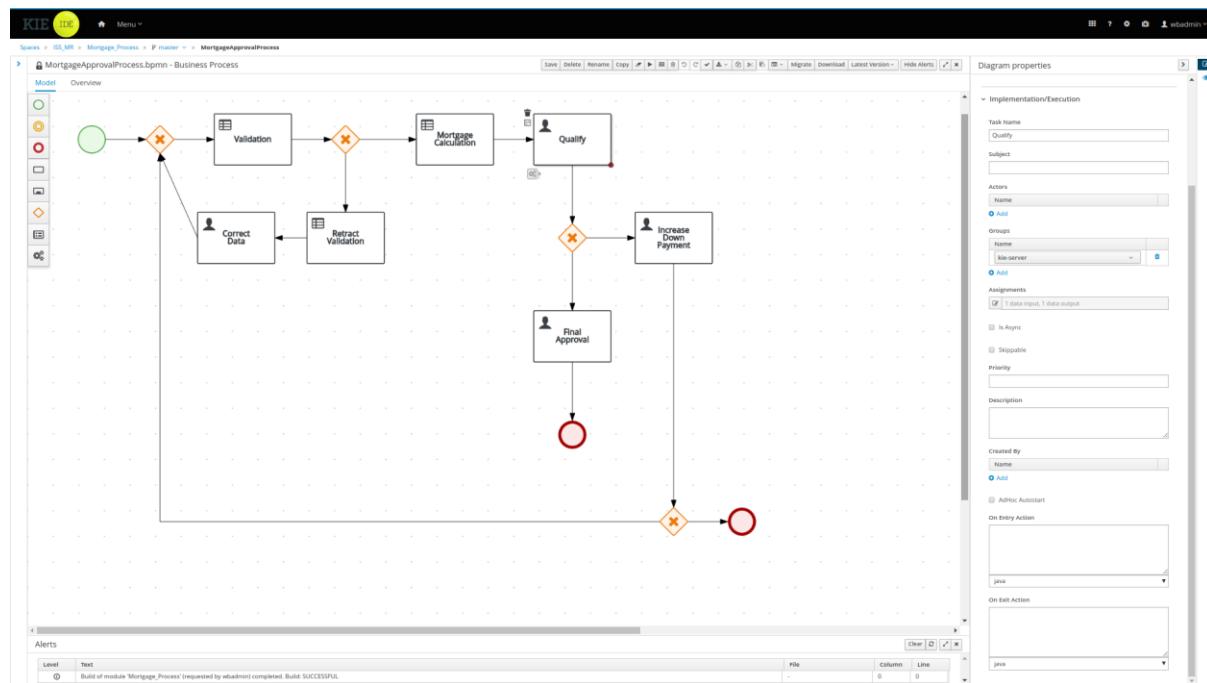
- 7) Click Business User Task: **Correct Data**; then expand Implementation/Execution at the right Diagram properties panel.



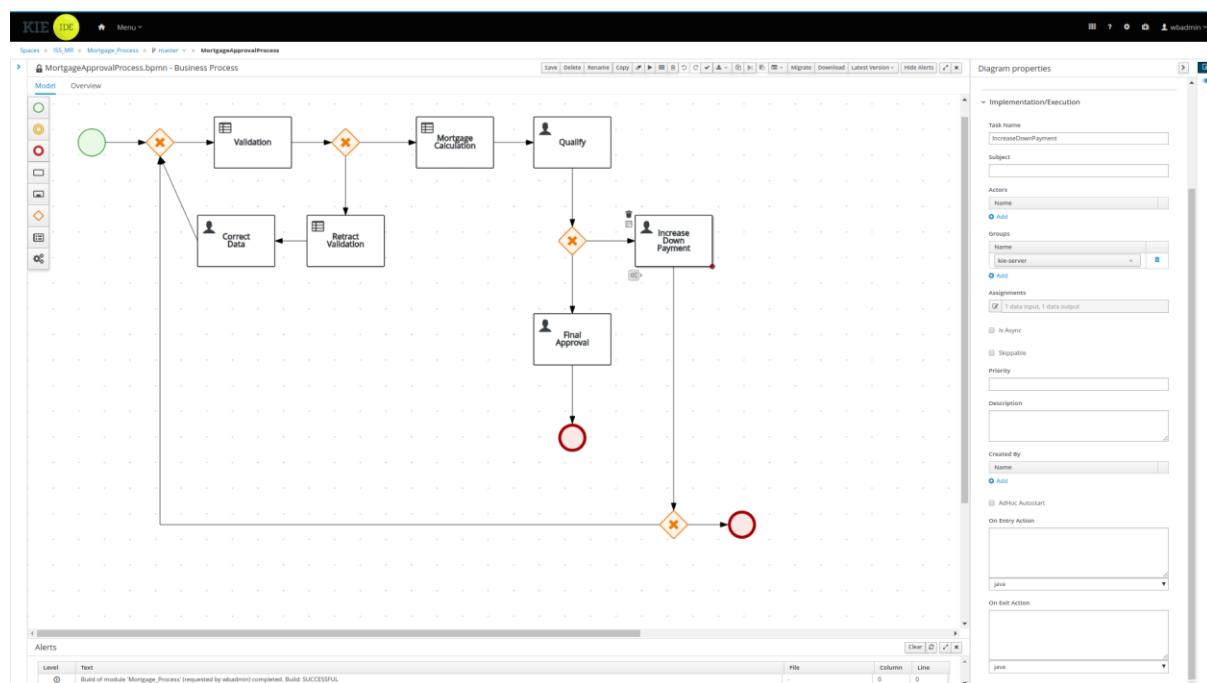
- 8) Update Groups: Name field value from: **broker** to: **kie-server**



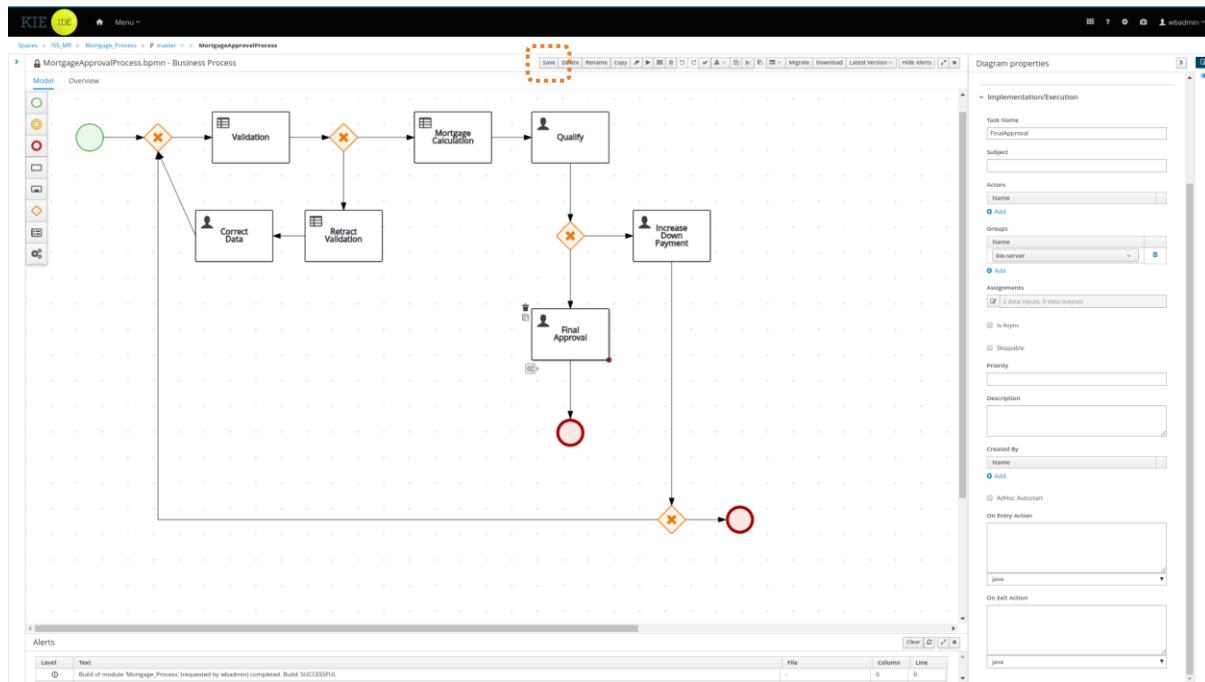
### 9) Repeat the Groups: Name update for Business User Task: *Quality*



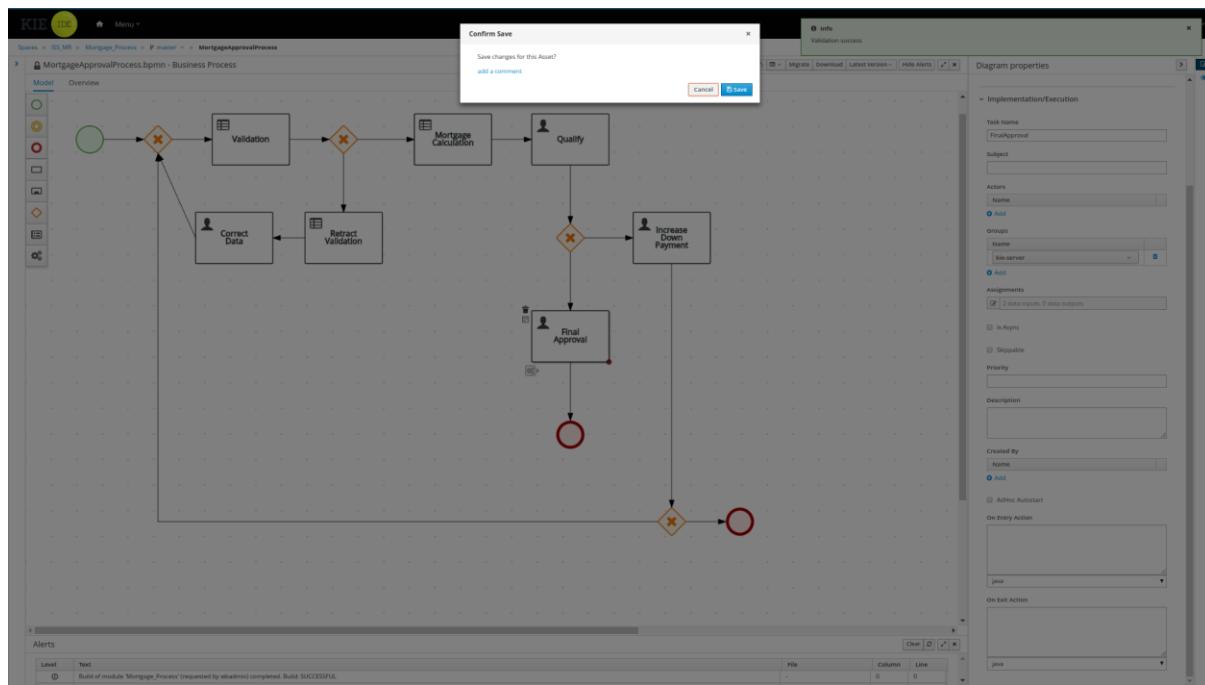
### 10) Repeat the Groups: Name update for Business User Task: *Increase Down Payment*

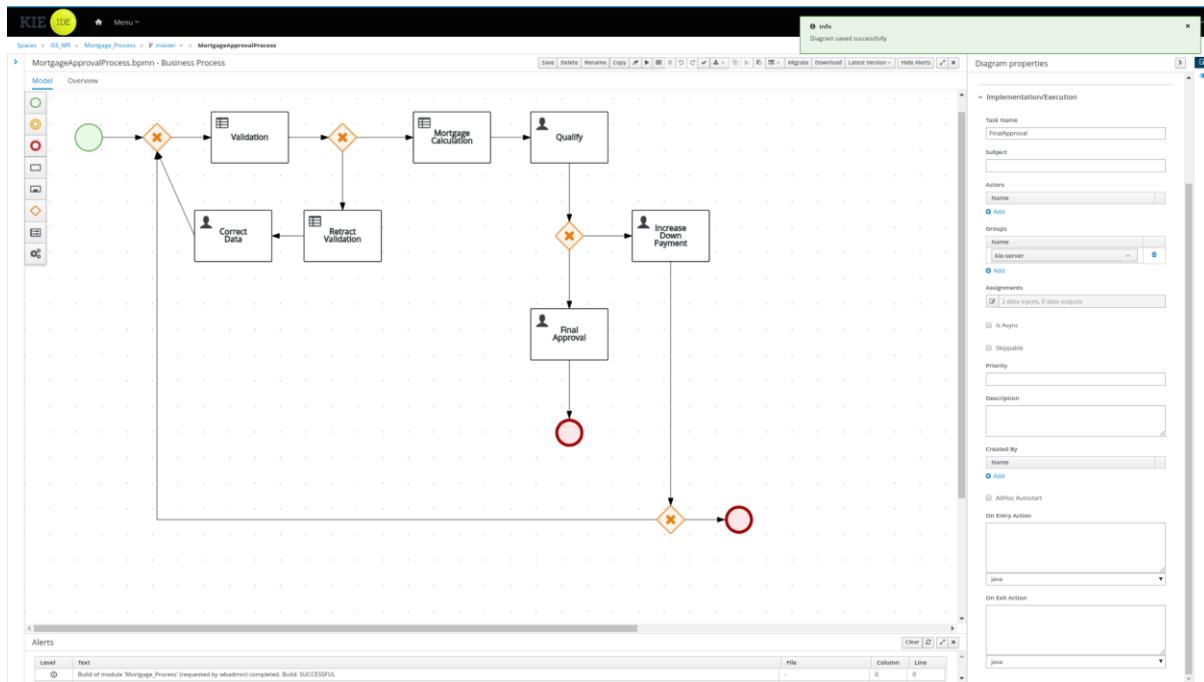


### 11) Repeat the Groups: Name update for Business User Task: *Final Approval*

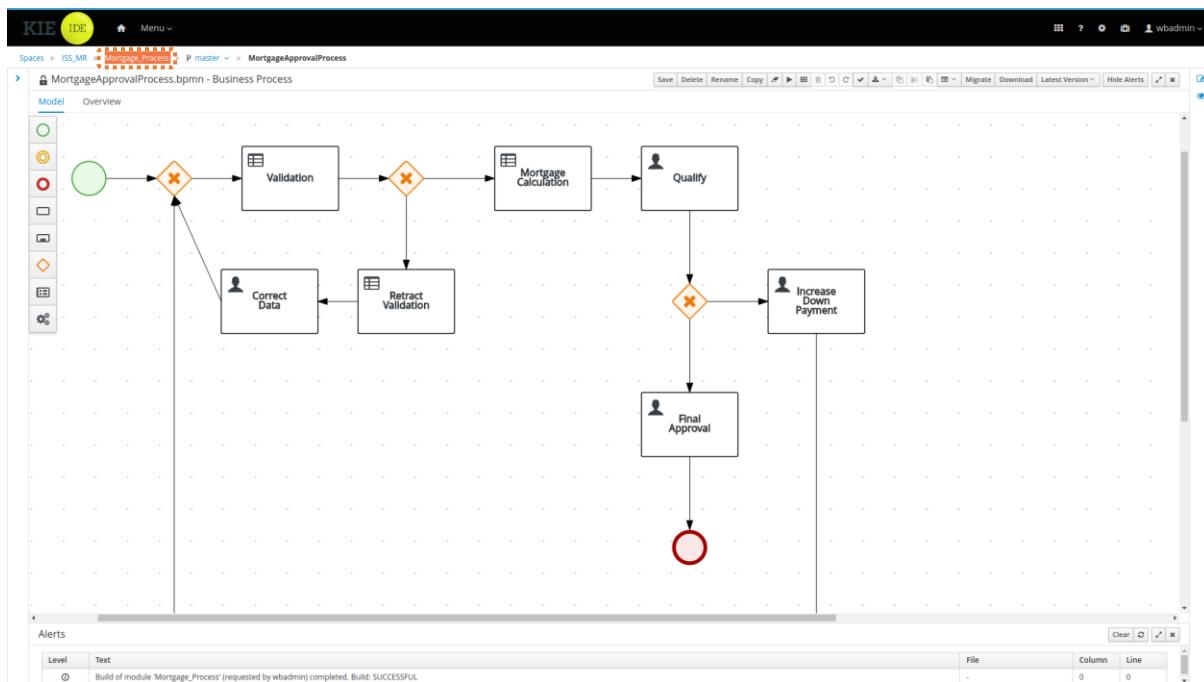


12) Click button: **Save**; Followed by clicking confirmation blue button: **Save**

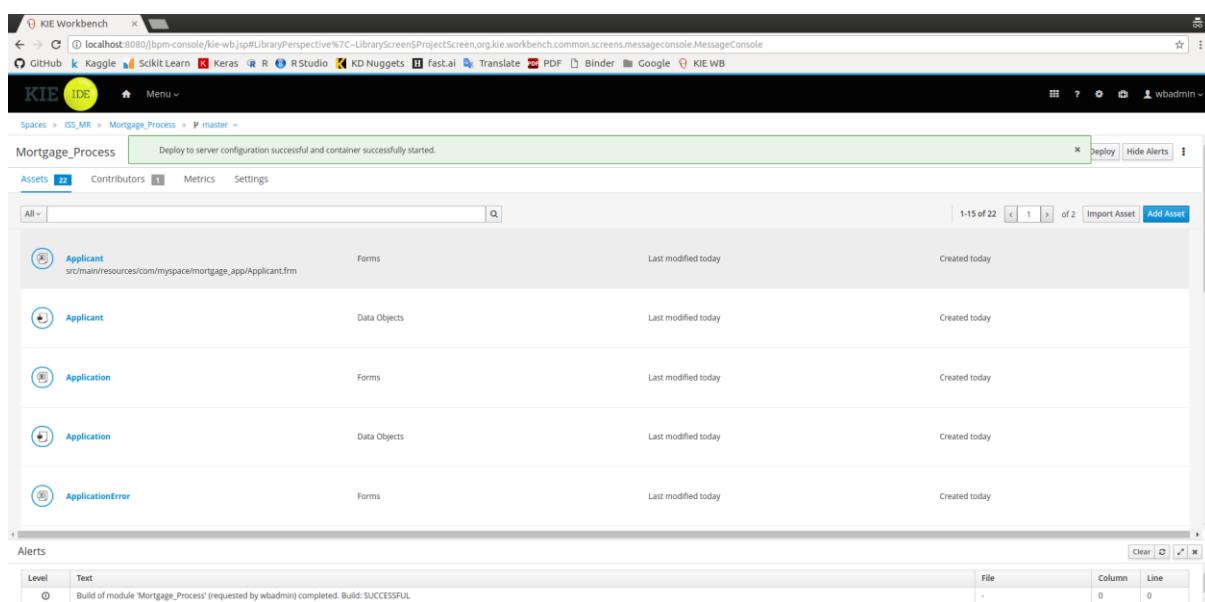
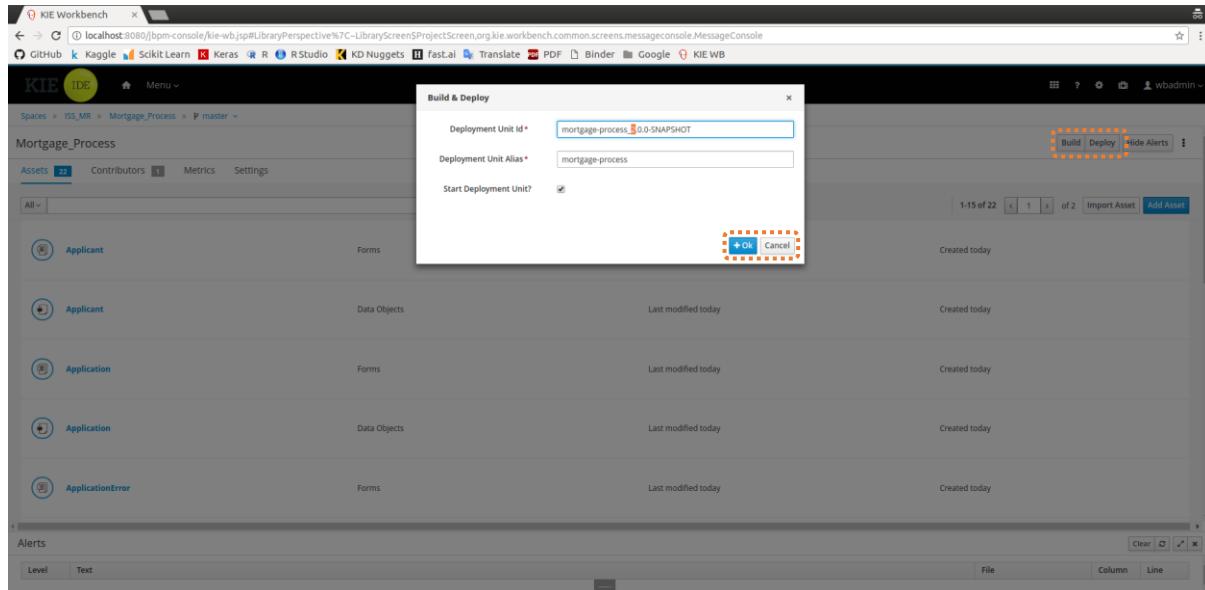




13) Click **Mortgage\_Process** link to go back to **Assets** list view.



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/bpm-console/kie-wb.jsp#LibraryPerspective%7C-ProjectScreen.org.kie.workbench.common.screens.messageconsole.MessageConsole`. The main menu bar includes 'File', 'Edit', 'View', 'Server Management', 'Process', 'Data Objects', 'Forms', 'Jobs', 'Alerts', 'Help', and 'Logout'. A dropdown menu 'Menu' is open, showing options like 'Design', 'Projects', 'Pages', 'Deploy' (which is highlighted with an orange dashed box), 'Manage', and 'Track'. Below the menu, there's a table listing four items: 'Applicant' (Data Objects, Last modified today, Created today), 'Application' (Forms, Last modified today, Created today), 'Application' (Data Objects, Last modified today, Created today), and 'ApplicationError' (Forms, Last modified today, Created today). At the bottom, there's an 'Alerts' section with a table showing one entry: 'Build of module 'Mortgage\_Process'' completed. Build: SUCCESSFUL.

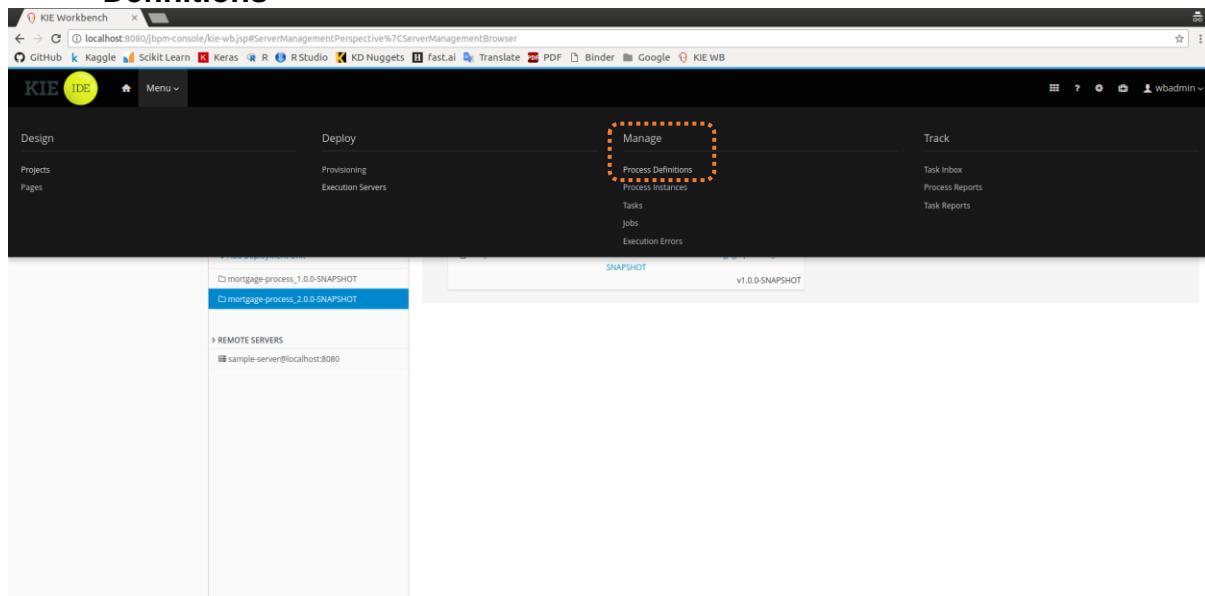
The screenshot shows the KIE Workbench interface with the 'Server Management' perspective selected. The left sidebar shows 'SERVER CONFIGURATIONS' with a 'sample-server' configuration selected (highlighted with an orange box). Under 'DEPLOYMENT UNITS' for this server, there are two entries: 'mortgage-process\_1.0.0-SNAPSHOT' and 'mortgage-process\_2.0.0-SNAPSHOT' (both highlighted with an orange box). The right panel displays the 'mortgage-process' group details, including tabs for 'Status', 'Version Configuration', and 'Process Configuration'. Under 'Status', it shows 'sample-server@localhost:8080' with a green status icon and a link to its snapshot: [http://localhost:8080/kie-server/services/rest/server/containers/mortgage-process\\_2.0.0-SNAPSHOT](http://localhost:8080/kie-server/services/rest/server/containers/mortgage-process_2.0.0-SNAPSHOT).

{ 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](http://localhost:8080/kie-server/services/rest/server/containers/mortgage-process_2.0.0-SNAPSHOT)

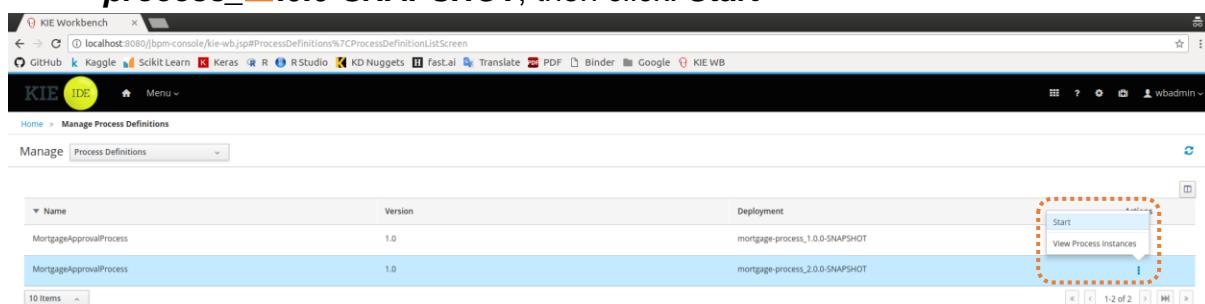
### 1.2.3. Business system: Smooth mortgage application

{ 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**



KIE IDE

Home > Manage Process Definitions

Manage Process Definitions

MortgageApprovalProcess

Correlation key

Form

Application

Down Payment Years of amortization

Down Payment Years of amortization

Applicant

Name

Annual Income

SSN

Property

Age of property

Address of property

Locale

Sale Price

Submit

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

KIE IDE

Home > Manage Process Definitions

Manage Process Definitions

MortgageApprovalProcess

Correlation key

Form

Application

Down Payment Years of amortization

50000 20

Applicant

Name

Annual Income

SSN

Property

Age of property

Address of property

Locale

Sale Price

Submit

The screenshot shows the KIE IDE interface for managing process definitions. The current view is 'Process Instance: 1' for the '1 - MortgageApprovalProcess'. The 'Instance Details' tab is selected, highlighted with a red dashed border. Other tabs include 'Process Variables', 'Documents', 'Logs', and 'Diagram'. The 'Instance Details' section displays various properties:

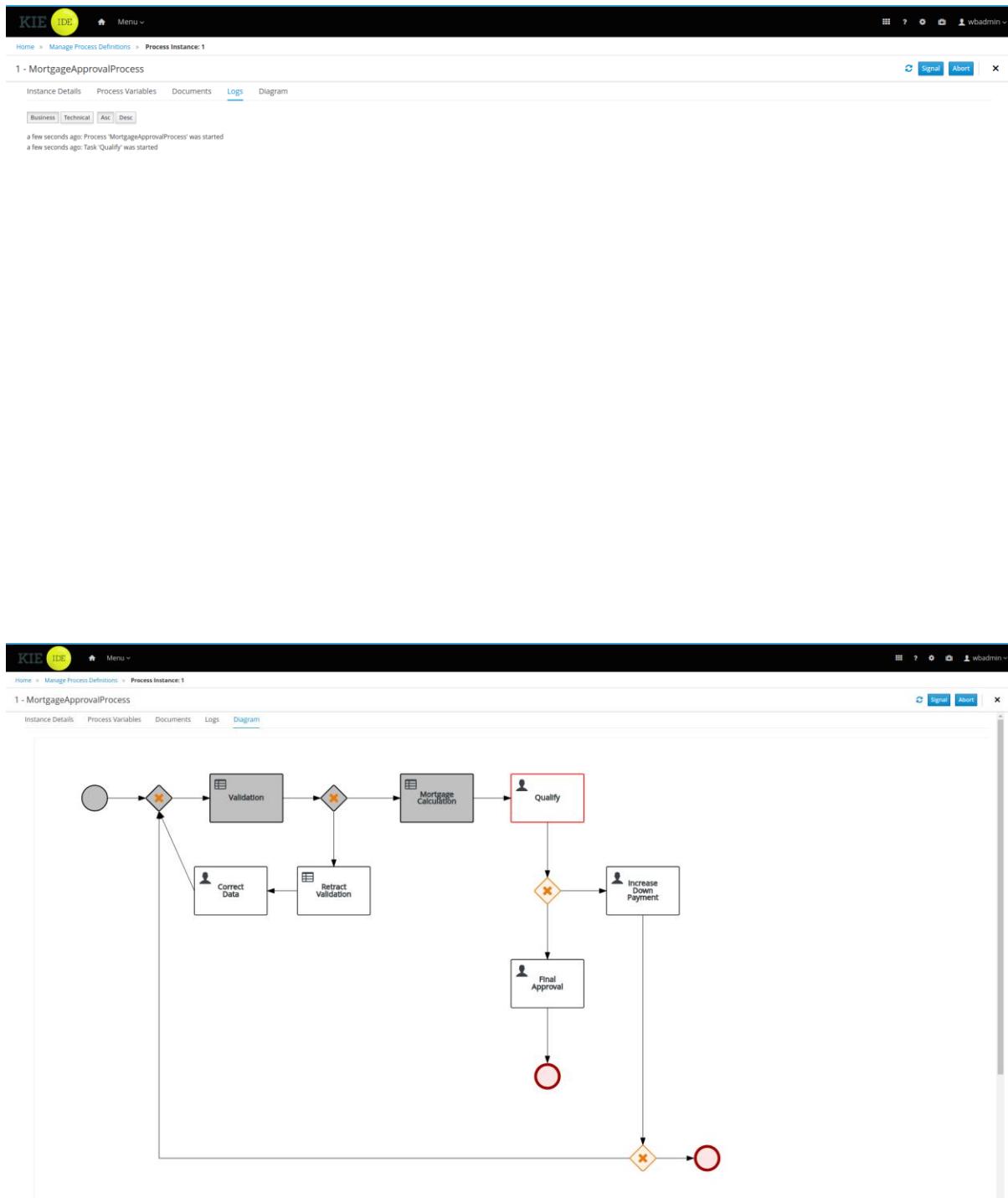
Definition Id	Mortgage_Process.MortgageApprovalProcess
Instance State	Active
Deployment	mortgage-process_2.0.0-SNAPSHOT
Definition Version	1.0
SLA Compliance	N/A
Correlation key	1
Parent Process Instance	No Parent Process Instance
Active user tasks	Qualify (Ready) owner: --
Current Activities	Tue Feb 19 16:06:32 SGT 2019: 5 - Qualify (HumanTaskNode)

At the top right, there are buttons for 'Signal' and 'Abort', and a close button 'x'. The top navigation bar includes 'Home', 'Manage Process Definitions', and 'Process Instance: 1'. The top right corner shows the user 'wbadmin'.

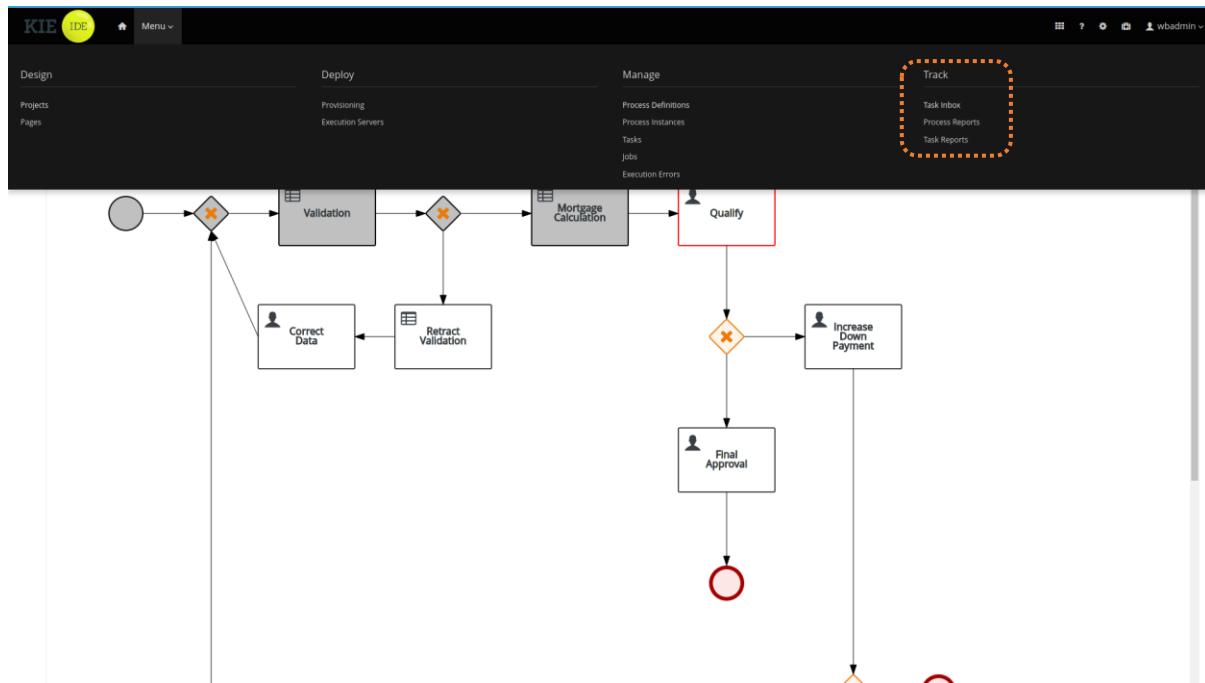
The screenshot shows the KIE IDE interface for managing process definitions. The current view is 'Process Instance: 1' for the '1 - MortgageApprovalProcess'. The 'Process Variables' tab is selected, highlighted with a red dashed border. Other tabs include 'Instance Details', 'Documents', 'Logs', and 'Diagram'. The 'Process Variables' section displays a table of variables:

Name	Value	Type	Last Modification	Actions
initiator	wbadmin		19-Feb-2019 16:06:31	Edit History
application	com.myspace.mortgage_app.Application@1749d8aa	com.myspace.mortgage_app.Application	19-Feb-2019 16:06:32	Edit History
inlimit	Boolean		19-Feb-2019 16:05:54	Edit History
incdownpayment	Boolean		19-Feb-2019 16:06:54	Edit History

At the bottom left, there is a dropdown menu '10 Items'. At the bottom right, there are navigation icons and the text '1-4 of 4'.



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



Task	Process Definition Id	Status	Created On	Actions
Qualify	Mortgage_Process.MortgageApprovalProcess	Ready	19-Feb-2019 16:06:32	[Edit]

- 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 <= Mortgage amount?)

The screenshot shows the KIE IDE interface with the title '1 - Qualify'. The page is divided into sections for 'Inputs:' and 'Outputs:'.

**Inputs:**

- Application**:
  - Mortgage amount: \$200000
  - Down Payment: \$50000
  - Years of amortization: 20
- Applicant**:
  - Name: D. Di
  - Annual Income: \$124000
  - SSN: 0
- Property**:
  - Age of property: 3
  - Address of property: #5 HWT, Singapore
  - Locale: Urban
  - Sale Price: \$250000

**Outputs:**

- Is mortgage application in limit? (This checkbox is highlighted with an orange 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**;

The screenshot shows a KIE Task Inbox interface. At the top, there's a navigation bar with 'KIE IDE' and 'Menu'. Below it is a breadcrumb trail 'Home > Task Inbox'. The main area is titled 'Task Inbox' with a subtitle 'Active filters: Status: Ready, InProgress, Reserved'. A table lists one task:

Task	Process Definition Id	Status	Created On	Actions
Final Approval	Mortgage_Process.MortgageApprovalProcess	Ready	21-Feb-2019 12:00:11	

At the bottom left, it says '10 items'. On the right, there are icons for search, refresh, and help, along with 'Save Filters | Clear All'.

- 8) [ Task Inbox: **Final Approval** ] Click to view the task details. The purpose of this business task is for final approval from credit risk manager before mortgage loan disbursement. (Human business user has final say/decision.)

This screenshot is identical to the one above, but the row for 'Final Approval' is highlighted with a blue background, indicating it is selected or being viewed.

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

KIE IDE Home > Task Inbox > Task: 2  
2 - Final Approval

Work Details Assignments Comments Admin Logs

Inputs:

Application

Mortgage amount: 200000

Down Payment: 50000 Years of amortization: 20

Applicant

Name: D. Di

Annual Income: 123456

SSN: 0

Property

Age of property: 3

Address of property: 25 HDBT, Singapore

Locale: Urban

Sale Price: 250000

Intimit

**Claim**

KIE IDE Home > Task Inbox > Task: 2  
2 - Final Approval

Work Details Assignments Comments Admin Logs

Inputs:

Application

Mortgage amount: 200000

Down Payment: 50000 Years of amortization: 20

Applicant

Name: D. Di

Annual Income: 123456

SSN: 0

Property

Age of property: 3

Address of property: 25 HDBT, Singapore

Locale: Urban

Sale Price: 250000

Intimit

**Release** **Start**

KIE IDE

Home > Task Inbox > Task: 2

2 - Final Approval

Work Details Assignments Comments Admin Logs

Inputs:

Application

Mortgage amount: 200000

Down Payment: 50000 Years of amortization: 20

Applicant

Name: D. Di

Annual Income: 123456

SSN: 0

Property

Age of property: 3

Address of property: 25 HNKLT, Singapore

Locale: Urban

Sale Price: 250000

Initiator:  Save  Release  Complete

KIE IDE

Home > Task Inbox

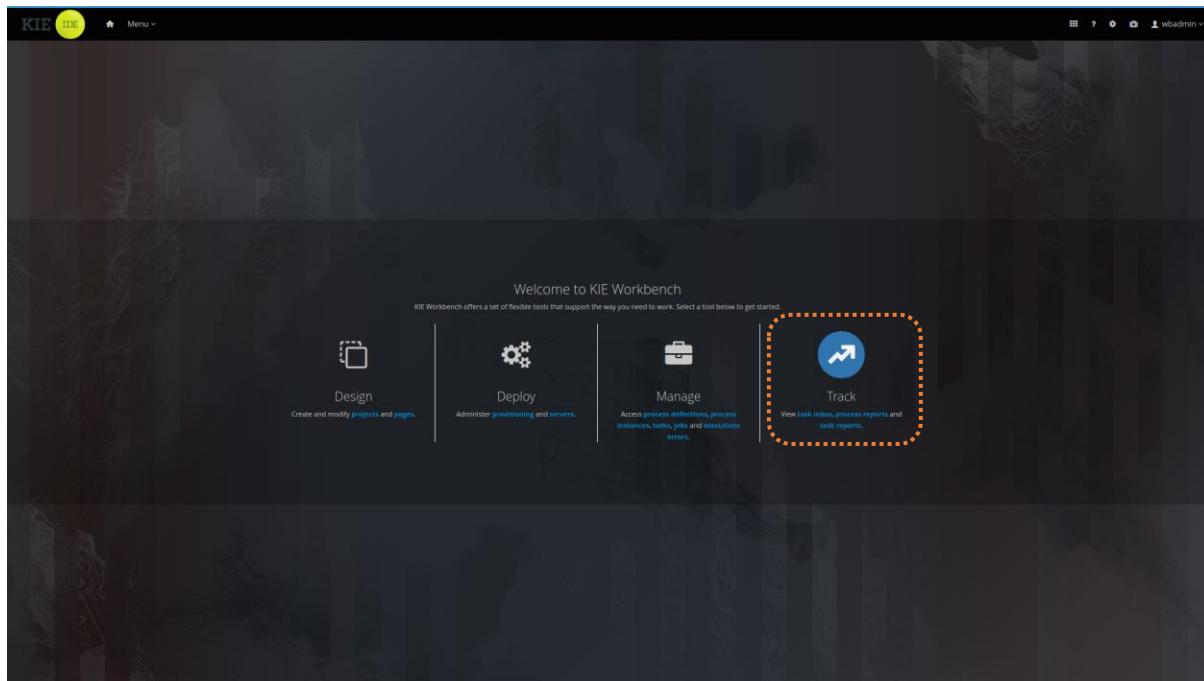
Task Inbox

Active filters: Status: Ready InProgress Reserved

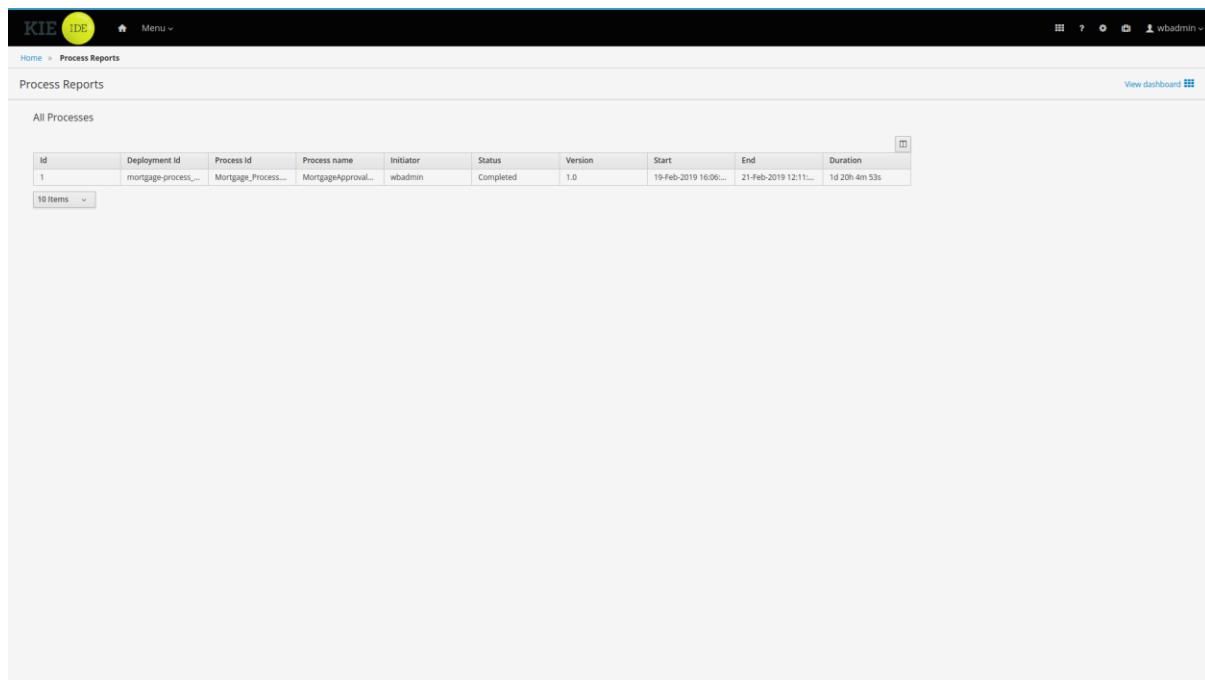
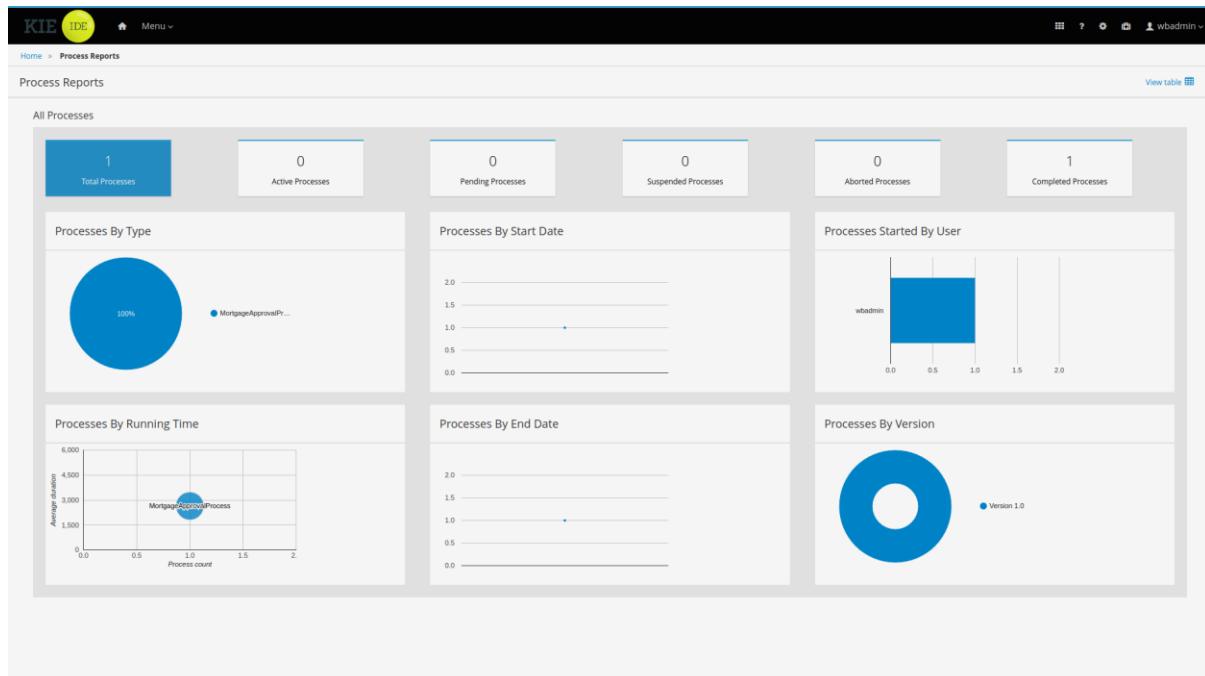
Task	Process Definition Id	Status	Created On	Actions
No tasks found.				

10 items   0 of 0

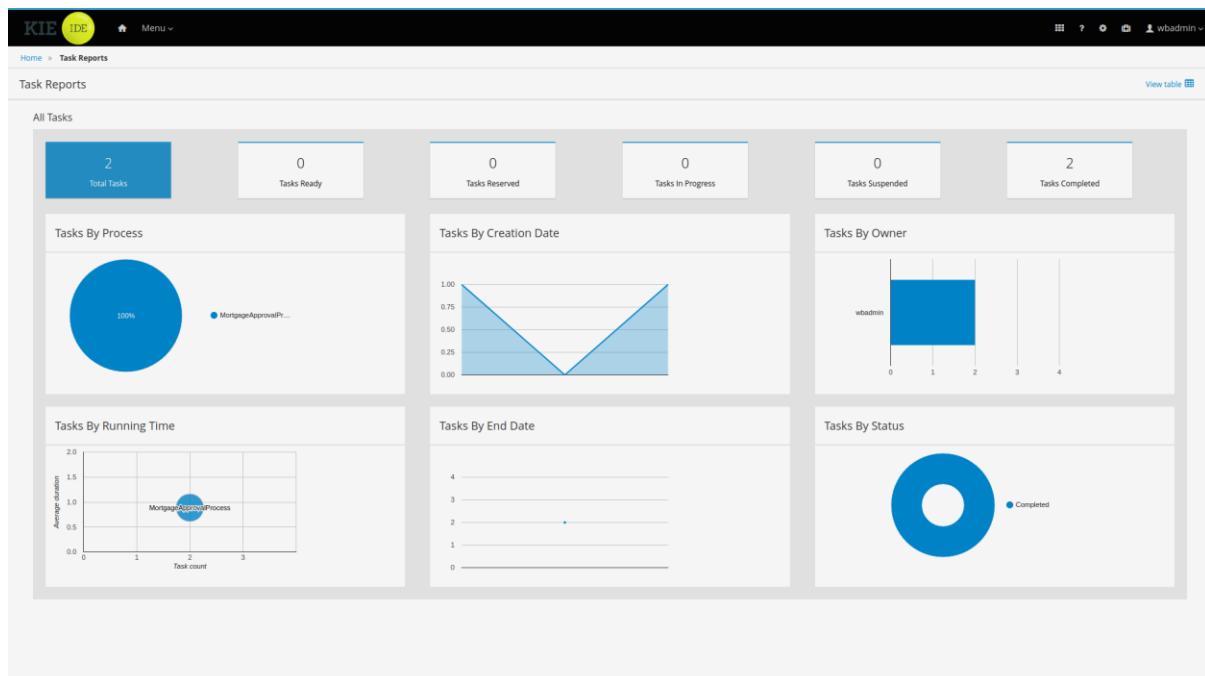
10) Go back to main menu; Let's look at: **Track**



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



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



The screenshot shows the KIE IDE Task Reports dashboard with the following table of completed tasks:

ID	Process	Process Instance Id	Task	Owner	Status	Start	End	Duration	Deployment Id
2	MortgageApproval...	1	Final Approval	wbadmin	Completed	21-Feb-2019 12:00:00	21-Feb-2019 12:11:11	11m 13s	mortgage-process_...
1	MortgageApproval...	1	Qualify	wbadmin	Completed	19-Feb-2019 16:06:00	21-Feb-2019 12:00:00	1d 19h 53m 38s	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 KIE IDE interface with the 'MortgageApprovalProcess' window open. The 'Down Payment' field is highlighted with a red dashed border, containing the value '0'. The 'Years of amortization' field contains '20'. Other fields include 'Name' (placeholder), 'Annual Income' (123456), 'SSN' (placeholder), 'Property' (Age of property: 3, Address of property: 25 HMTK, Singapore, Locale: Urban, Sale Price: 250000), and a 'Submit' button at the bottom.

KIE JBoss BPM Server Home > Manage Process Definitions > Process Instance: 2

2 - MortgageApprovalProcess

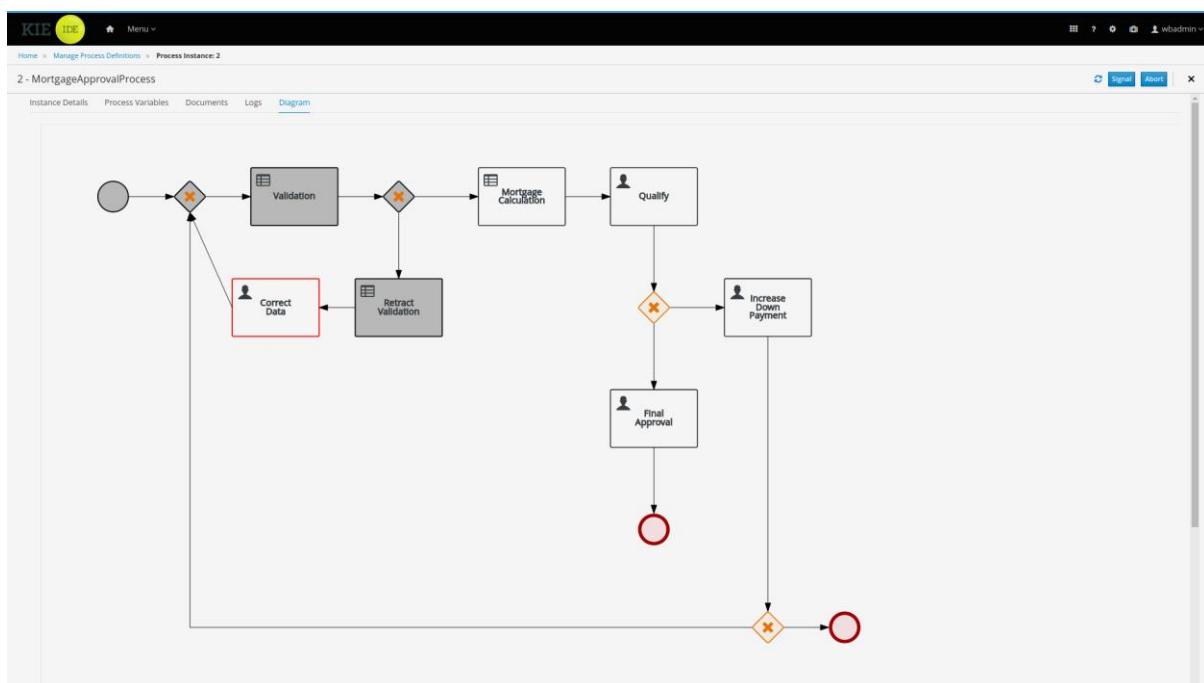
Instance Details Process Variables Documents Logs Diagram

Definition Id: Mortgage\_Process.MortgageApprovalProcess  
 Instance State: Active  
 Deployment: mortgage-process\_2.0.0-SNAPSHOT  
 Definition Version: 1.0  
 SLA Compliance: N/A  
 Correlation key: 2

Parent Process Instance: No Parent Process Instance

Active user tasks: Correct Data (Ready owner: wbadmin)

Current Activities: Thu Feb 21 12:41:37 SGT 2019:5 - Correct Data (HumanTaskNode)



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

The screenshot shows the KIE IDE interface with the title bar "KIE IDE". The main area is titled "Task Inbox". On the left, there is a "Filters" panel with a "Status" dropdown containing several options like Completed, Created, Error, Failed, InProgress, Obsolete, Ready, Reserved, and Suspended. The "Ready" option is checked. Below the filters are sections for "Filter By" (Id, Filter By Id...), "Process Definition Id" (Select), and "Created On" (Created On...). The main table lists one task:

Task	Process Definition Id	Status	Created On	Actions
Correct Data	Mortgage_Process.MortgageApprovalProcess	Ready	21-Feb-2019 12:41:37	

At the bottom of the table, it says "10 Items" and has navigation buttons.

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

The screenshot shows the KIE IDE interface with the title bar "KIE IDE". The main area is titled "3 - Correct Data". The top navigation bar includes "Work", "Details", "Assignments", "Comments", "Admin", and "Logs". The "Work" tab is selected. The page displays various input fields grouped into sections: "Outputs: Application", "Error details" (with an error message about down payment), "Years of amortization" (set to 20), "Applicant" (Name: Li Li, Annual Income: 123456, SSN: 0), "Property" (Age of property, Address of property: 25 HMT, Singapore, Location: Urban, Sale Price: 250000), and a "Claim" button at the bottom.

The screenshot shows a web-based application interface for 'KIE' (Knowledge Integration Environment). The title bar includes the KIE logo, a menu icon, and the user 'wadmin'. The main navigation bar has links for 'Home', 'Task Index', and 'Task: 3'. Below this, a sub-menu for '3 - Correct Data' is shown with tabs for 'Work', 'Details', 'Assignments', 'Comments', 'Admin', and 'Logs'. The main content area is divided into several sections:

- Outputs:** Application
- Error details:** Down payment cannot be 0, greater than, or equal to the property sale price.
- Applicant:** Name (D. D.), Annual Income (123456), SSN (0).
- Property:** Age of property (3), Address of property (25 HMT, Singapore), Locale (Urban), Sale Price (250000), and two buttons: 'Release' and 'Start'.

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

KIE IDE

Home > Task Inbox > Task: 3

3 - 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 0 Years of amortization 20

Applicant

Name Di Di

Annual Income 123456

SSN 0

Property

Age of property 3

Address of property 25 HMTK, Singapore

Locale

Urban

Sale Price 250000

Save Release Complete

KIE IDE

Home > Task Inbox > Task: 3

3 - 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 60000 Years of amortization 20

Applicant

Name Di Di

Annual Income 123456

SSN 0

Property

Age of property 3

Address of property 25 HMTK, Singapore

Locale

Urban

Sale Price 250000

Save Release Complete

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

The screenshot shows the KIE IDE Task Inbox interface. The title bar includes the KIE IDE logo and a menu. The main area displays a table titled "Task Inbox" with one item listed:

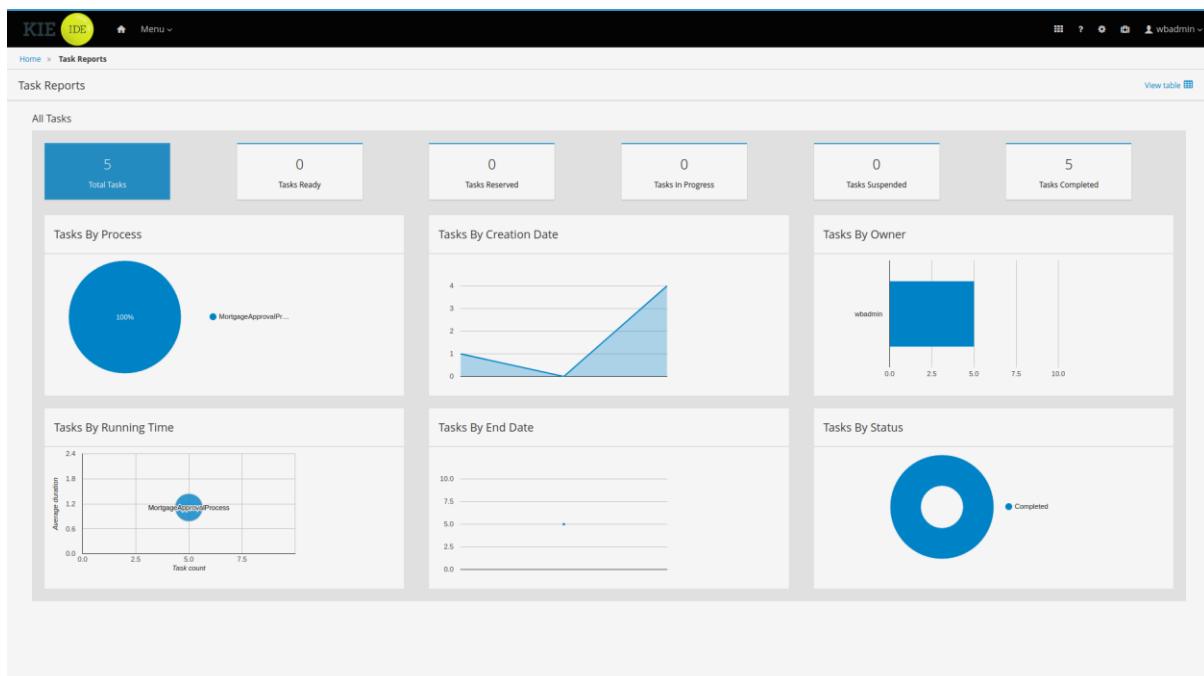
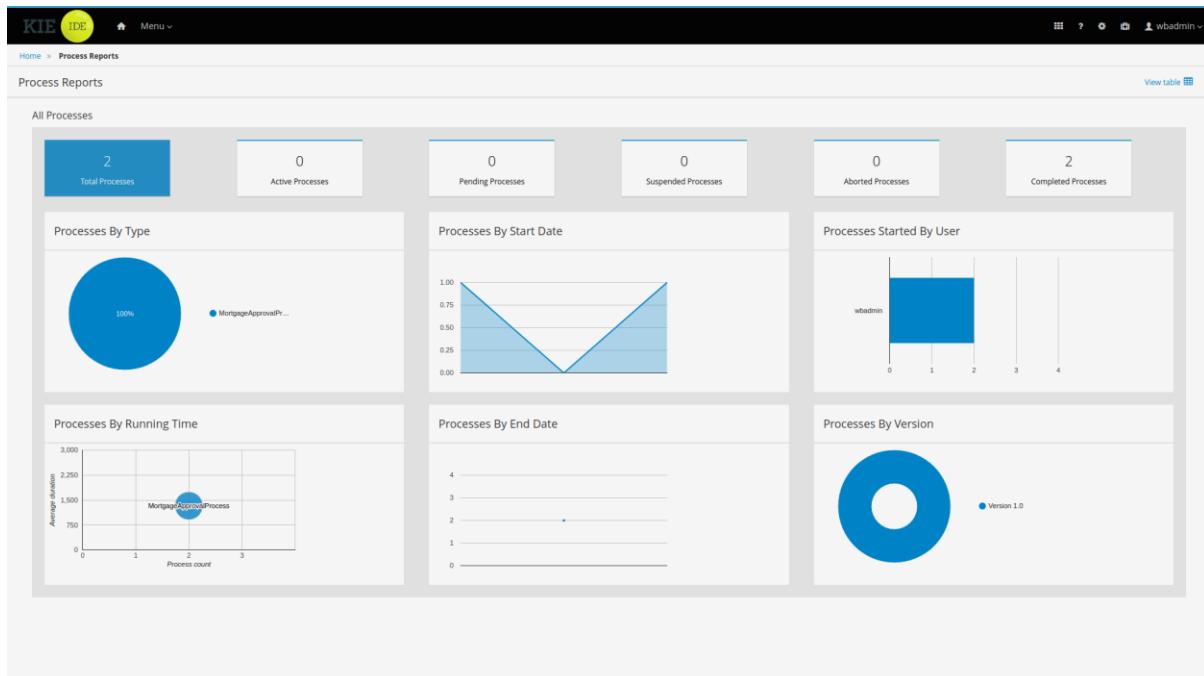
Task	Process Definition Id	Status	Created On	Actions
Qualify	Mortgage_Process.MortgageApprovalProcess	Ready	21-Feb-2019 12:49:03	[View]

Below the table, there are buttons for "Save Filters" and "Clear All", and a page navigation section showing "1 of 1".

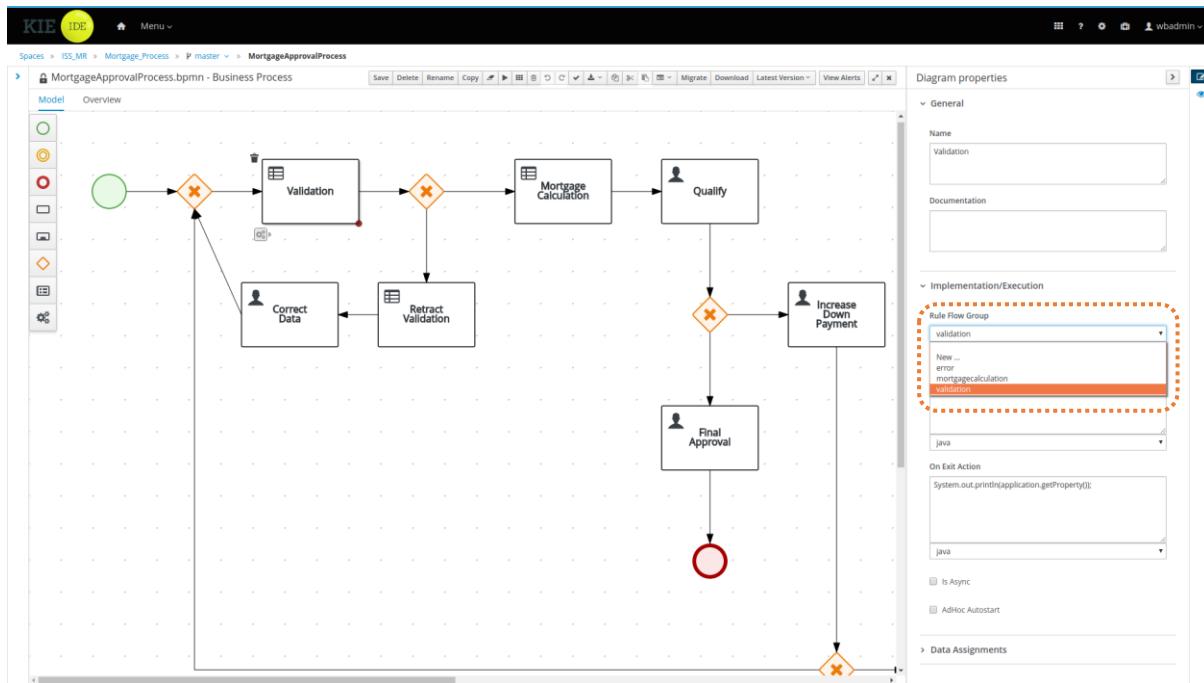
The screenshot shows the KIE IDE Task Inbox interface. The title bar includes the KIE IDE logo and a menu. The main area displays a table titled "Task Inbox" with one item listed:

Task	Process Definition Id	Status	Created On	Actions
Final Approval	Mortgage_Process.MortgageApprovalProcess	Ready	21-Feb-2019 12:52:04	[View]

Below the table, there are buttons for "Save Filters" and "Clear All", and a page navigation section showing "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 import java.lang.Number;
3 rule "Validate Down Payment"
4 dialect "mvel"
5 ruleFlow-group "validation"
6 when
7   app : Application( downpayment == 0 || downpayment >= app.property.saleprice )
8 then
9   ValidationException fact0 = new ValidationException();
10  fact0.setError("Down payment cannot be 0, greater than, or equal to the property sale price.");
11  insert( fact0 );
12  System.out.println("Executed Rule: " + drools.getRule().getName() );
13  app.setErrors( fact0 );
14 end
15
16
17

```

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

- Project Explorer:** Shows the package structure: <default> > com > myspace > MortgageApprovalProcess.bpmn.
- Data Objects Tab:** Active tab. It displays a table of 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		<b>Remove</b>
- Information Panel:** A message states: "By default only Data Objects within the same package as the asset are available for authoring. Additional Data Objects can be imported from other packages."

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

- Project Explorer:** Shows the package structure: <default> > com > myspace > MortgageApprovalProcess.bpmn.
- Overview Tab:** Active tab. It displays the following information for the rule:
 

Type	Guided Rules
Description	No description yet - what does this asset do?
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
- Comments:** A panel on the right side of the screen.

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

Rule 1: WHEN

THEN

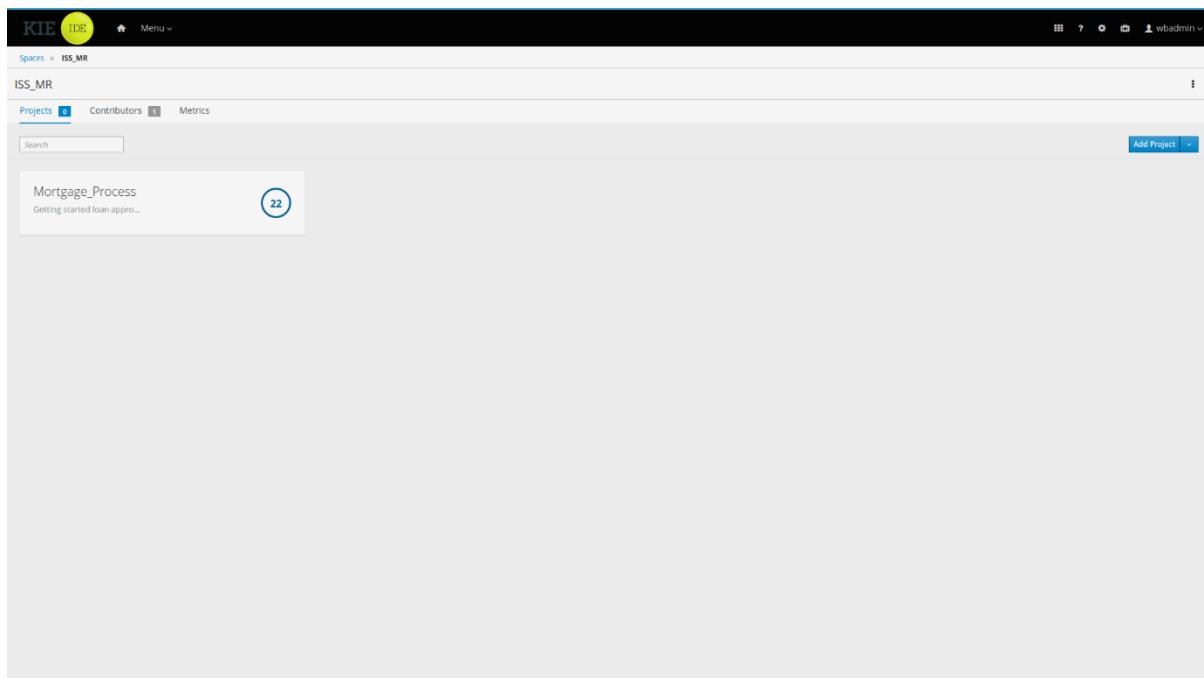
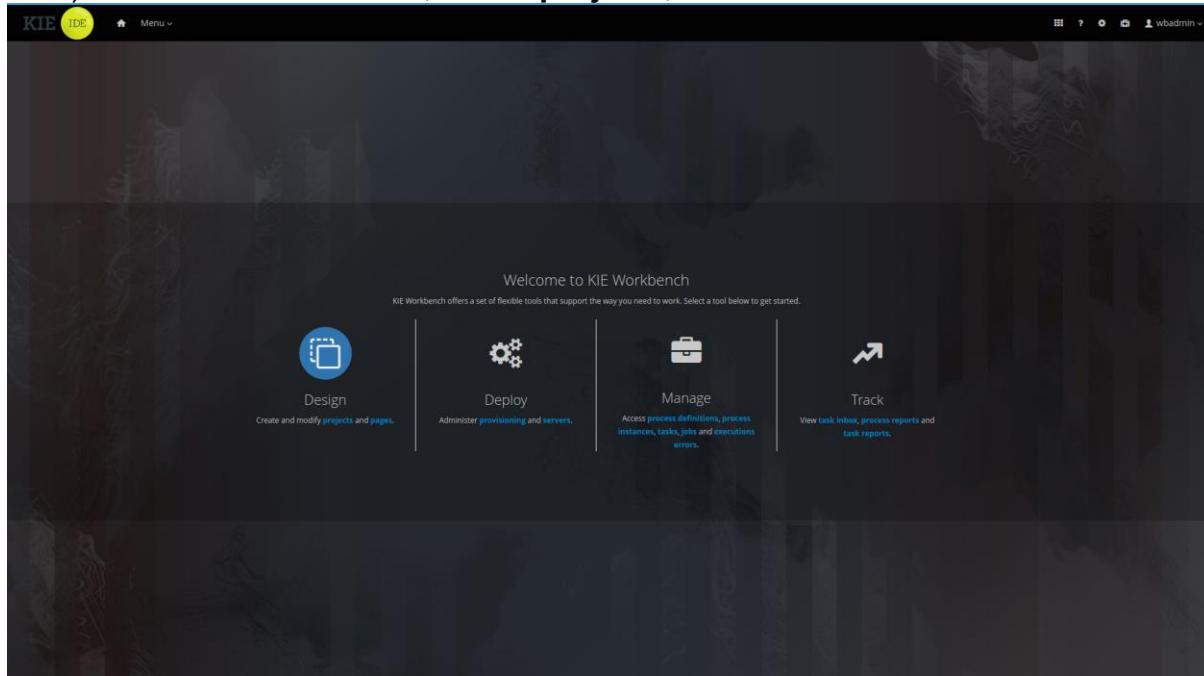
Rule 2: WHEN

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;**

The screenshot shows a list of assets in the KIE IDE. The assets are:

- ApplicationMortgage (Forms, Last modified 1 day ago, Created 1 day ago)
- ApplicationMortgage (Forms, Last modified 1 day ago, Created 1 day ago)
- CorrectData-taskform (Forms, Last modified 1 day ago, Created 1 day ago)
- FinalApproval-taskform (Forms, Last modified 1 day ago, Created 1 day ago)
- IncreaseDownPayment-taskform (Forms, Last modified 1 day ago, Created 1 day ago)
- mortgage-app.MortgageApprovalProcess-taskform (Forms, Last modified 1 day ago, Created 1 day ago)
- Mortgage\_Process.MortgageApprovalProcess-taskform (Forms, Last modified 1 day ago, Created 1 day ago)
- MortgageApprovalProcess (Business Processes, Last modified 1 day ago, Created 1 day ago)
- MortgageDecisionTable** (src/main/resources/com/myspace/mortgage\_app/MortgageDecisionTable.gdst, Guided Decision Tables, Last modified 1 day ago, Created 1 day ago)
- Property (Forms, Last modified 1 day ago, Created 1 day ago)

The screenshot shows the MortgageDecisionTable.gdst guided decision table. The table has the following structure:

#	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 2<sup>nd</sup> rule's sequence number # 2, right click to select **Insert row below**; Close **Analysis** tab window;

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

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

- 4) [ Guided Decision Tables: **MortgageDecisionTable** ] Double click 3<sup>rd</sup> 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
1	mortgagecalculation	mortgagecalculation	\$100000	200000	300000
2	mortgagecalculation	mortgagecalculation	\$50000	99999	100000
3	mortgagecalculation	mortgagecalculation	\$10000	49999	

#	Description	ruleflow-group	Applicant Annual Income	Property	application
1	mortgagecalculation	mortgagecalculation	\$100000	200000	300000
2	mortgagecalculation	mortgagecalculation	\$50000	99999	100000
3	mortgagecalculation	mortgagecalculation	\$10000	49999	50000

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

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

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

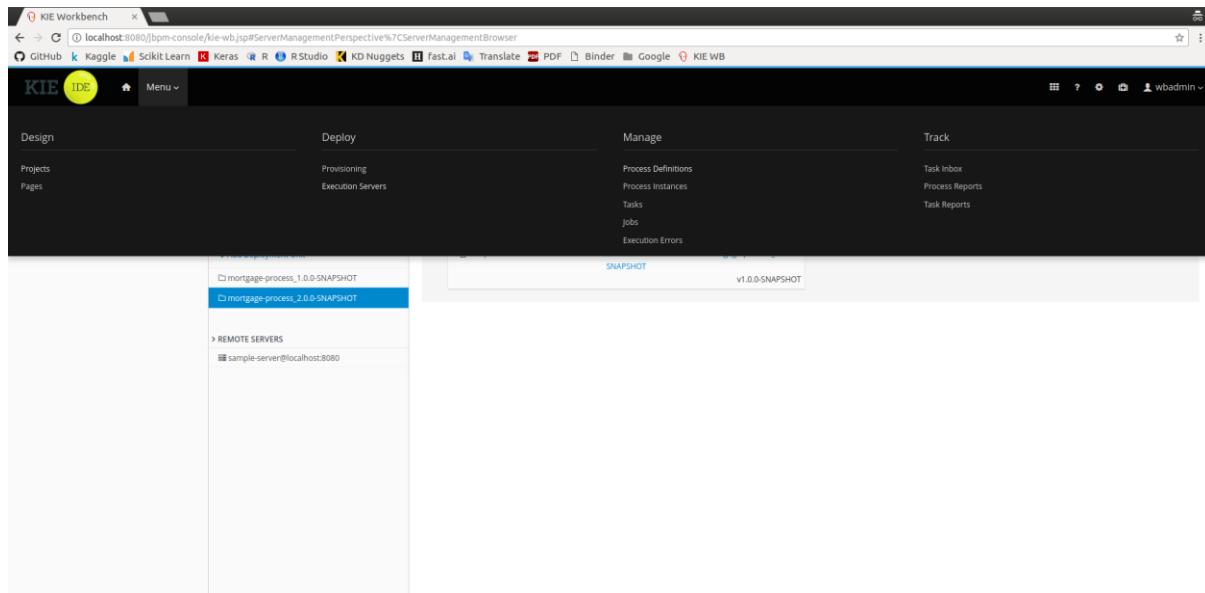
6) Go back to asset list view; Click button: **Deploy**; Update Deployment Unit

**Id\*: mortgage-process\_3.0.0-SNAPSHOT**; Click blue button **OK**

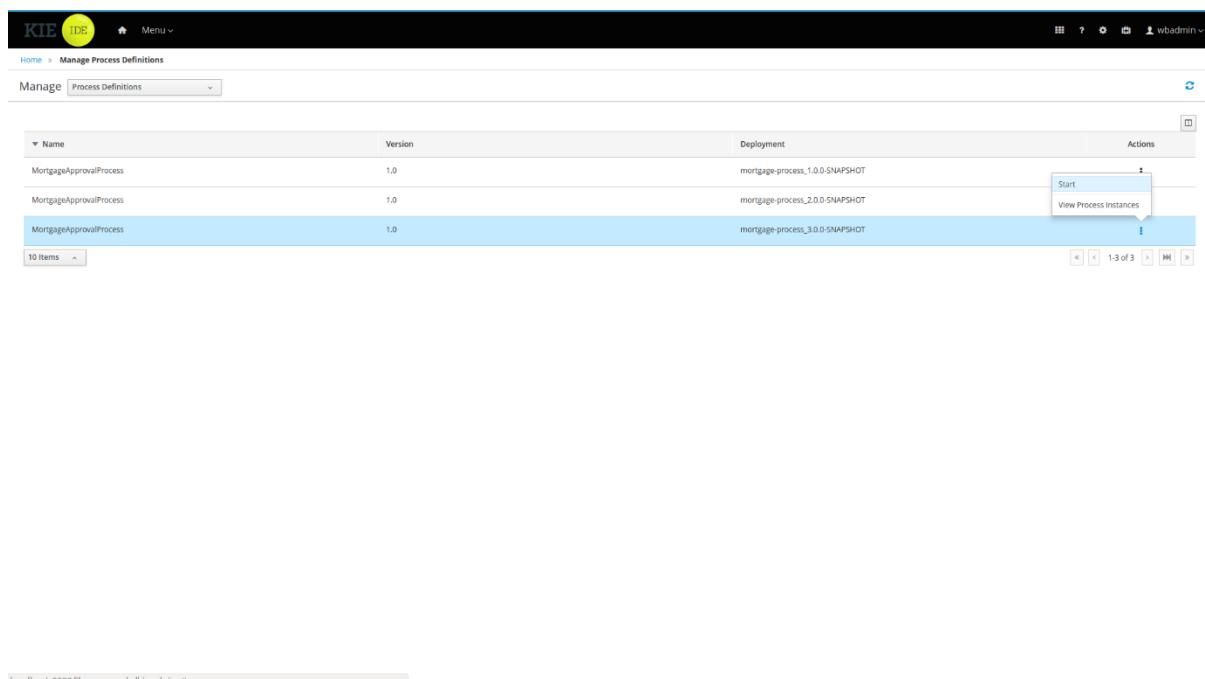
The screenshot shows the KIE IDE interface with the 'Mortgage\_Process' space selected. A modal dialog titled 'Build & Deploy' is open. In the 'Deployment Unit Id' field, the value 'mortgage-process\_3.0.0-SNAPSHOT' is entered. In the 'Deployment Unit Alias' field, the value 'mortgage-process' is entered. The 'Start Deployment Unit?' checkbox is checked. At the bottom right of the dialog, there is a blue 'OK' button, which is highlighted with a red box.

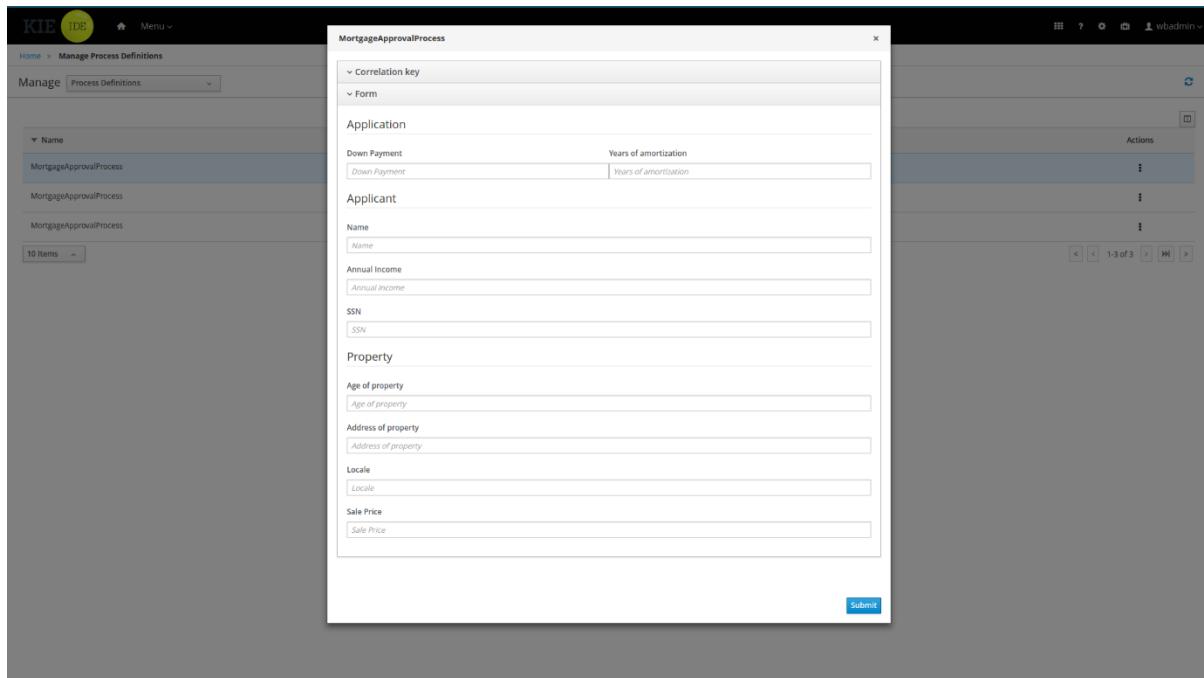
The screenshot shows the KIE IDE interface with the 'mortgage-process' deployment unit selected. On the left, the 'SERVER CONFIGURATIONS' sidebar shows 'sample-server' is selected. The main panel displays the 'mortgage-process' deployment unit status. The 'Status' tab is active, showing the deployment unit is running on 'sample-server@localhost:8080'. Below the status, the URL 'http://localhost:8080/kie-server/services/rest/server/containers/mortgage-process\_3.0.0-SNAPSHOT' and the version 'v1.0.0-SNAPSHOT' are listed.

- 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**



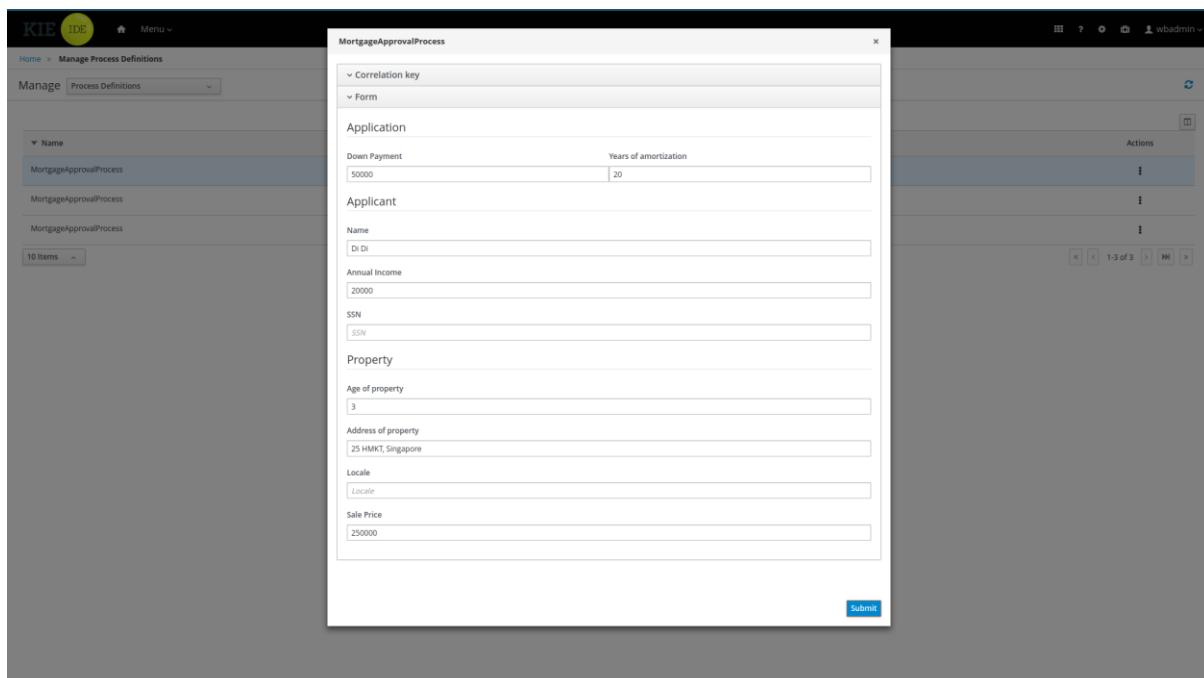
- 8) Select the mortgage system with intended version, e.g., ***mortgage-process\_3.0.0-SNAPSHOT***, then click: **Start**





The screenshot shows the KIE IDE interface with the 'MortgageApprovalProcess' form open. The 'Down Payment' field is empty and has a red border, indicating it is the current field being edited. Other fields like 'Years of amortization', 'Name', 'Annual Income', 'SSN', 'Age of property', 'Address of property', 'Locale', and 'Sale Price' are also visible.

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



The screenshot shows the KIE IDE interface with the 'MortgageApprovalProcess' form open. The 'Down Payment' field now contains '50000' and the 'Years of amortization' field contains '20'. The 'Annual Income' field now contains '20000'. The other fields remain empty or have their original placeholder values.

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 (Ready) owner: --  
 Current Activities: Thu Feb 21 15:36:09 SGT 2019:5 - Qualify (HumanTaskNode)

Signal    Abort    X

KIE IDE

Home > Manage Process Definitions > Process Instance: 3

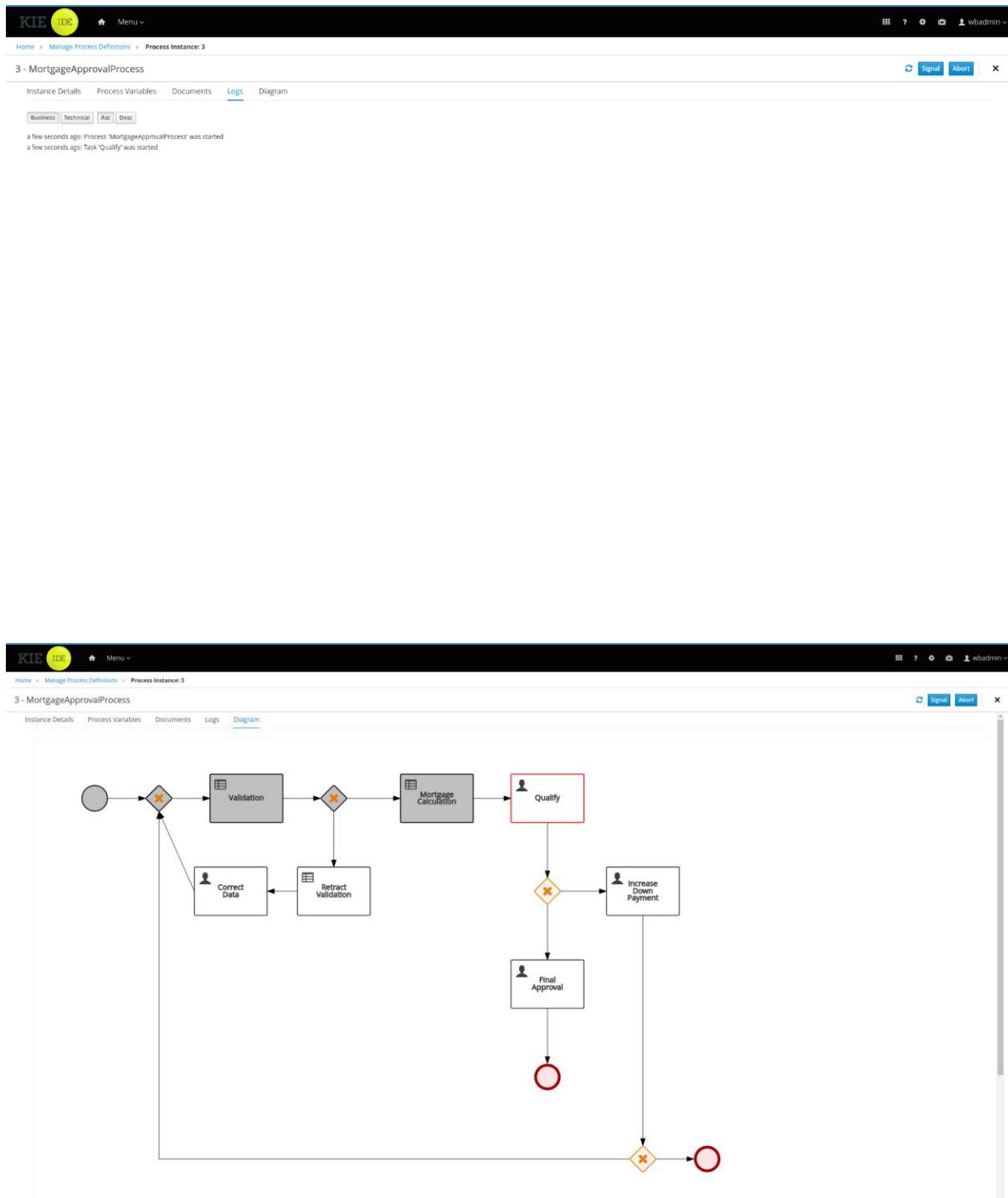
3 - MortgageApprovalProcess

Instance Details    Process Variables    Documents    Logs    Diagram

Process Variables:

Name	Value	Type	Last Modification	Actions
initiator	wbadmin		21-Feb-2019 15:36:09	Edit History
application	com.myspace.mortgage_app.Application@13c39906	com.myspace.mortgage_app.Application	21-Feb-2019 15:36:09	Edit History
inlimit		Boolean	21-Feb-2019 15:36:23	Edit History
incdownpayment		Boolean	21-Feb-2019 15:36:23	Edit History

10 Items    < < < 1-4 of 4 > > >



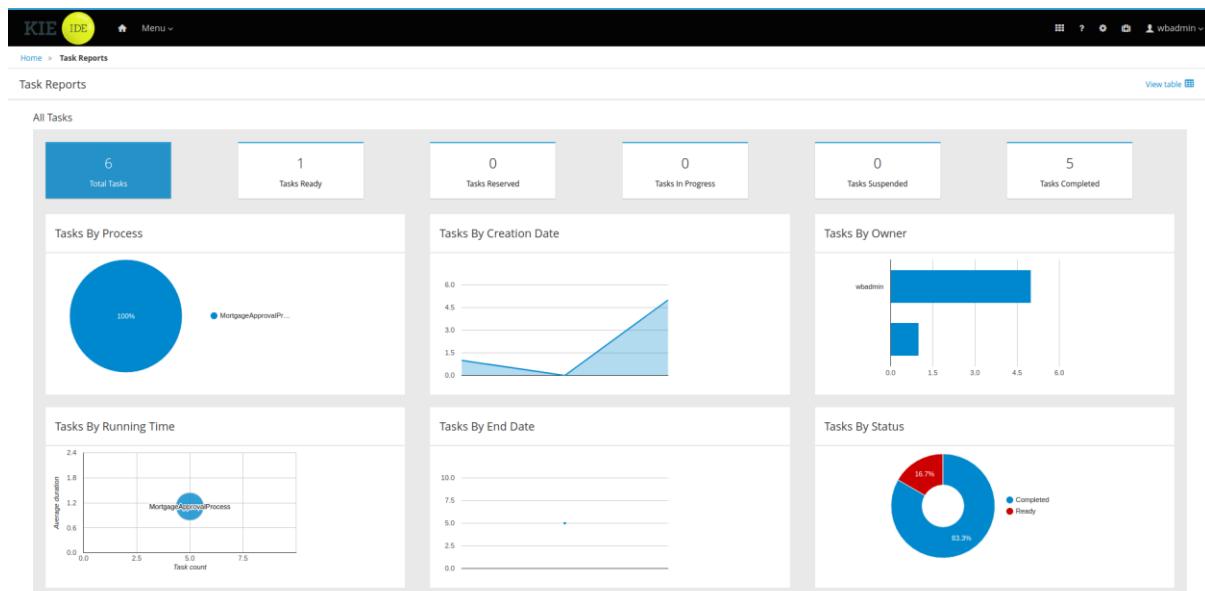
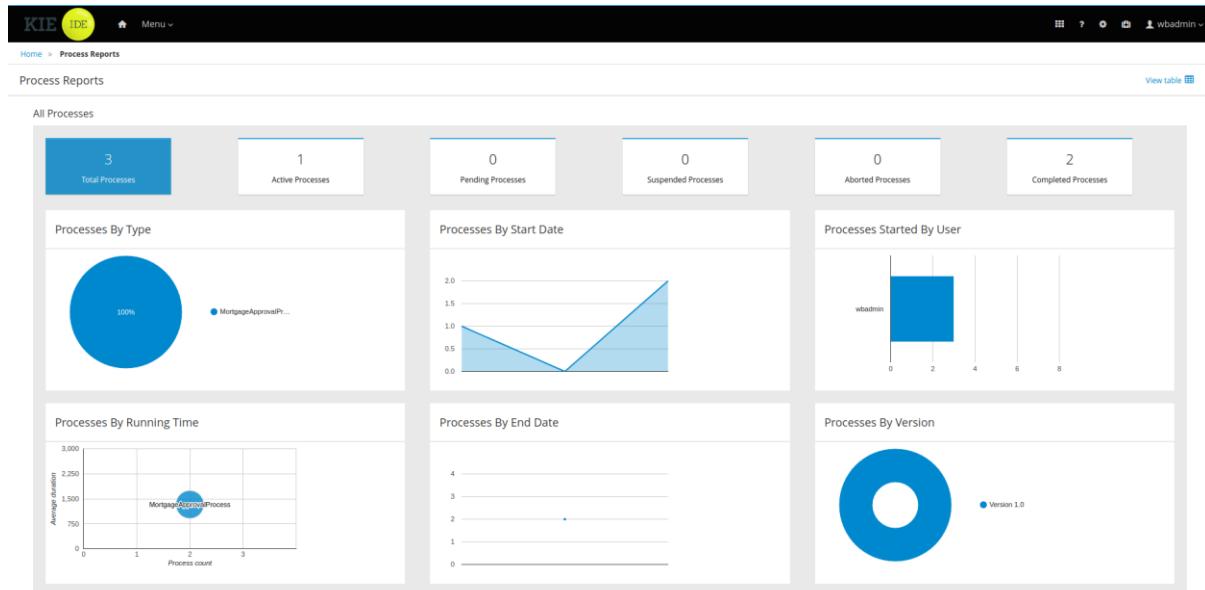
10) To review (pending user task: ***Qualify***) the mortgage application, click: **Menu** → **Task Inbox**

The screenshot shows the KIE Task Inbox interface. On the left, there is a sidebar with 'Filters' expanded, showing options like Status (Completed, Created, Error, Failed, InProgress, Obsolete, Ready, Reserved, Suspended), Filter By (Id, Filter By Id...), Process Definition Id (Select), and Created On (Created On...). The main area is titled 'Task Inbox' and shows a table with one row. The table columns are Task, Process Definition Id, Status, Created On, and Actions. The single row contains 'Qualify', 'Mortgage\_Process.MortgageApprovalProcess', 'Ready', '21-Feb-2019 15:36:09', and an 'Actions' button. At the top right of the main area, there are 'Save Filters' and 'Clear All' buttons.

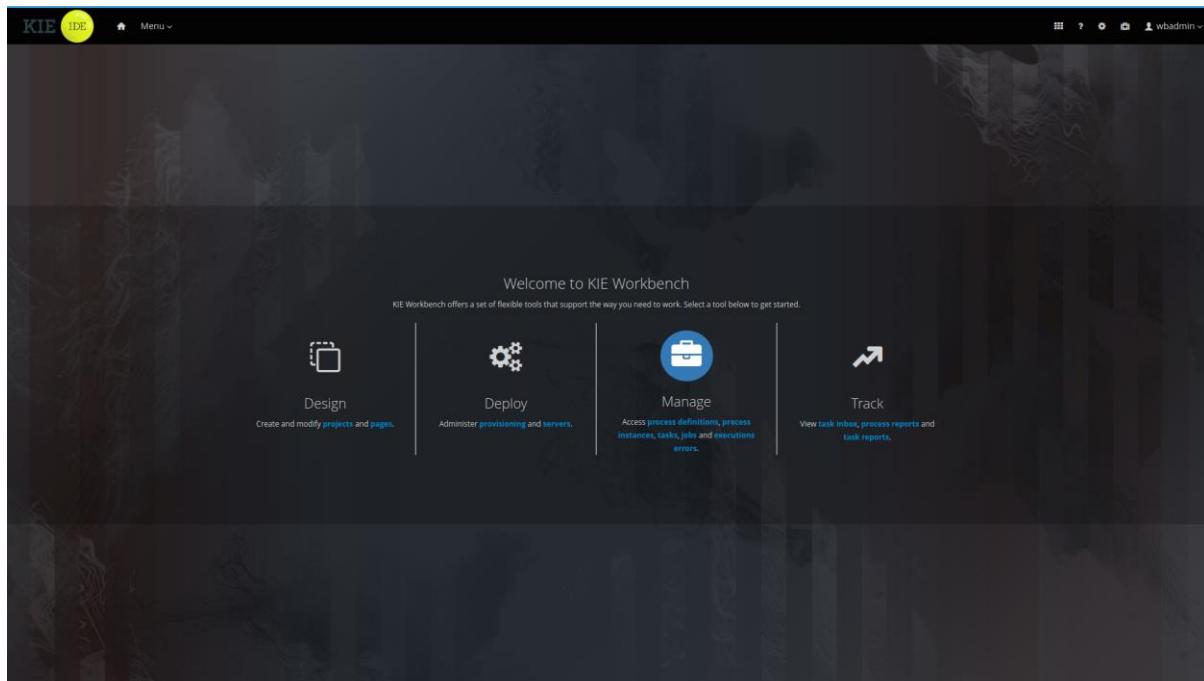
11)[ Task Inbox: ***Qualify*** ] Click to view the task details. Notice the **Mortgage amount** is now calculated as **\$50,000**.

The screenshot shows the task details for 'Qualify'. The top navigation bar includes 'Home', 'Task Inbox', 'Task: 6', 'Work', 'Details', 'Assignments', 'Comments', 'Admin', and 'Logs'. The main area is divided into sections: 'Inputs:' and 'Outputs:'. Under 'Inputs:', there are sections for 'Application' (with 'Mortgage amount' set to '\$50000') and 'Applicant' (with 'Name' set to 'D. Di'). There are also sections for 'Annual Income' (\$20000), 'SSN' (0), and 'Property' (with 'Age of property' (3), 'Address of property' (25 HDBKT, Singapore), 'Locale' (Locality), and 'Sale Price' (\$200000)). Under 'Outputs:', there is a checkbox 'Is mortgage application in limit?' and a 'Claim' button.

## 12) Have a look at **Process Reports** and **Task Reports**

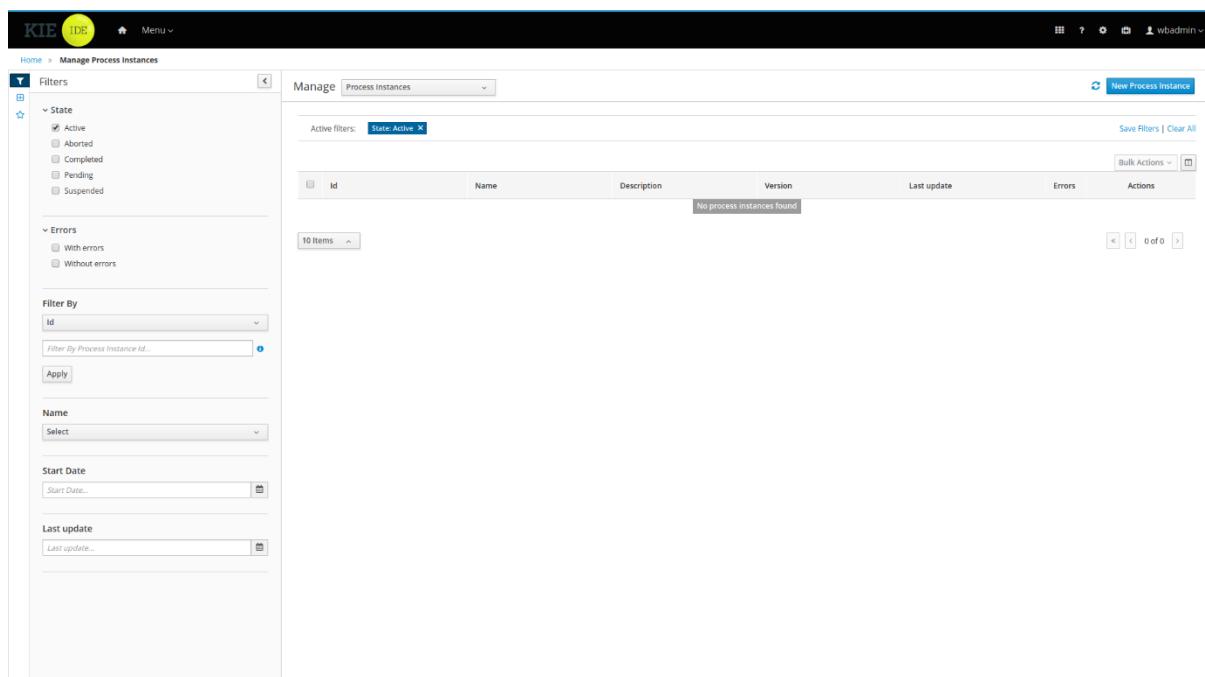
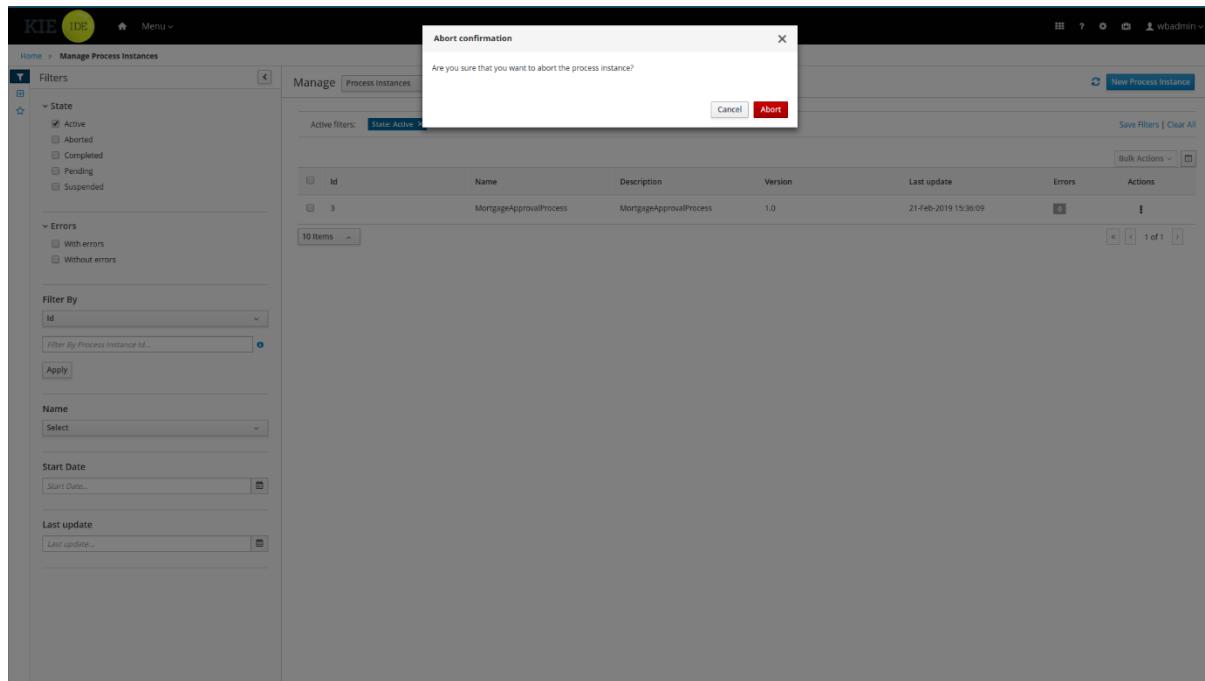


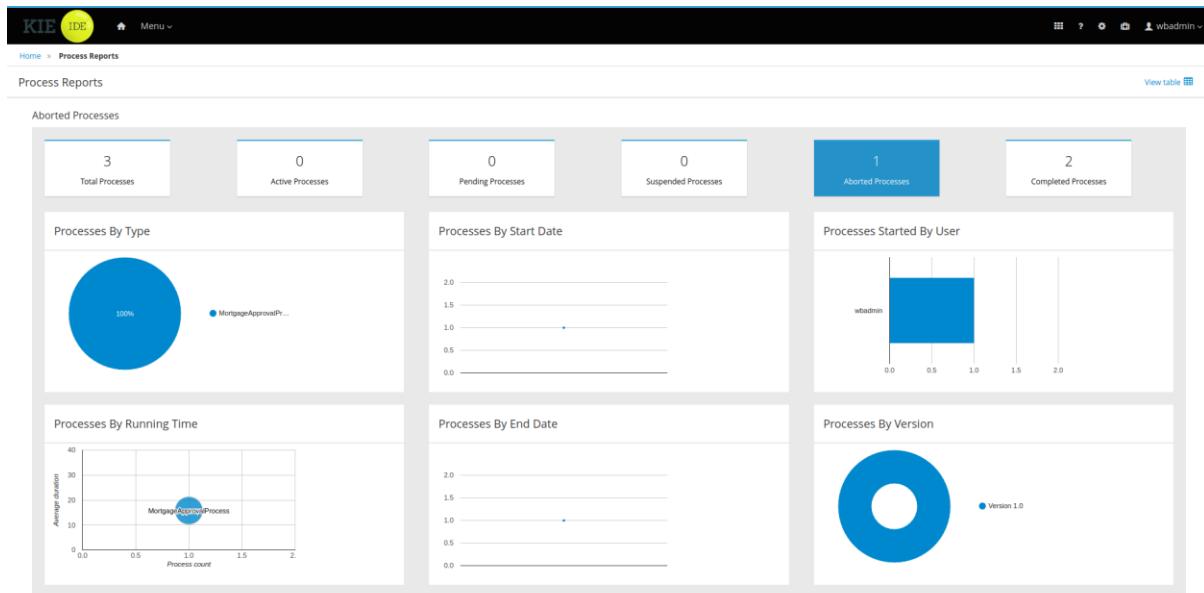
13) Abort/Cancel a process and its tasks: Go to main menu; Click **process instances**



This screenshot shows the "Manage Process Instances" screen within the KIE Workbench. On the left, there's a sidebar with filter options for "State" (Active, Aborted, Completed, Pending, Suspended) and "Errors" (With errors, Without errors). Below that are "Filter By" fields for "Id", "Name", "Start Date", and "Last update". The main area is titled "Manage" with a dropdown set to "Process Instances". It shows a table with one item: Id 3, Name MortgageApprovalProcess, Description MortgageApprovalProcess, Version 1.0, Last update 21-Feb-2019 15:36:09. To the right of the table are buttons for "Signal", "Abort", "View jobs", and "View tasks". A message box is open over the "Abort" button, showing the options "Abort" and "Cancel". The URL at the bottom of the browser is "localhost:8080/jbpm-console/kie-wb.jsp#".

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

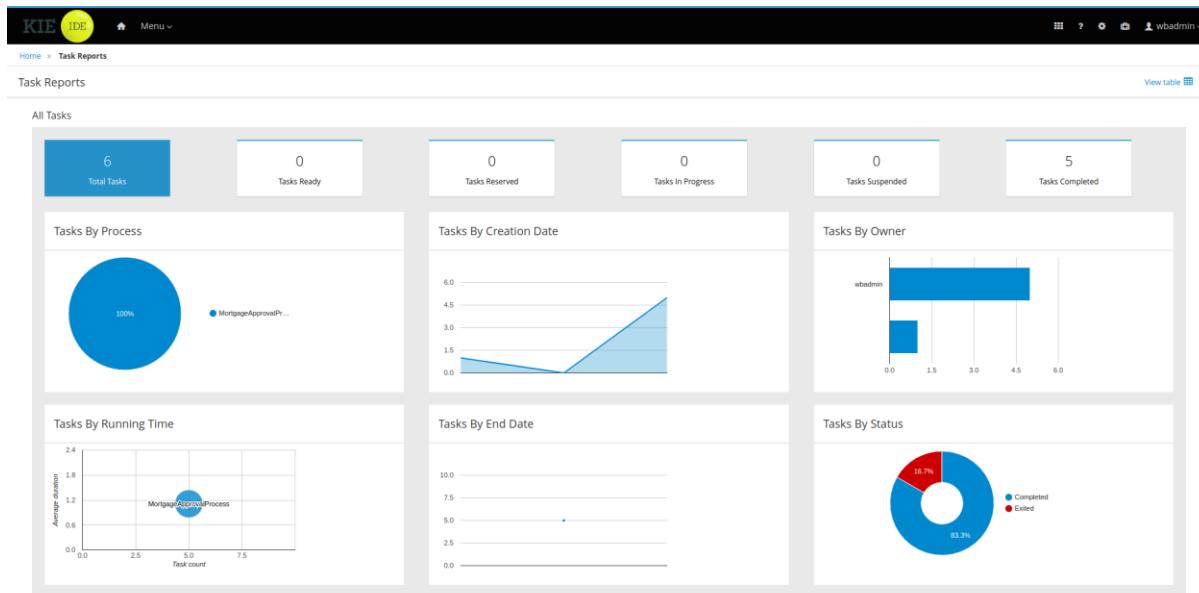




The table lists the following processes:

ID	Deployment Id	Process Id	Process name	Initiator	Status	Version	Start	End	Duration
3	mortgage-process_...	Mortgage_Process...	MortgageApproval...	wbadmin	Aborted	1.0	21-Feb-2019 15:36:...	21-Feb-2019 15:51:...	15m 47s
2	mortgage-process_...	Mortgage_Process...	MortgageApproval...	wbadmin	Completed	1.0	21-Feb-2019 12:41:...	21-Feb-2019 12:53:...	11m 39s
1	mortgage-process_...	Mortgage_Process...	MortgageApproval...	wbadmin	Completed	1.0	19-Feb-2019 16:06:...	21-Feb-2019 12:11:...	1d 20h 4m 53s

10 Items



The table view shows a list of process instances:

ID	Process	Process Instance Id	Task	Owner	Status	Start	End	Duration	Deployment Id
6	MortgageApprov...	3	Qualify	wbadmin	Exited	21-Feb-2019 15:3...	—	17m 16s	mortgage-process,3.0.0-SNAPSHOT
5	MortgageApprov...	2	Final Approval	wbadmin	Completed	21-Feb-2019 12:5...	21-Feb-2019 12:5...	1m 12s	mortgage-process,2.0.0-SNAPSHOT
4	MortgageApprov...	2	Qualify	wbadmin	Completed	21-Feb-2019 12:4...	21-Feb-2019 12:5...	3m	mortgage-process,2.0.0-SNAPSHOT
3	MortgageApprov...	2	Correct Data	wbadmin	Completed	21-Feb-2019 12:4...	21-Feb-2019 12:4...	7m 25s	mortgage-process,2.0.0-SNAPSHOT
2	MortgageApprov...	1	Final Approval	wbadmin	Completed	21-Feb-2019 12:0...	21-Feb-2019 12:1...	11m 13s	mortgage-process,2.0.0-SNAPSHOT
1	MortgageApprov...	1	Qualify	wbadmin	Completed	19-Feb-2019 16:0...	21-Feb-2019 12:0...	1d 19h 53m 38s	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

Y IRS-PM / Workshop-Project-Submission-Template  
forked from telescopeuser/Workshop-Project-Submission-Template

Code Pull requests 0 Projects 0 Insights

No description, website, or topics provided.

13 commits 1 branch 0 releases 1 contributor

Branch: master New pull request Find file Clone or download

This branch is 1 commit ahead of telescopeuser:master.

telescopeuser Merge pull request #1 from telescopeuser/master ...

Miscellaneous	Initial
ProjectReport	Initial
SystemCode/clips	Initial
UserGuide	Initial
README.md	updated readme

Clone with HTTPS ⓘ  
Use Git or checkout with SVN using the web URL.  
<https://github.com/IRS-PM/Workshop-Proje>

Open in Desktop Download ZIP 23 days ago 23 days ago 9 days ago

## 2.2. KIE BPMS/BRMS Business System Enhancement

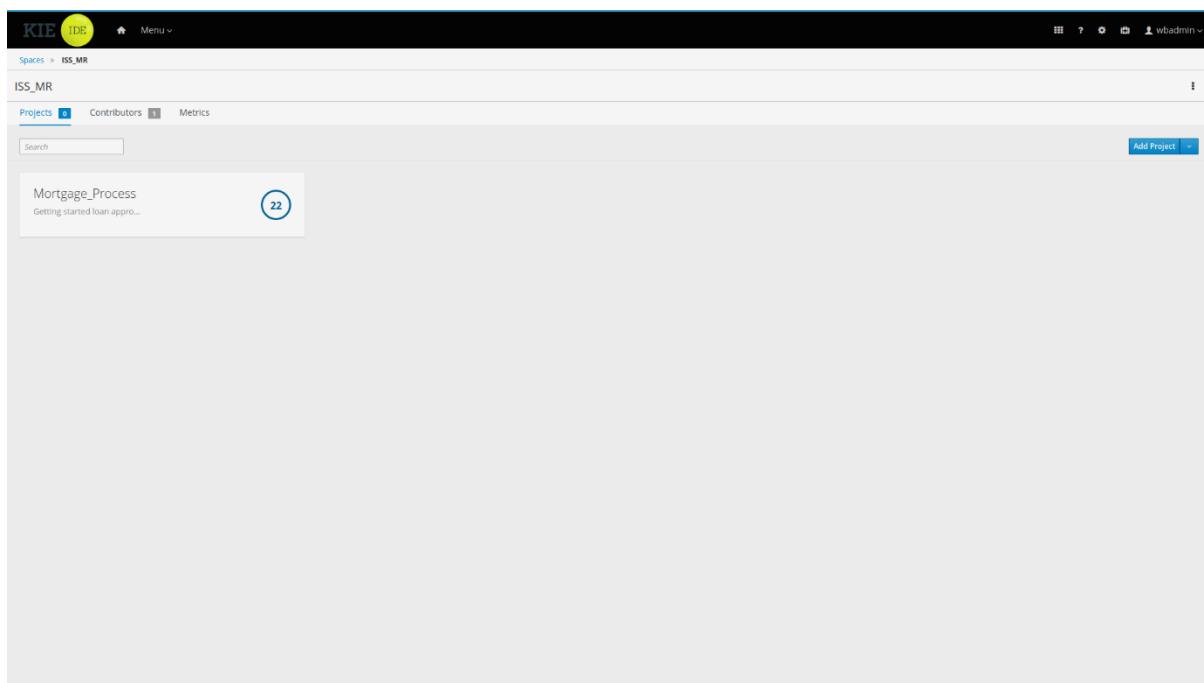
{ Objective } To enhance **Mortgage\_Process** system by adding new machine reasoning **Business Rule Task**, to automate the decision of **User Task: Qualify**;

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 Assets view. The navigation bar at the top includes 'Spaces > ISS\_MR > Mortgage\_Process > master'. The main area displays a table 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	
ApplicationError	Forms	Last modified today	Created 2 days ago	
ApplicationMortgage	Forms	Last modified today	Created 2 days ago	
ApplicationMortgage	Forms	Last modified today	Created 2 days ago	
CorrectData-taskform	Forms	Last modified today	Created 2 days ago	
FinalApproval-taskform	Forms	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 Data Objects view. The left sidebar lists various project components like Business Processes, Data Objects, Forms, etc. The main area shows the 'Application.java - Data Object' details. A 'New Field' dialog is open, prompting for the following information:

- Id\***: InlimitMR
- Label**: Inlimit Machine Reasoning
- Type\***: Boolean

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

The screenshot shows the KIE IDE Application Data Objects editor. On the left is a Project Explorer sidebar with categories like BUSINESS PROCESSES, DATA OBJECTS, FORMS, GUIDED DECISION TABLES, GUIDED RULES, and OTHERS. The central area displays a table titled 'Application.java - Data Objects' under the 'Model' tab. The table has columns: Identifier, Label, Type, and Actions (Delete). It contains several rows: amortization (Label: Years of amortization, Type: Integer), applicant (Label: Applicant, Type: Applicant), downpayment (Label: Down Payment, Type: Integer), errors (Label: Error details, Type: Validation Error), mortgageamount (Label: Mortgage amount, Type: Integer), property (Label: Property, Type: Property), and inlimitMR (Label: Inlimit Machine Reasoning, Type: Boolean). To the right of the table, there is a panel for 'inlimitMR' general properties with fields for Identifier, Label, Description, Type, and List. At the top right of the editor are buttons for Save, Delete, Rename, Copy, Validate, Download, Latest Version, and View Alerts.

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**

KIE IDE

Spaces > ISS\_MR > Mortgage\_Process > F master > Application

Project Explorer

**Application.java - Data Objects**

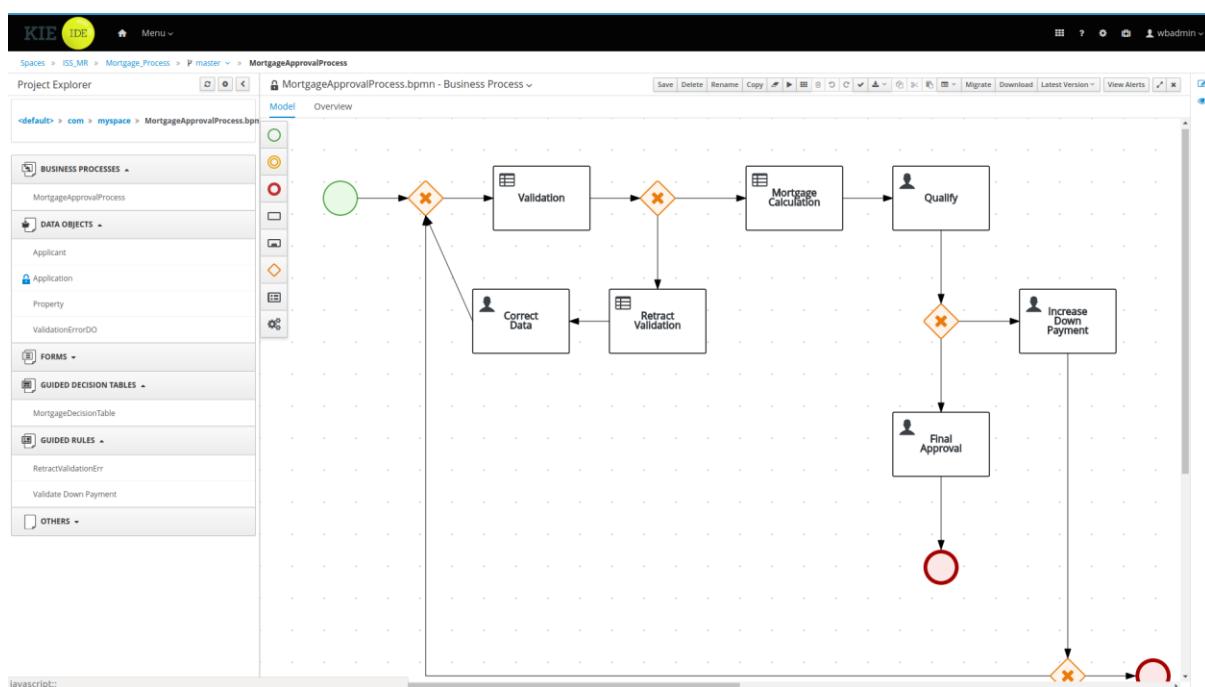
Model Overview Source

**Application**

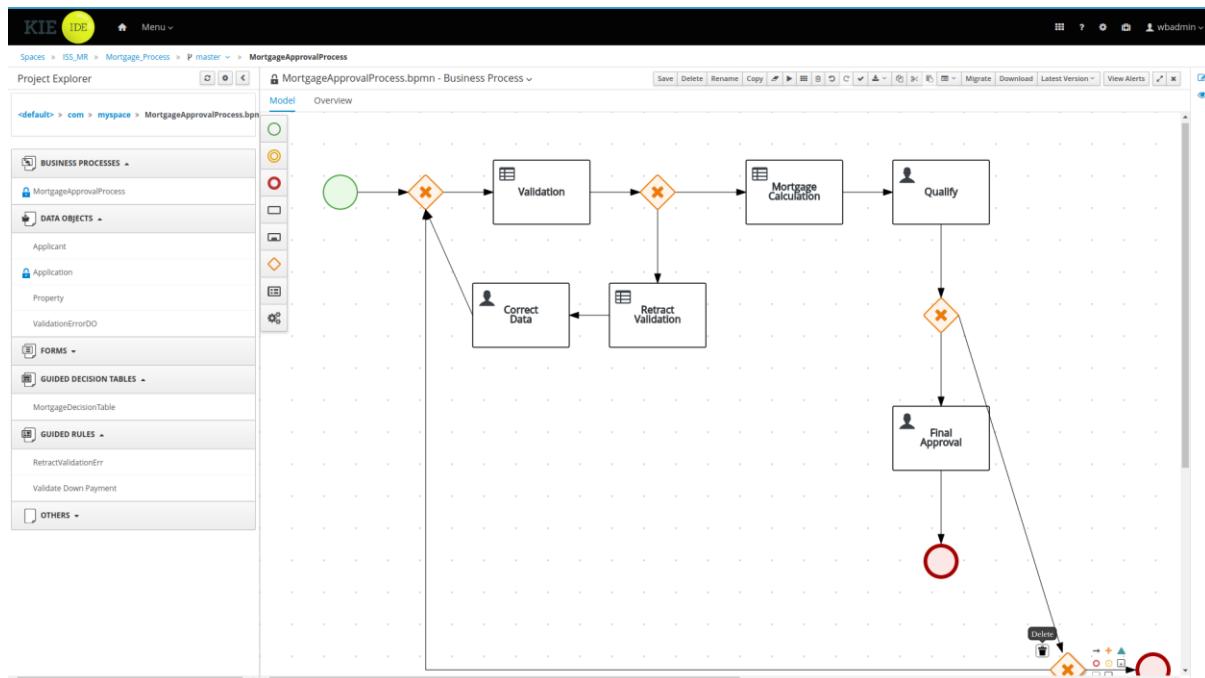
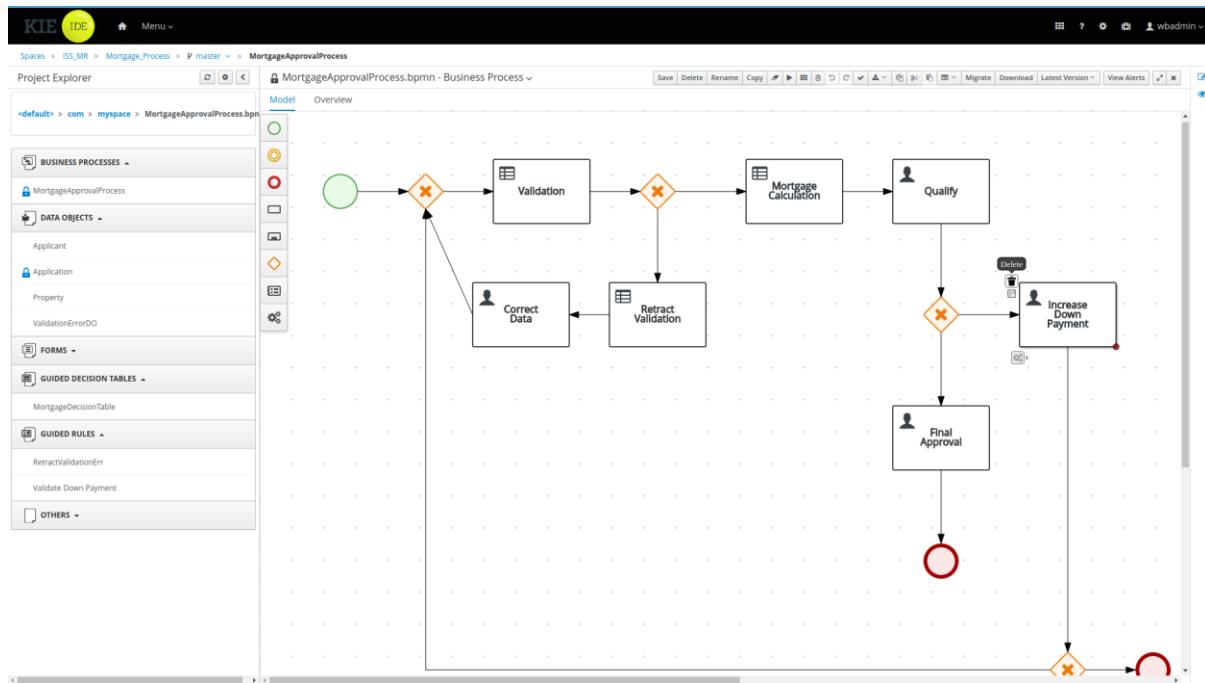
Identifier	Label	Type	Actions
amortization	Years of amortization	Integer	<input type="button" value="Delete"/>
applicant	Applicant	Applicant	<input type="button" value="Delete"/>
downpayment	Down Payment	Integer	<input type="button" value="Delete"/>
errors	Error details	Validation Error	<input type="button" value="Delete"/>
mortgageamount	Mortgage amount	Integer	<input type="button" value="Delete"/>
property	Property	Property	<input type="button" value="Delete"/>
inlimitMR	Inlimit Machine Reasoning	Boolean	<input type="button" value="Delete"/>

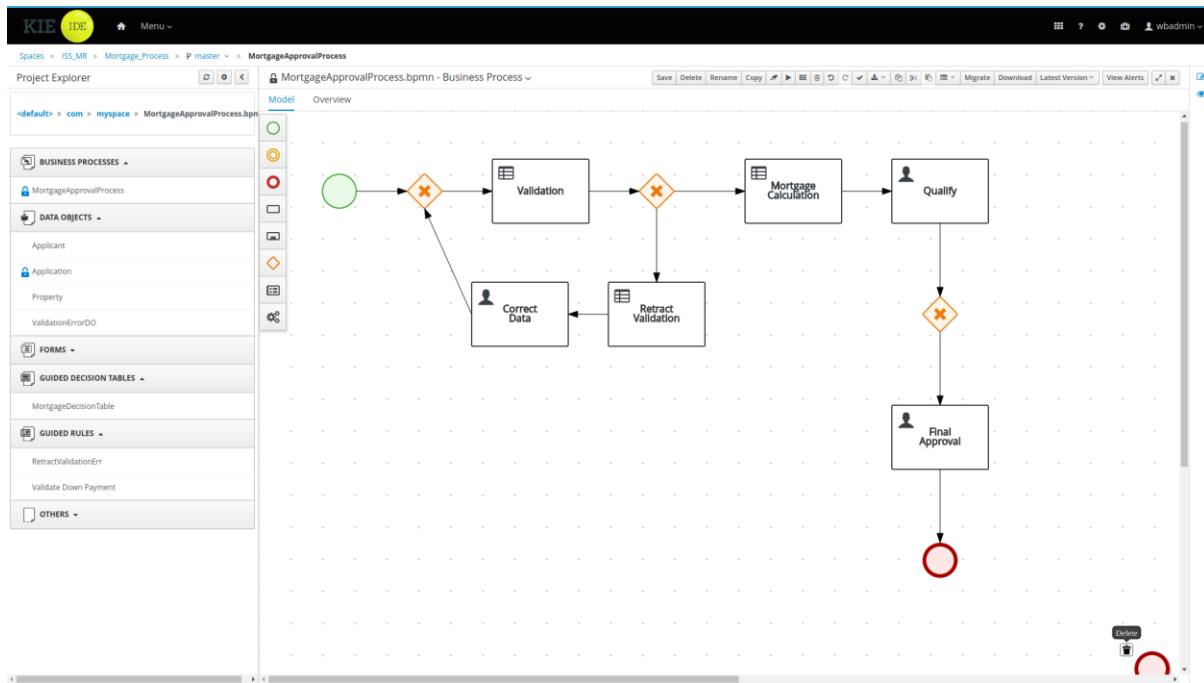
**'inlimitMR'- general properties**

Identifier	inlimitMR
Label	Inlimit Machine Reasoning
Description	
Type	Boolean
List	

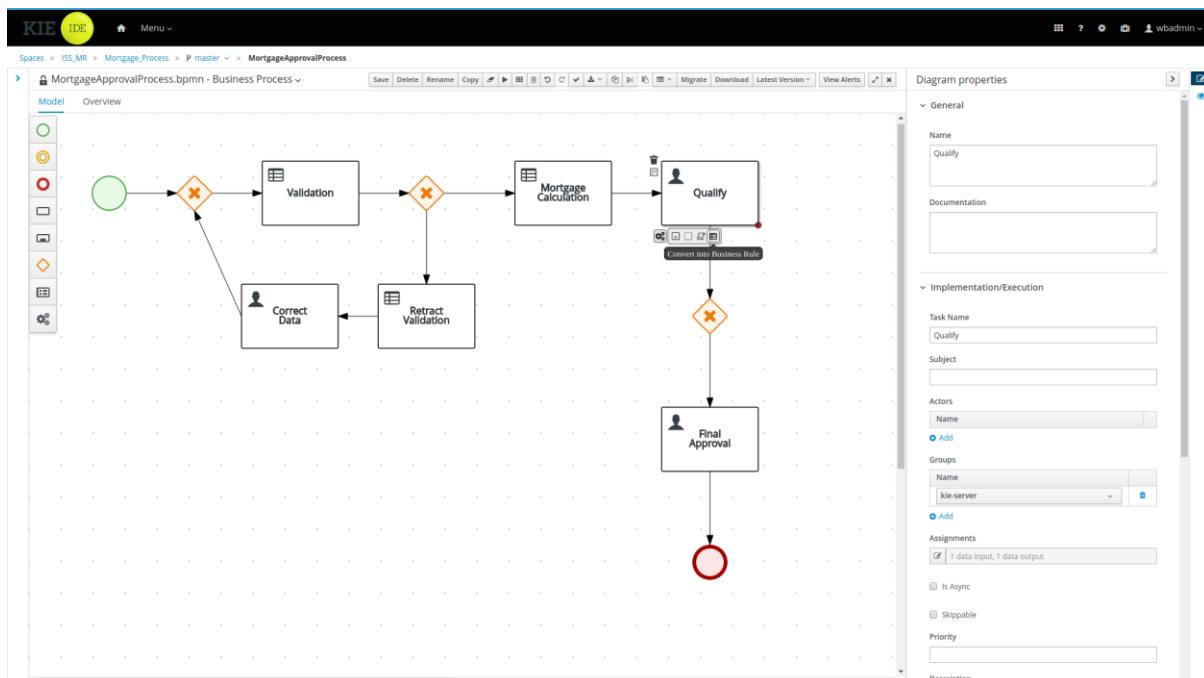


- 2) Edit business process: Delete ***Increase Down Payment*** and few other not to be used process nodes, e.g. end node, links;

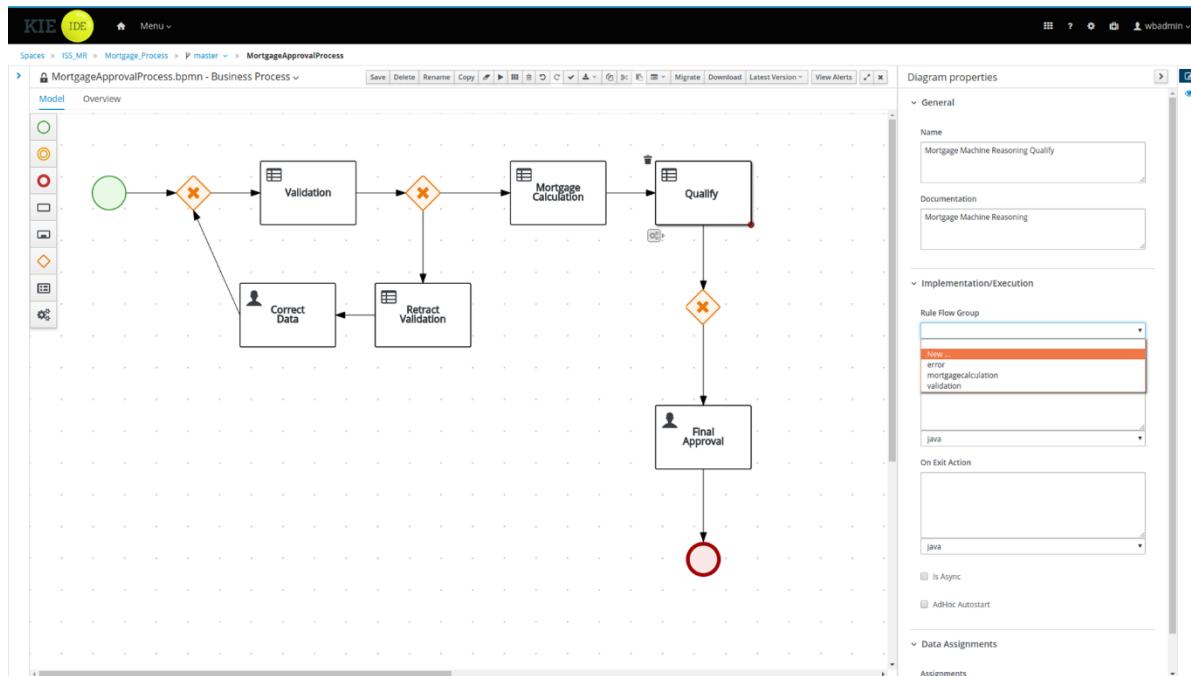




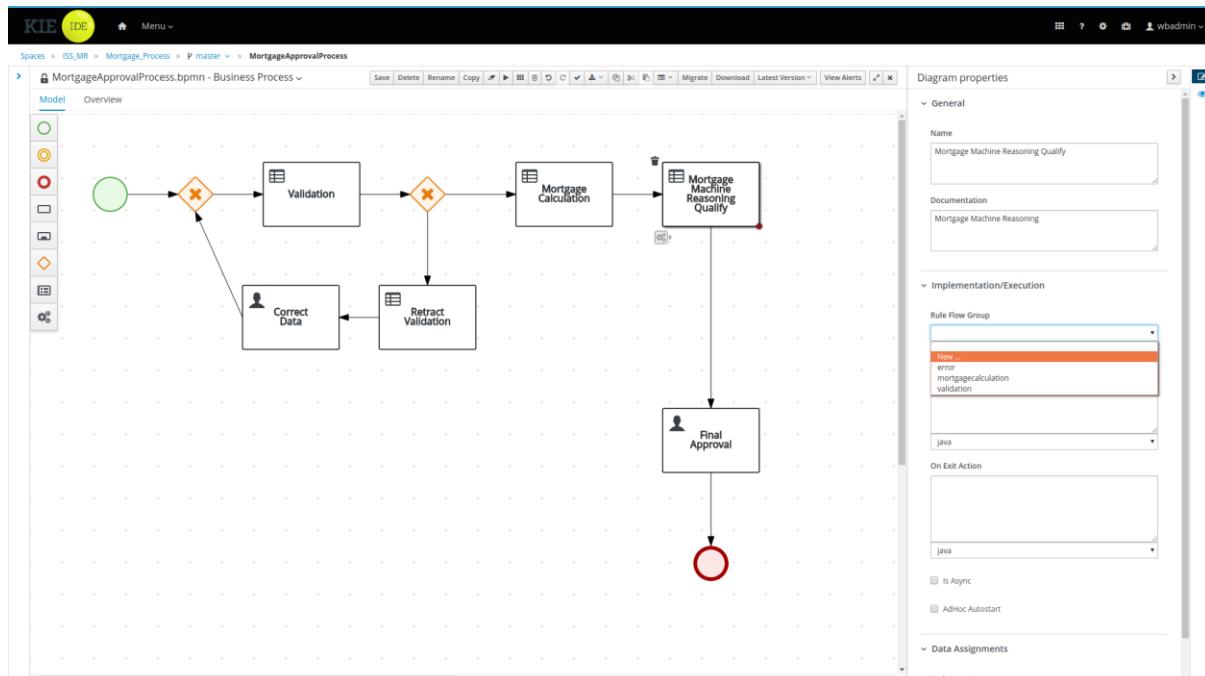
### 3) Convert User Task: **Qualify** into Business Rule Task;



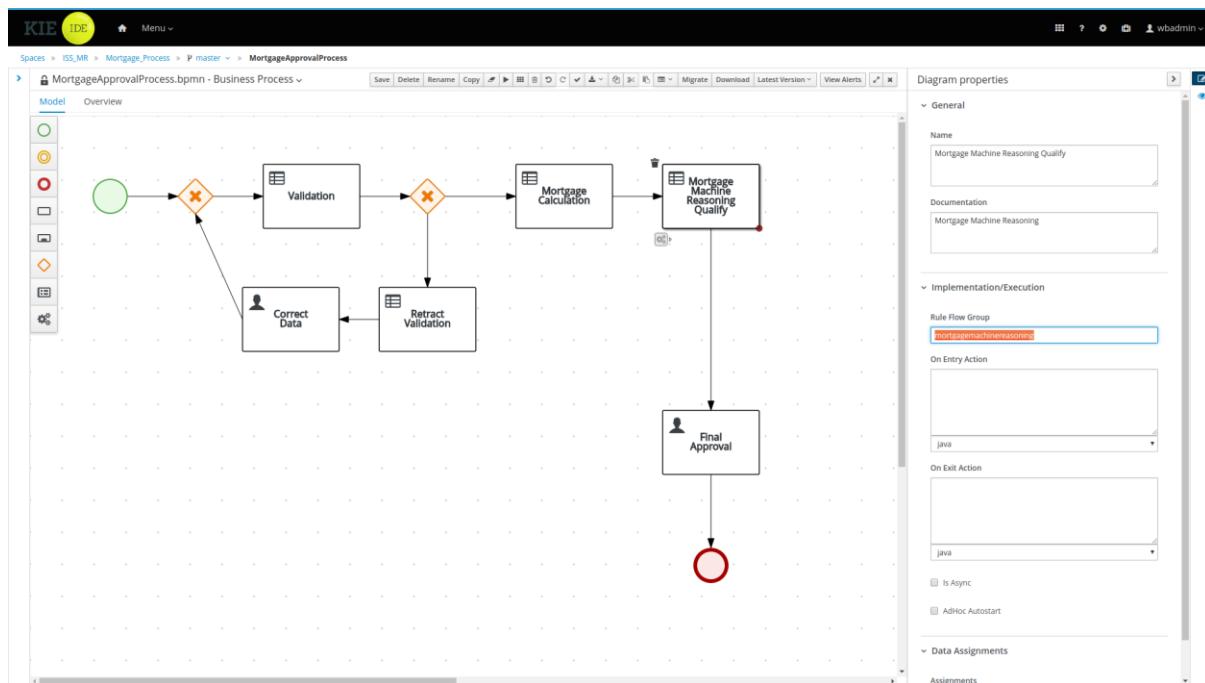
- 4) Remove  in-between **Qualify** and **Final Approval**



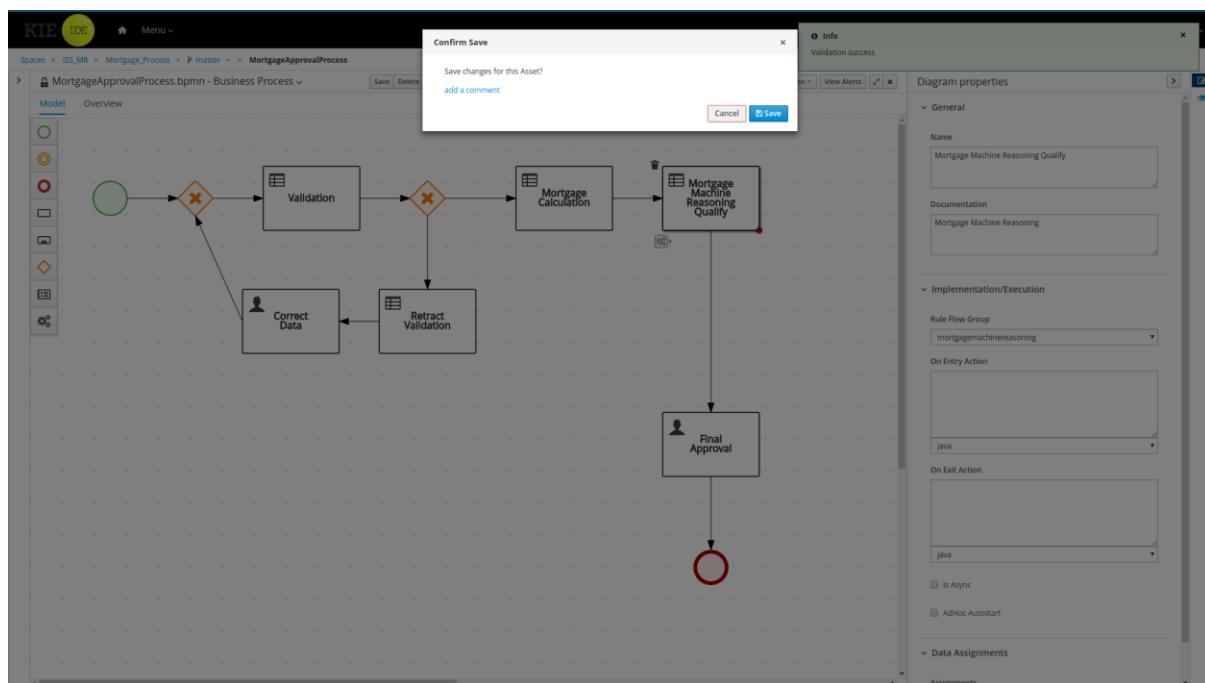
- 5) Update fields: **Name: Mortgage Machine Reasoning Qualify** and **Documentation: Mortgage Machine Reasoning** fields using its **Diagram properties**



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

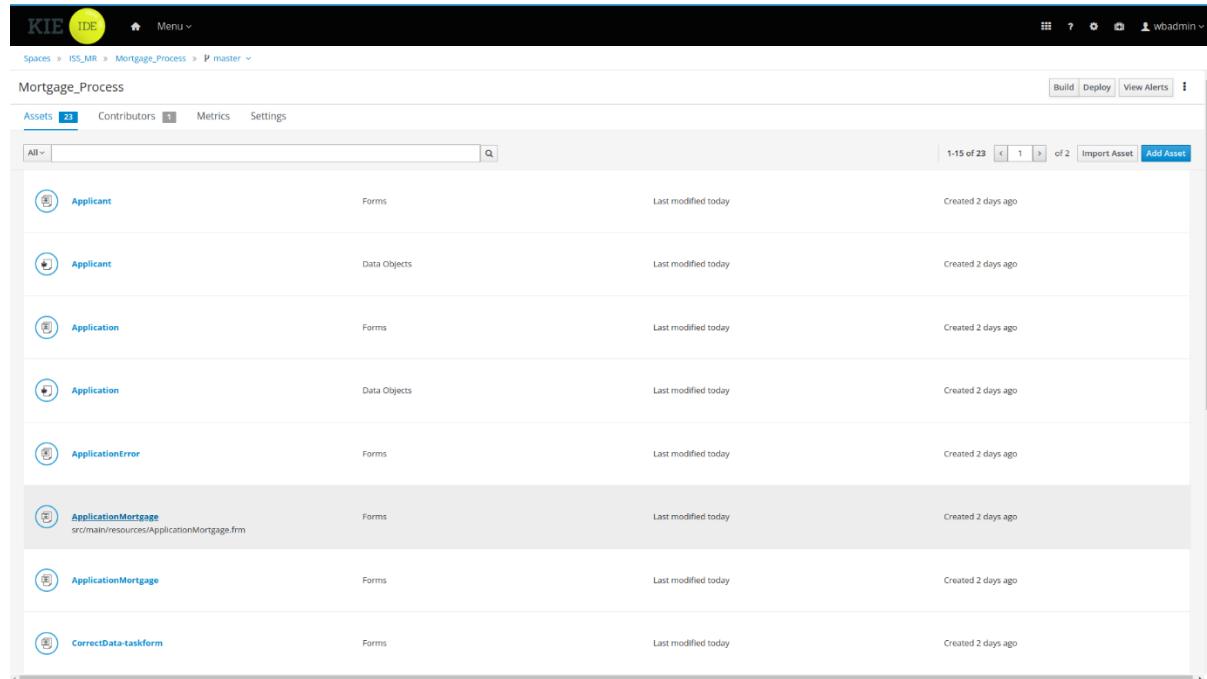


7) **Save** the changes;



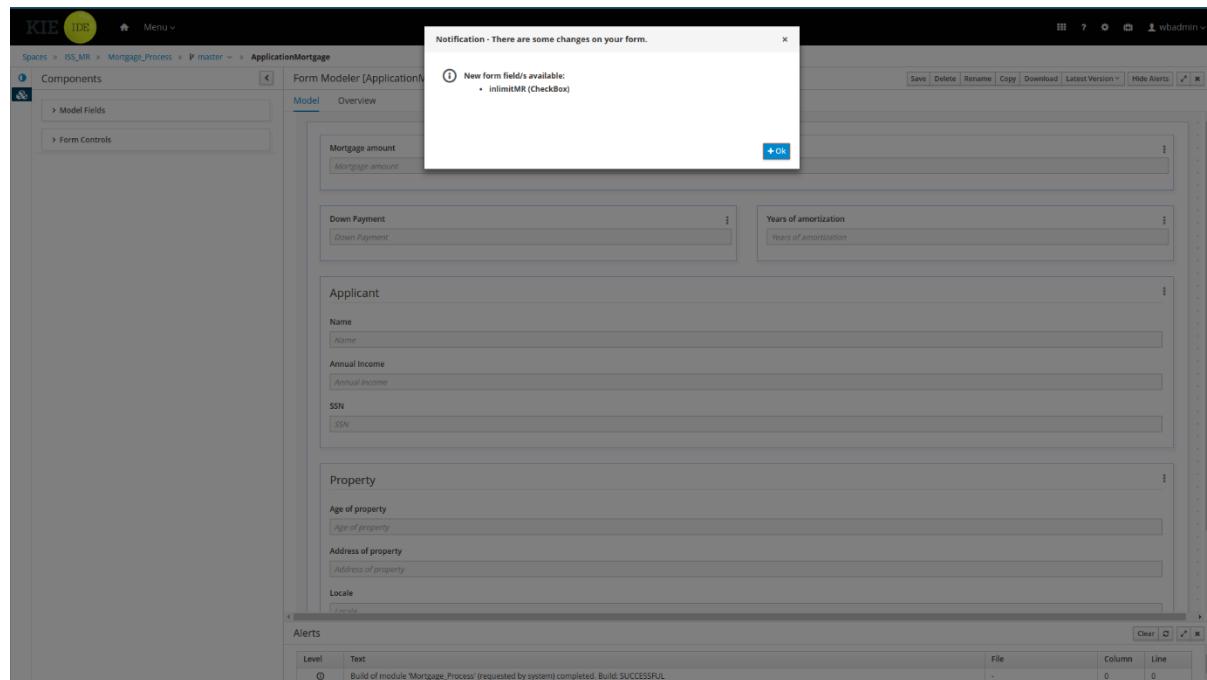
## 2.2.3. Business system enhancement [ Forms ]

- From Assets list view, click to edit **Forms: ApplicationMortgage.frm**  
 src/main/resource/ApplicationMortgage.frm



The screenshot shows the KIE IDE Assets list view for the Mortgage\_Process module. The list includes the following items:

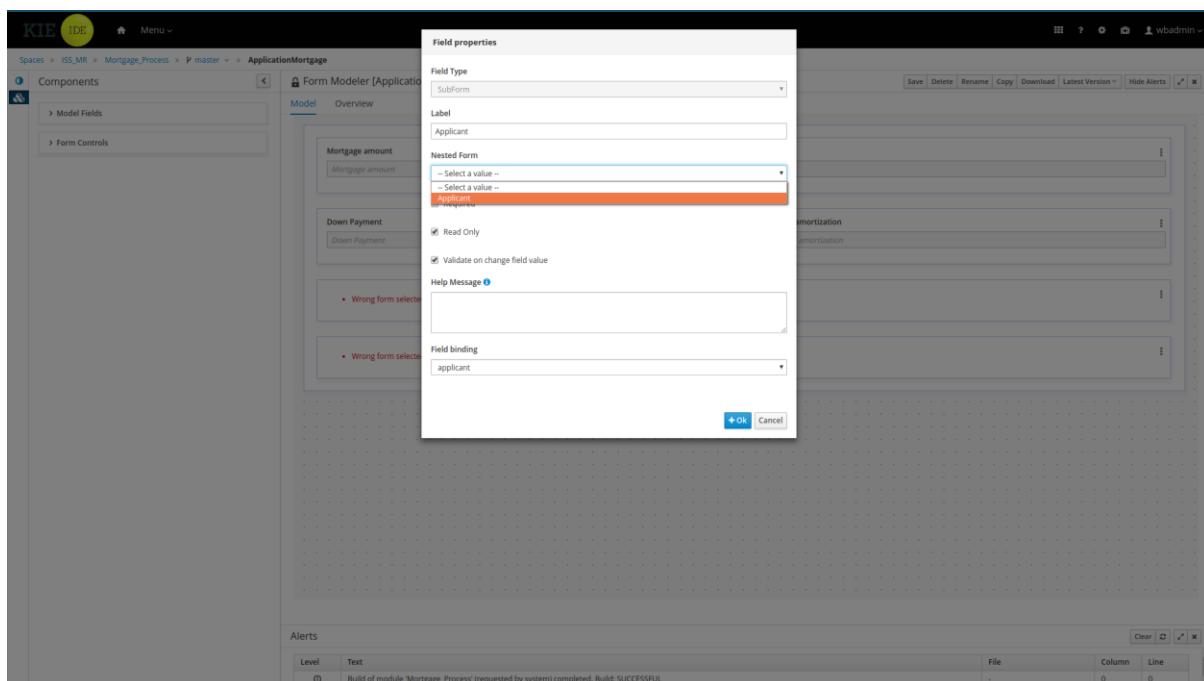
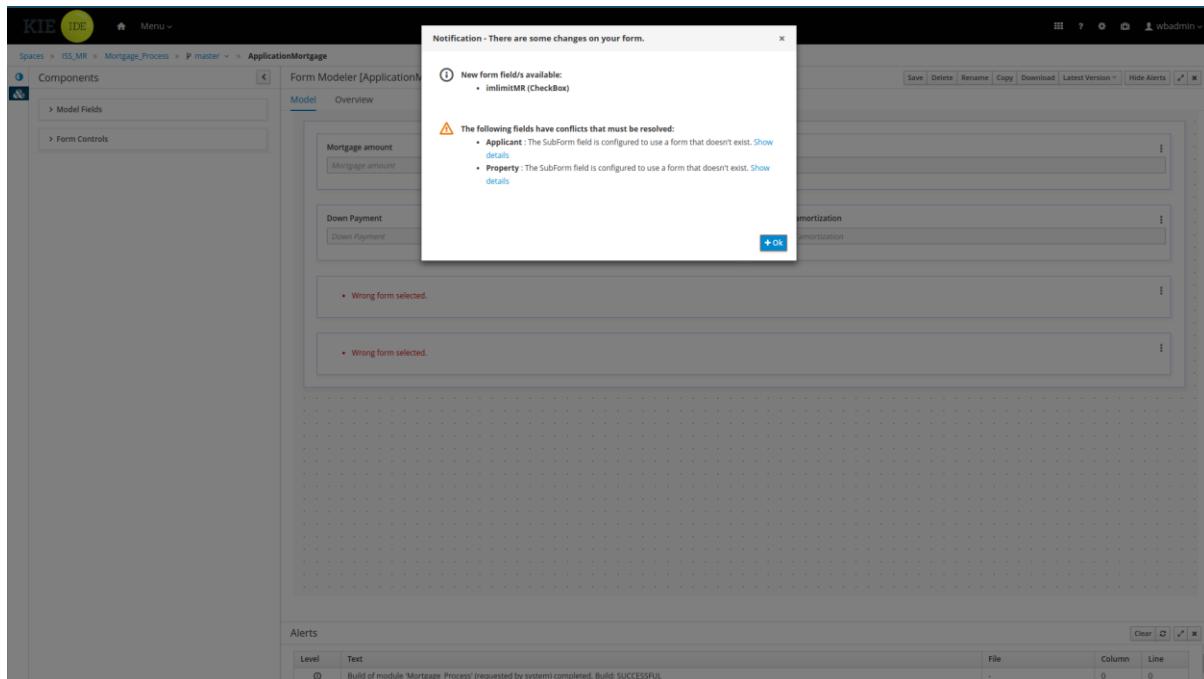
Icon	Name	Type	Last modified	Created
Applicant	Applicant	Forms	Today	2 days ago
Applicant	Applicant	Data Objects	Today	2 days ago
Application	Application	Forms	Today	2 days ago
Application	Application	Data Objects	Today	2 days ago
ApplicationError	ApplicationError	Forms	Today	2 days ago
ApplicationMortgage	ApplicationMortgage src/main/resource/ApplicationMortgage.frm	Forms	Today	2 days ago
ApplicationMortgage	ApplicationMortgage	Forms	Today	2 days ago
CorrectData-taskform	CorrectData-taskform	Forms	Today	2 days ago



The screenshot shows the KIE IDE Form Modeler for the ApplicationMortgage form. A modal dialog box displays a notification: "Notification - There are some changes on your form." It lists a new form field available: "inlimitMR (CheckBox)". The background shows the form structure with sections like Mortgage amount, Down Payment, Applicant, Property, and Years of amortization.

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

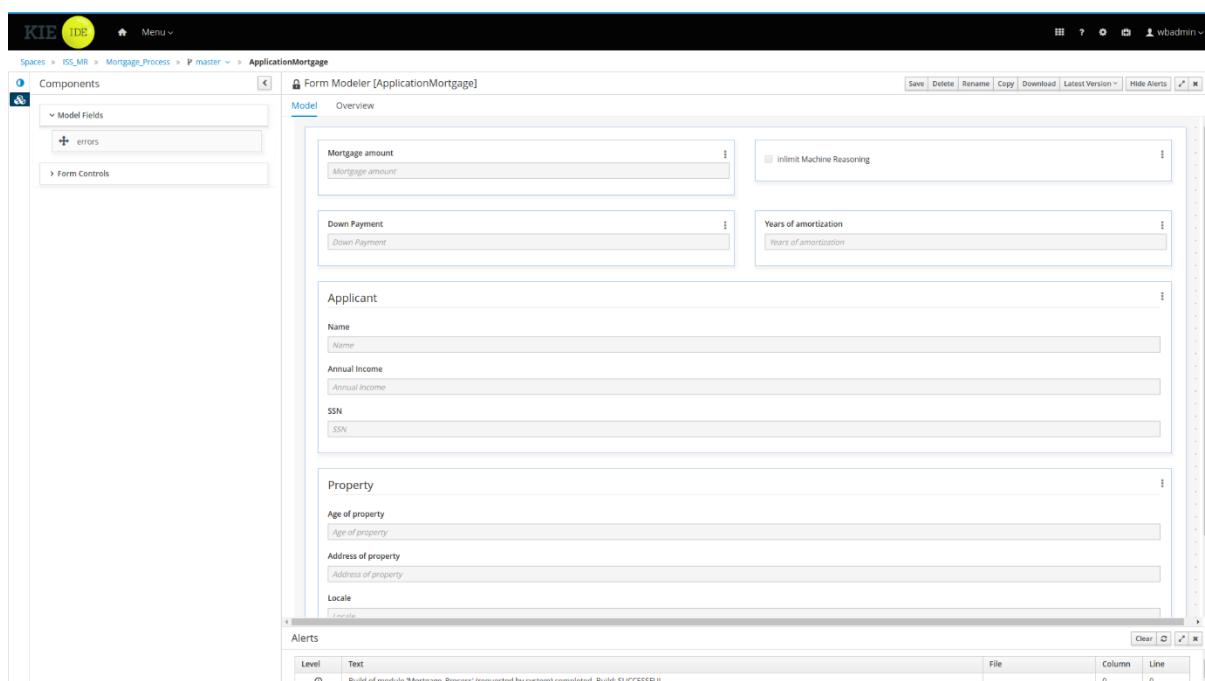
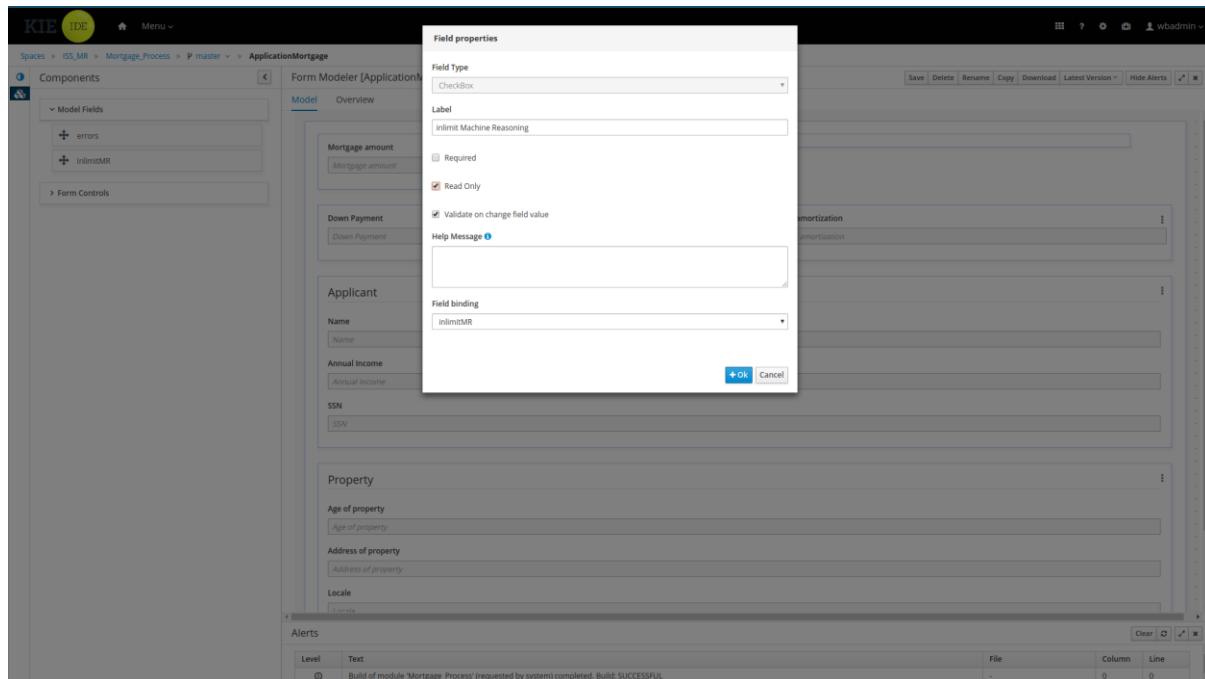
- 2) { Optional } The system may send warning, regarding embedded sub-forms not found, in this case, update the sub-forms: **Applicant** and **Property**,



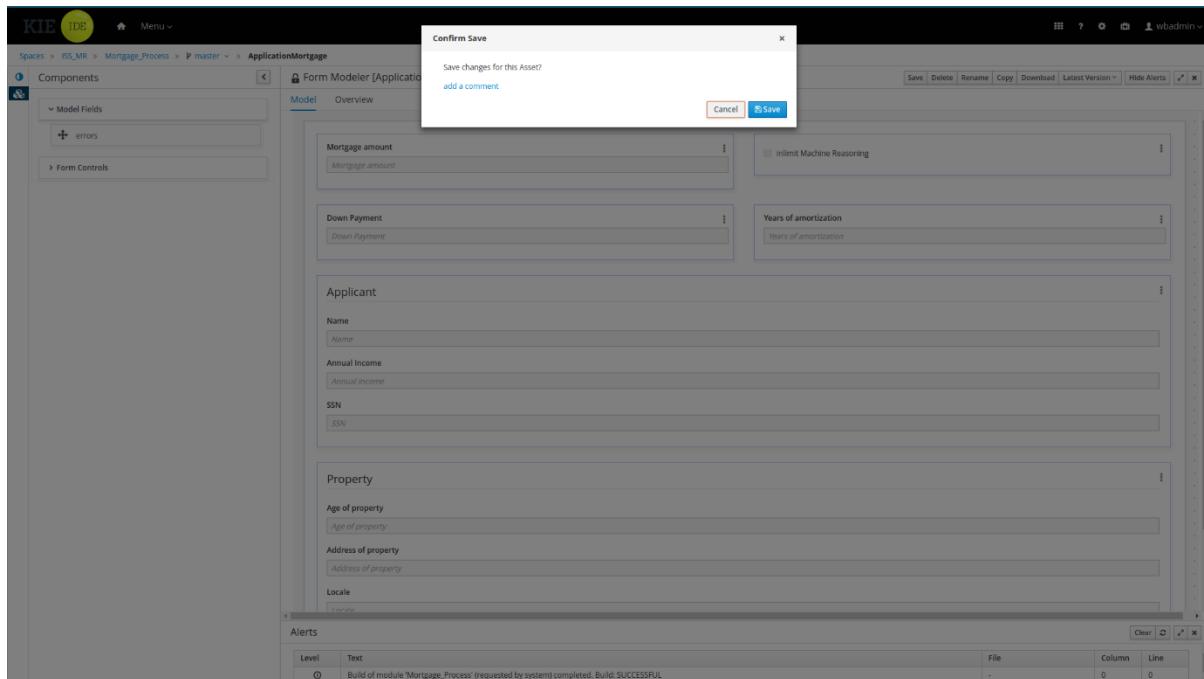
The screenshot shows the KIE IDE interface with the 'Form Modeler [ApplicationMortgage]' selected. A 'Field properties' dialog box is open over the main form editor. The 'Field Type' dropdown is set to 'SubForm'. The 'Nested Form' dropdown is expanded, showing three options: '- Select a value -', '- Select a value -', and 'Property'. The 'Property' option is highlighted with a red background. Other visible settings in the dialog include 'Read Only' checked, 'Validate on change field value' checked, and a 'Help Message' input field. The main form editor shows fields for 'Mortgage amount', 'Down Payment', 'Applicant' (with sub-fields 'Name', 'Annual income', 'SSN'), and 'Property' (with sub-fields 'Age of property', 'Address of property', 'Locale'). An alert message at the bottom left says 'Wrong form selected.' The top right of the screen shows the user 'wbadmin'.

This screenshot shows the 'Form Modeler [ApplicationMortgage]' interface after the changes made in the previous screenshot have been applied. The 'Property' section now contains the sub-fields 'Age of property', 'Address of property', and 'Locale'. The 'Alerts' panel at the bottom right shows a single entry: 'Build of module 'Mortgage\_Process' (requested by system) completed. Build: SUCCESSFUL.' The overall layout is identical to the first screenshot, with the KIE IDE header, toolbars, and navigation bar visible.

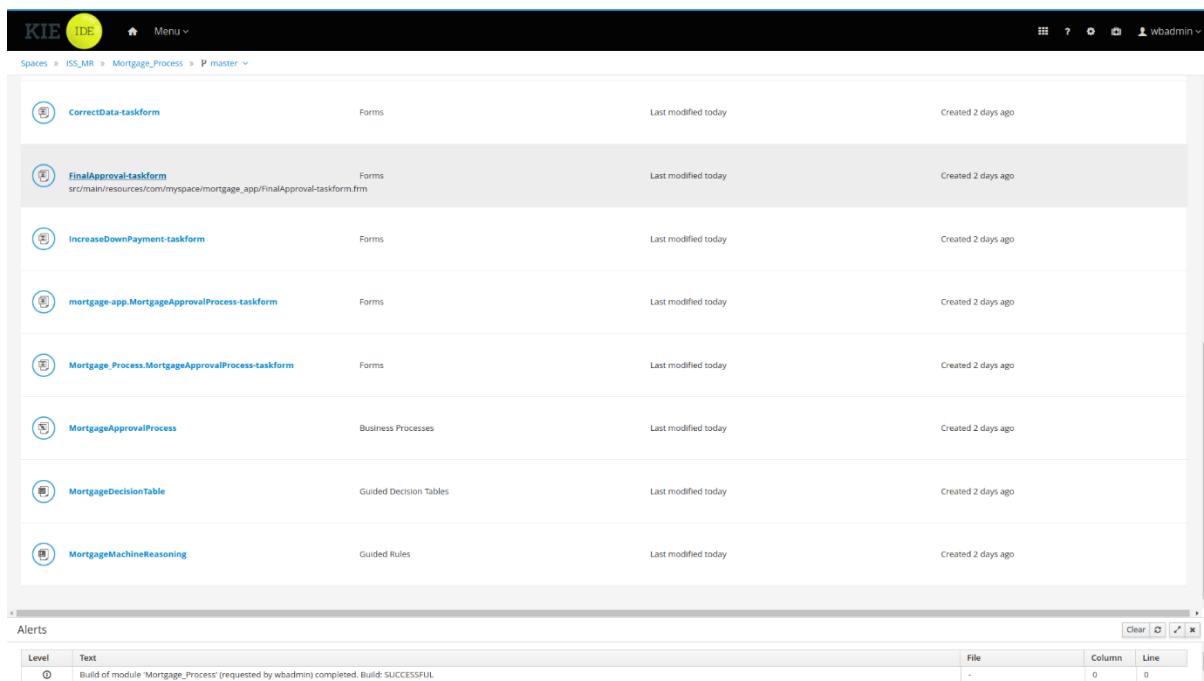
- 3) Add new field **InlimitMR** from left panel: **Model Fields** to actual form; Drag it next to **Mortgage amount** field;



4) **Save** the form changes;



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



KIE IDE

Project Explorer

Spaces > ISS\_MR > Mortgage\_Process > P master > FinalApproval-taskform

Form Modeler [FinalApproval-taskform]

Model Overview

Inputs:

Application

Mortgage amount

Down Payment

Years of amortization

Applicant

Name

Annual Income

SSN

Property

Age of property

Address of property

Alerts

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

## 2.2.4. Business system enhancement [ Guided Rules ]

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

KIE IDE

Mortgage\_Process

Assets Contributors Metrics Settings

	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
	ApplicationError	Forms	Last modified today Created 2 days ago
	ApplicationMortgage	Forms	Last modified today Created 2 days ago
	ApplicationMortgage	Forms	Last modified today Created 2 days ago
	CorrectData-taskform	Forms	Last modified today Created 2 days ago

Alerts

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

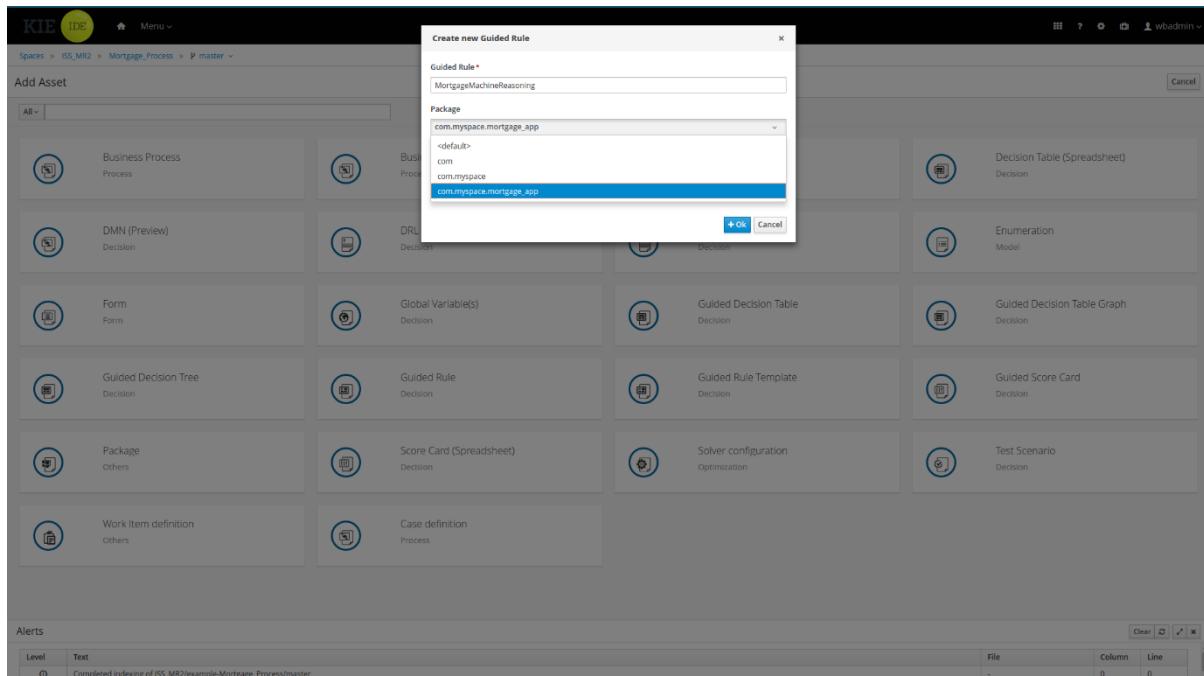
Add Asset

Business Process Process	Business Process (legacy) Process	Data Object Model	Decision Table (Spreadsheet) Decision
DMN (Preview) Decision	DRL file Decision	DSL definition Decision	Enumeration Model
Form Form	Global Variable(s) Decision	Guided Decision Table Decision	Guided Decision Table Graph Decision
Guided Decision Tree Decision	Guided Rule Decision	Guided Rule Template Decision	Guided Score Card Decision
Package Others	Score Card (Spreadsheet) Decision	Solver configuration Optimization	Test Scenario Decision
Work Item definition Others	Case definition Process		

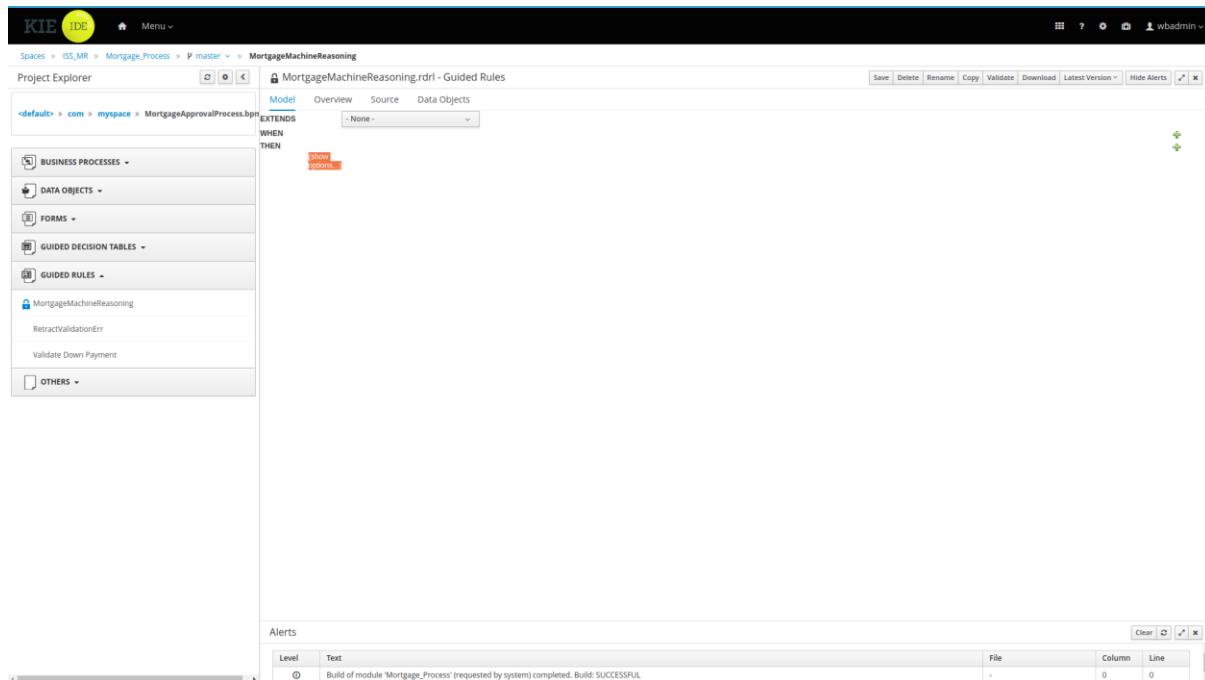
Alerts

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

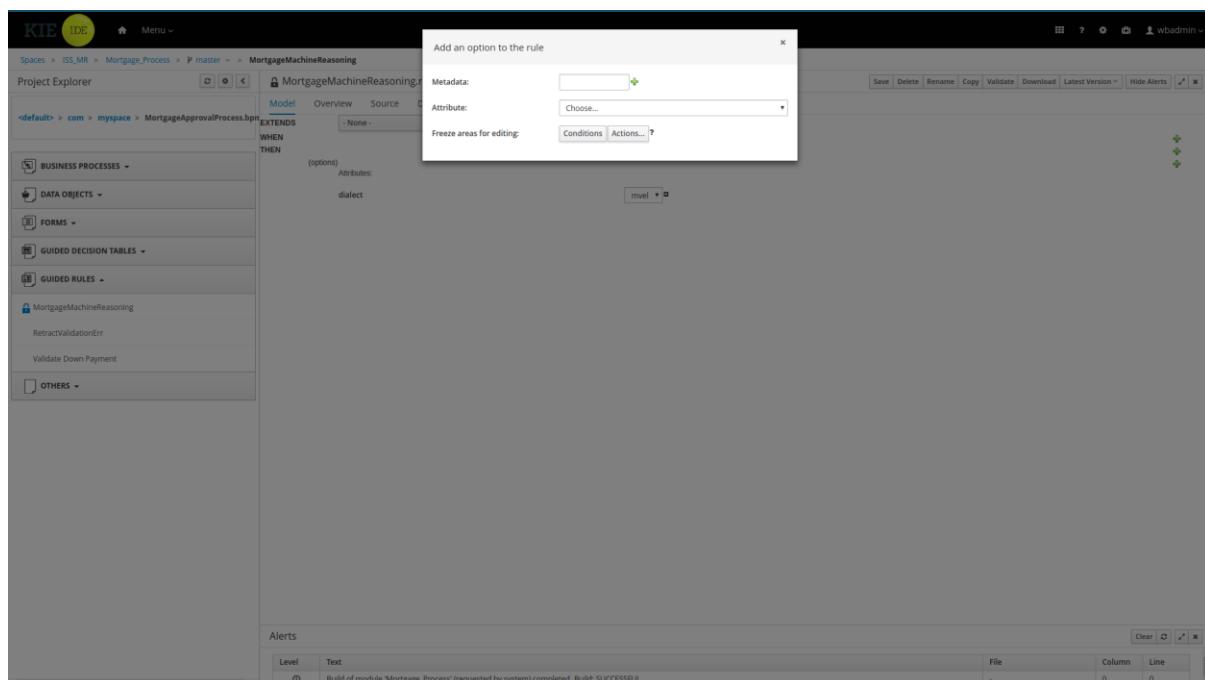
- 2) Fill in rule (file) name: **MortgageMachineReasoning**; Select Package: **com.myspace.mortgage\_app**



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

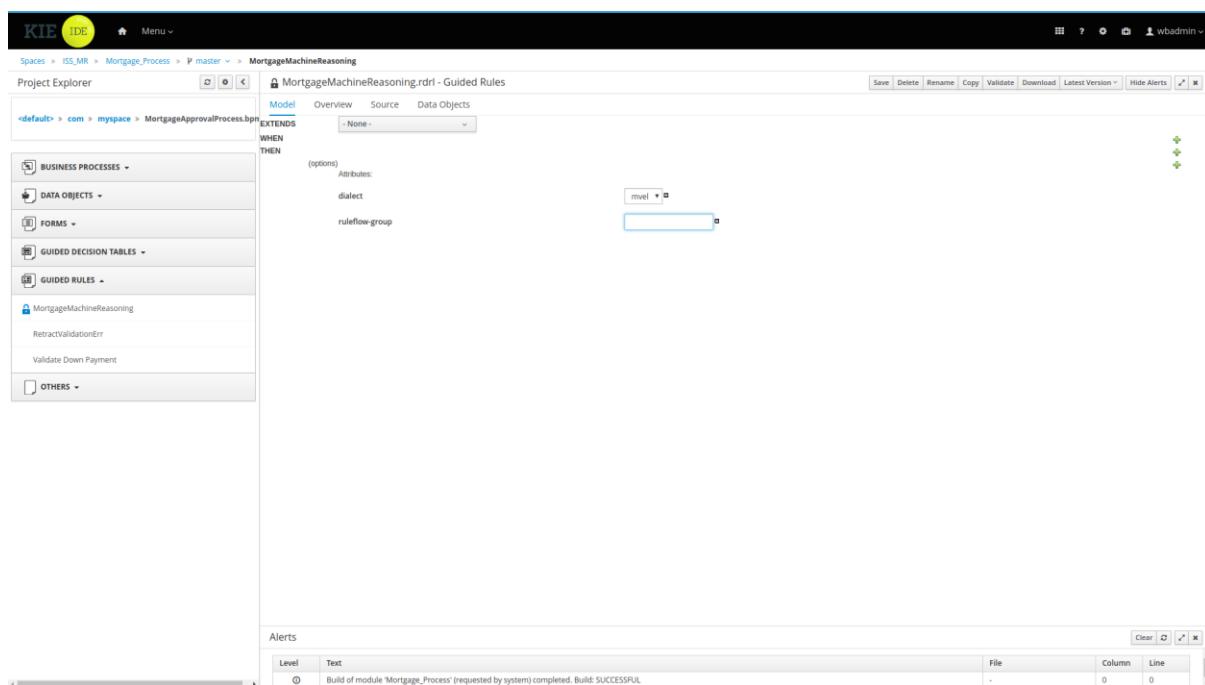
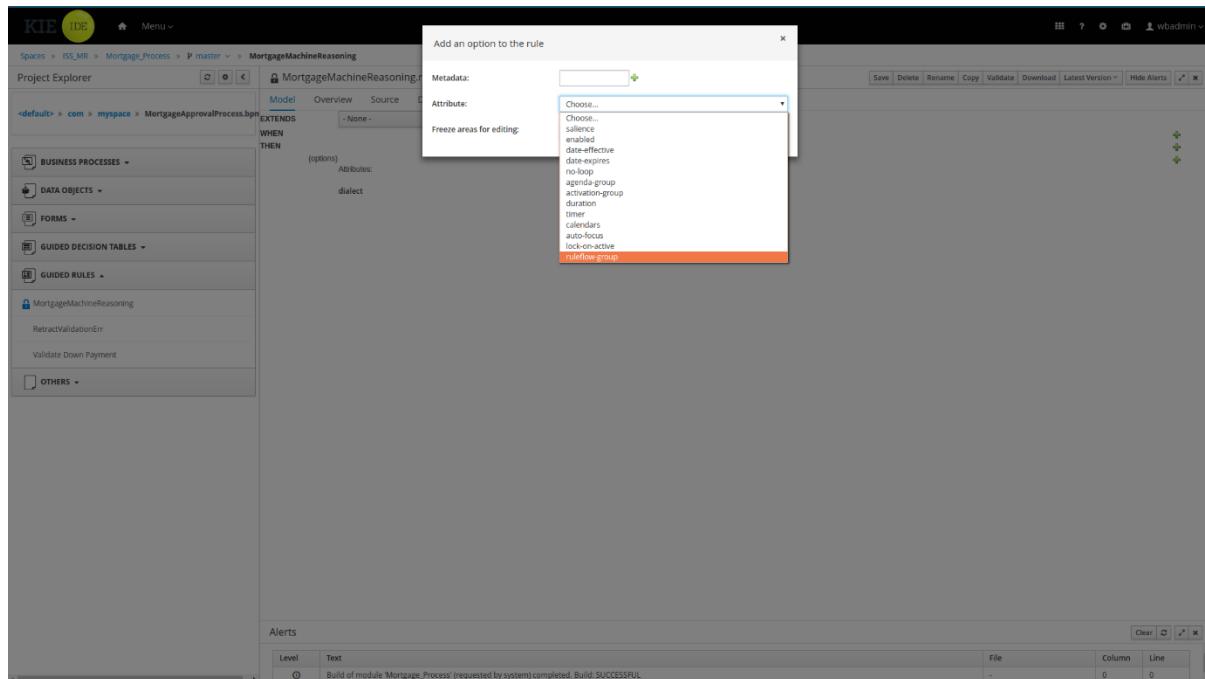


The screenshot shows the KIE IDE interface for managing guided rules. The main window displays the 'MortgageMachineReasoning.rdrl - Guided Rules' model. The 'Model' tab is active. A context menu is open over the 'WHEN THEN' section, with the 'show options...' option highlighted. The 'Alerts' panel at the bottom right shows a successful build message: 'Build of module 'Mortgage\_Process' (requested by system) completed. Build: SUCCESSFUL.' with file, column, and line details.



The screenshot shows the KIE IDE interface with the 'Add an option to the rule' dialog box open. The dialog has fields for 'Metadata' (empty), 'Attribute' (set to 'Choose...'), and 'Freeze areas for editing:' (with 'Conditions' and 'Actions...' buttons). The background shows the 'MortgageMachineReasoning.rdrl - Guided Rules' model in the KIE IDE.

#### 4) Choose ruleflow-group



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

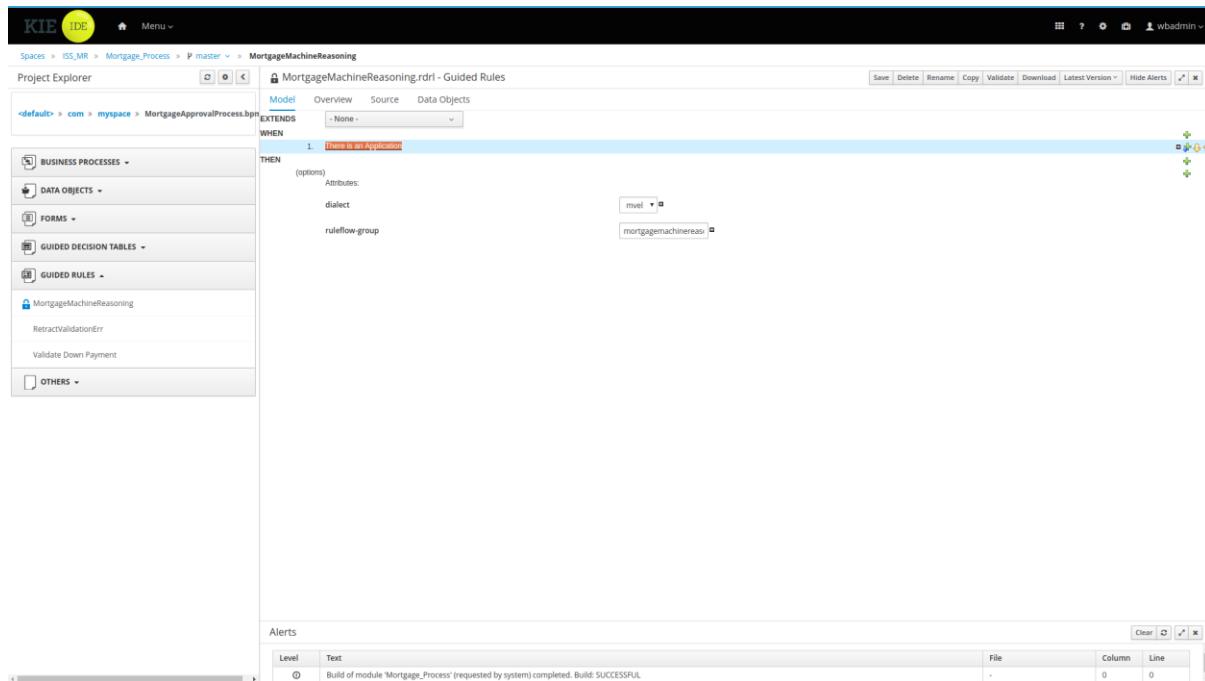
- 5) Key in the **Rule Flow Group** name we defined earlier at **Business Process [ Business Rule Task: Mortgage Machine Reasoning Qualify ]**; The name is **mortgagemachineReasoning**

The screenshot shows the KIE IDE interface for managing guided rules. The left sidebar lists various project components like Business Processes, Data Objects, and Guided Rules. The main area displays the 'MortgageMachineReasoning.rdrl - Guided Rules' model. In the 'Model' tab, under the 'WHEN THEN' section, there is a 'ruleflow-group' field where the value 'mortgagemachineReasoning' is entered. Below the model, the 'Alerts' panel indicates a successful build of the module.

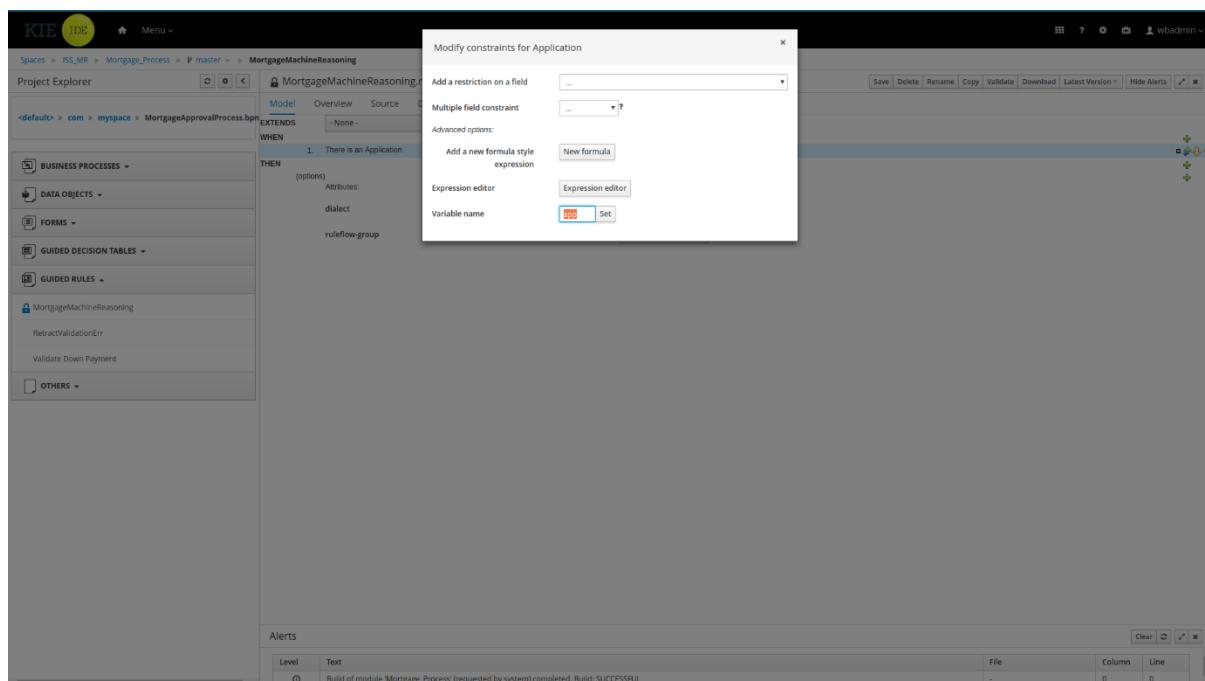
- 6) Click the highest 1<sup>st</sup> button: +

This screenshot shows the 'Add a condition to the rule...' dialog box overlaid on the KIE IDE. The dialog has 'Position: Bottom' selected. It lists several condition types such as 'Applicant...', 'Number...', 'Property...', 'ValidationErrDO...', and others. At the bottom of the dialog are 'OK' and 'Cancel' buttons.

## 7) Click 'There is an Application'



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



The screenshot shows the KIE IDE interface with the project 'MortgageMachineReasoning' selected. In the center, the 'MortgageMachineReasoning.rdrl - Guided Rules' editor is open. A single rule is defined:

```

WHEN
  1. There is an Application [app]
THEN
  (options)
    Attributes:
      dialect: mvel
    ruleflow-group: mortgagemachinereasoning
  
```

The 'Alerts' panel at the bottom right shows a single entry:

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

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

The screenshot shows the KIE IDE interface with the project 'MortgageMachineReasoning' selected. A modal dialog box titled 'Modify constraints for Application' is open, specifically the 'Add a restriction on a field' section. The dropdown menu lists several options, and 'mortgageamount' is highlighted with a red selection bar.

The screenshot shows the KIE IDE interface with the project 'MortgageMachineReasoning' selected. In the center, the 'Guided Rules' tab is active, displaying a rule definition. The 'WHEN' clause is defined as 'There is an Application [app] with: mortgageamount -- please choose --'. The 'THEN' clause includes attributes 'mvrl' and 'ruleflow-group' with the value 'mortagagemachinereason'. The bottom right corner shows an 'Alerts' panel indicating a successful build.

{ 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:

The screenshot shows the KIE IDE interface with the project 'MortgageMachineReasoning' selected. The 'Guided Rules' tab is active, and the 'WHEN' clause has been updated to include the 'greater than or equal to' operator, resulting in 'greater than or equal to' followed by 'mortagagemachinereason'. The bottom right corner shows an 'Alerts' panel indicating a successful build.

The screenshot shows the KIE IDE interface for editing a guided rule named MortgageMachineReasoning.rdrl. The rule has the following structure:

```

    WHEN
      1. There is an Application [app] with:
          mortgageamount greater than or equal to
    THEN
      (options)
        Attributes:
        dialect: mvrl
        ruleflow-group: mortgagemachinereasoning
  
```

A context menu is open over the first condition (line 1). The menu options visible are:

- Literal value
- Literal value
- Advanced options:
  - A formula (highlighted with a red dashed box)
  - New formula
  - Expression editor
- Expression editor

The screenshot shows the same KIE IDE interface as the previous one, but the 'Advanced options' submenu under the 'A formula' item is now open. The submenu items are:

- New formula
- Expression editor

The screenshot shows the KIE IDE interface for editing guided rules. The main workspace displays a rule definition:

```

    WHEN
      1. There is an Application [app] with:
          mortgageamount greater than or equal to
    THEN
      (options)
        Attributes:
        dialect: mvrl
        ruleflow-group: mortgagemachine reason
  
```

The Alerts panel at the bottom shows a single successful build message:

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

The screenshot shows the KIE IDE interface for editing guided rules. The main workspace displays a rule definition:

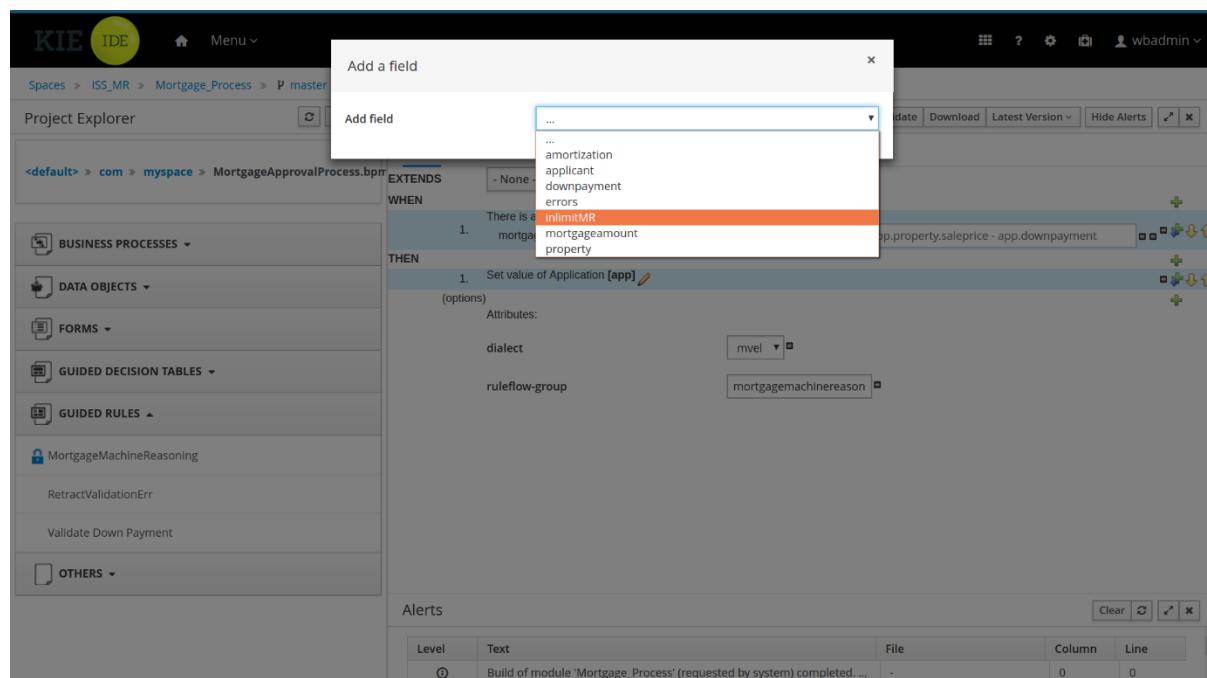
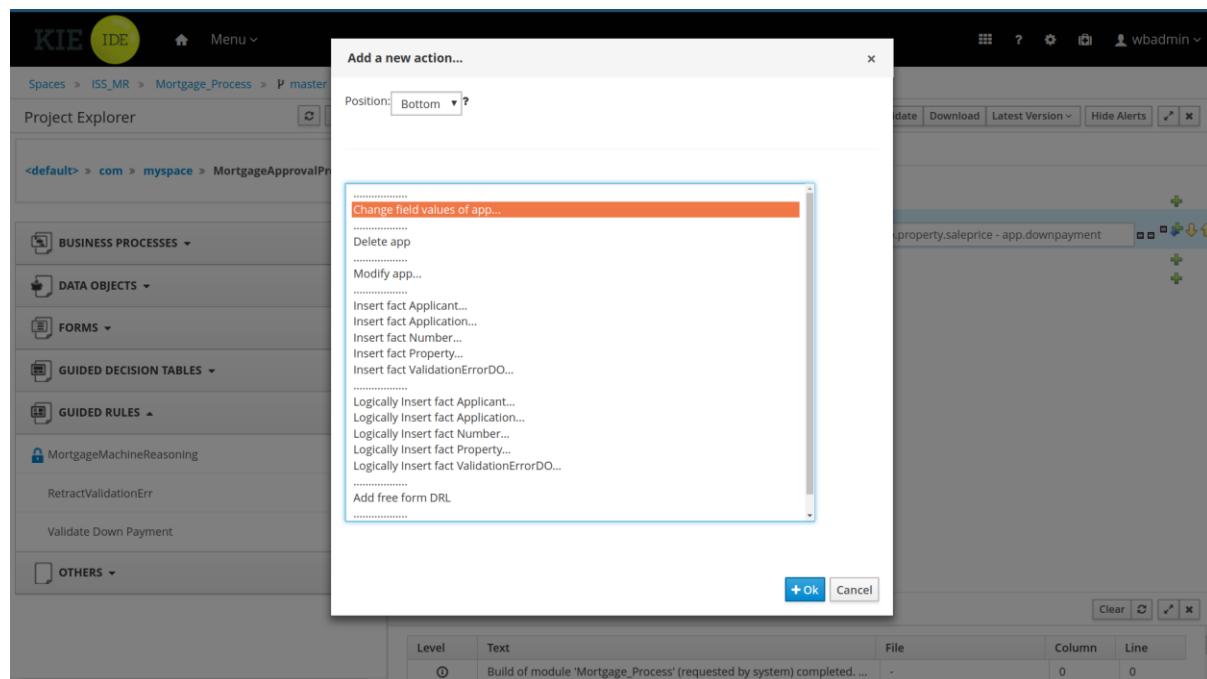
```

    WHEN
      1. There is an Application [app] with:
          mortgageamount greater than or equal to
    THEN
      (options)
        Attributes:
        dialect: mvrl
        ruleflow-group: mortgagemachine reason
  
```

The Alerts panel at the bottom shows a single successful build message:

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

Spaces > ISS\_MR > Mortgage\_Process > master > MortgageMachineReasoning

Model Overview Source Data Objects

EXTENDS - None -

WHEN

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

THEN

1. Set value of Application [app] inlimitMR  
(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

Spaces > ISS\_MR > Mortgage\_Process > master > MortgageMachineReasoning

Field value

Literal value

Advanced

Formula

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

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

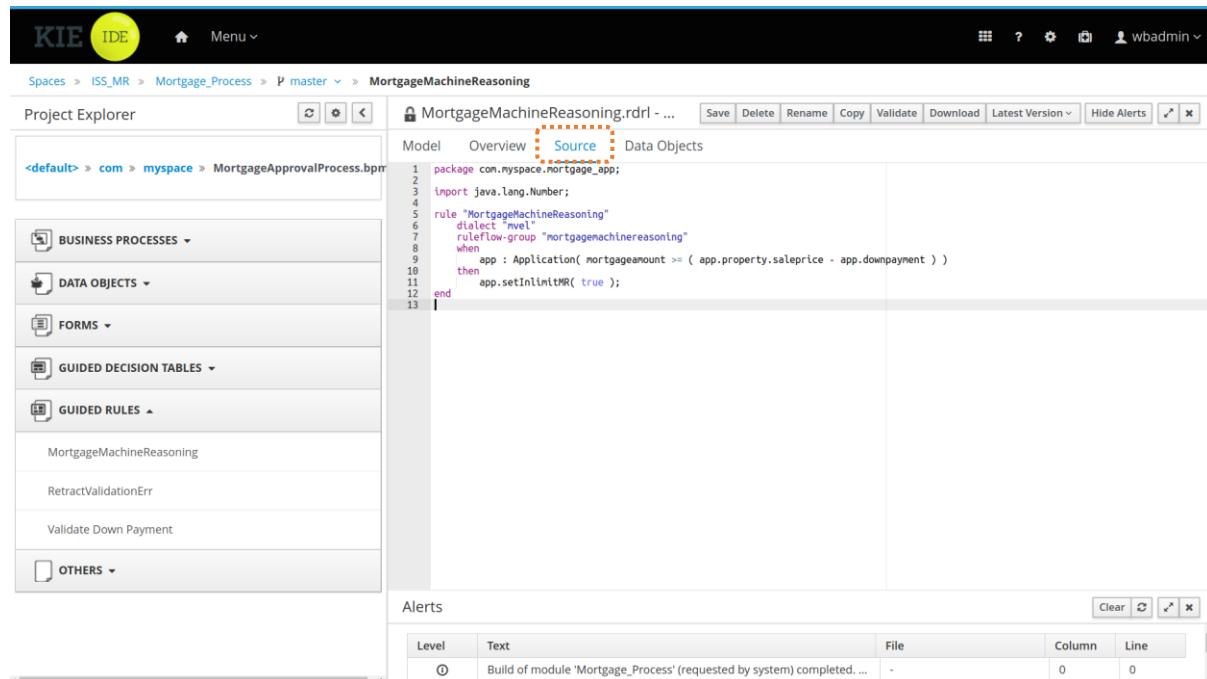
- Project Explorer:** Shows the file `MortgageApprovalProcess.bpmn`.
- Model Tab:** Active tab.
- Rule Content:**
  - WHEN:** There is an Application [app] with:
    - 1. mortgageamount greater than or equal to app.property.saleprice - app.downpayment
  - THEN:**
    - 1. Set value of Application [app] iniflmtMR to true (dialect: mvel, ruleflow-group: mortgagemachine reason)
- Alerts:** A single alert: "Build of module 'Mortgage\_Process' (requested by system) completed. ...."

12) Save the rule;

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

- Project Explorer:** Shows the file `MortgageApprovalProcess.bpmn`.
- Model Tab:** Active tab.
- Rule Content:** Same as the previous screenshot.
- Alerts:** A single alert: "Build of module 'Mortgage\_Process' (requested by system) completed. ...."
- Confirm Save Dialog:** A modal dialog titled "Confirm Save" is displayed, asking "Save changes for this Asset?". It has "Cancel" and "Save" buttons.

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:

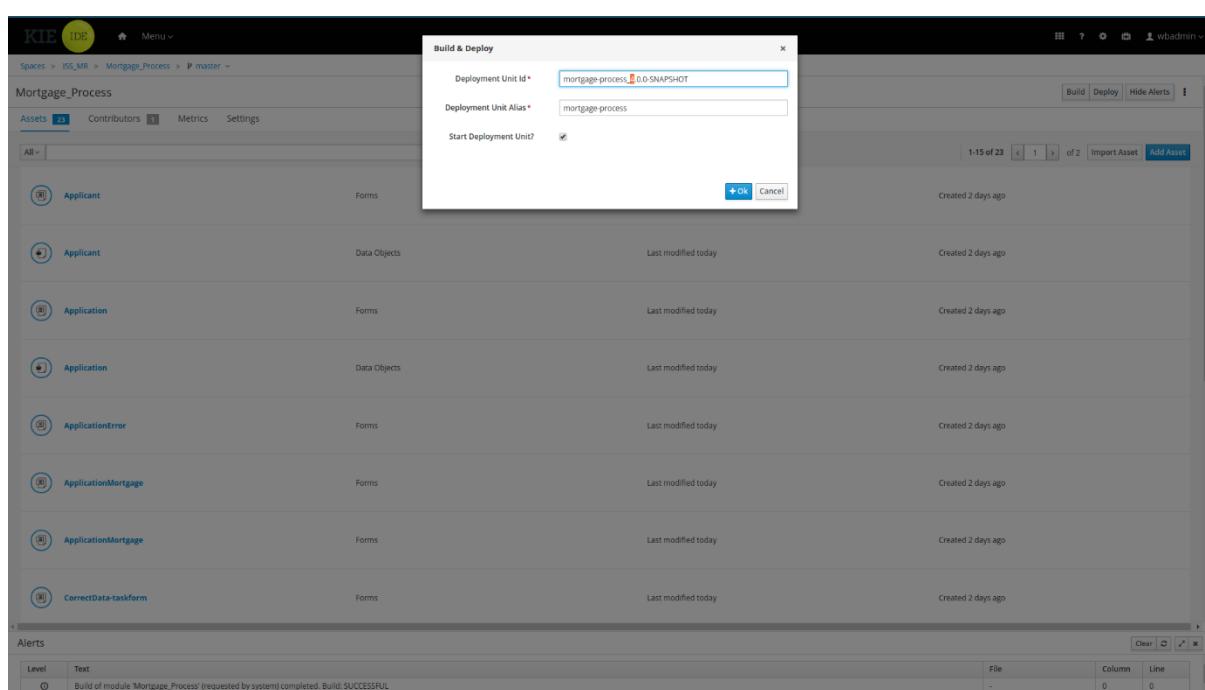
- Project Explorer:** Shows a tree structure with nodes like **BUSINESS PROCESSES**, **DATA OBJECTS**, **FORMS**, **GUIDED DECISION TABLES**, **GUIDED RULES** (which contains "MortgageMachineReasoning"), and **OTHERS**.
- MortgageMachineReasoning.rdrl - ...** is the active file in the **Source** tab.
- Source Tab Content:**

```
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 |
```
- Toolbars and Buttons:** Standard KIE IDE buttons for Save, Delete, Rename, Copy, Validate, Download, Latest Version, Hide Alerts, and Close.
- Alerts:** A table showing one alert: "Build of module 'Mortgage\_Process' (requested by system) completed. ...."

## 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 a tree structure with 'sample-server' selected. Under 'DEPLOYMENT UNITS', 'mortgage-process\_4.0.0-SNAPSHOT' is also selected. The main panel displays the deployment status for 'sample-server@localhost:8080'. It shows a green checkmark icon and the URL [http://localhost:8080/kie-server/services/rest/server/containers/mortgage-process\\_4.0.0-SNAPSHOT](http://localhost:8080/kie-server/services/rest/server/containers/mortgage-process_4.0.0-SNAPSHOT). Below the URL, it says 'v1.0.0-SNAPSHOT'.

- 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. A context menu is open over the first row of the table, with 'Start' highlighted. The table lists four entries for 'MortgageApprovalProcess' with versions 1.0, each deployed to a different snapshot of the mortgage-process. The bottom of the screen shows a browser address bar with 'localhost:8080/bpm-console/kie-wb.jsp#'

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**

KIE IDE

MortgageApprovalProcess

Application

Down Payment: 50000 | Years of amortization: 20

Applicant

Name: Sam GU  
Annual Income: 123456  
SSN: SSN

Property

Age of property: 3  
Address of property: 25 HMT, Singapore  
Locale: Urban  
Sale Price: 250000

Submit

KIE IDE

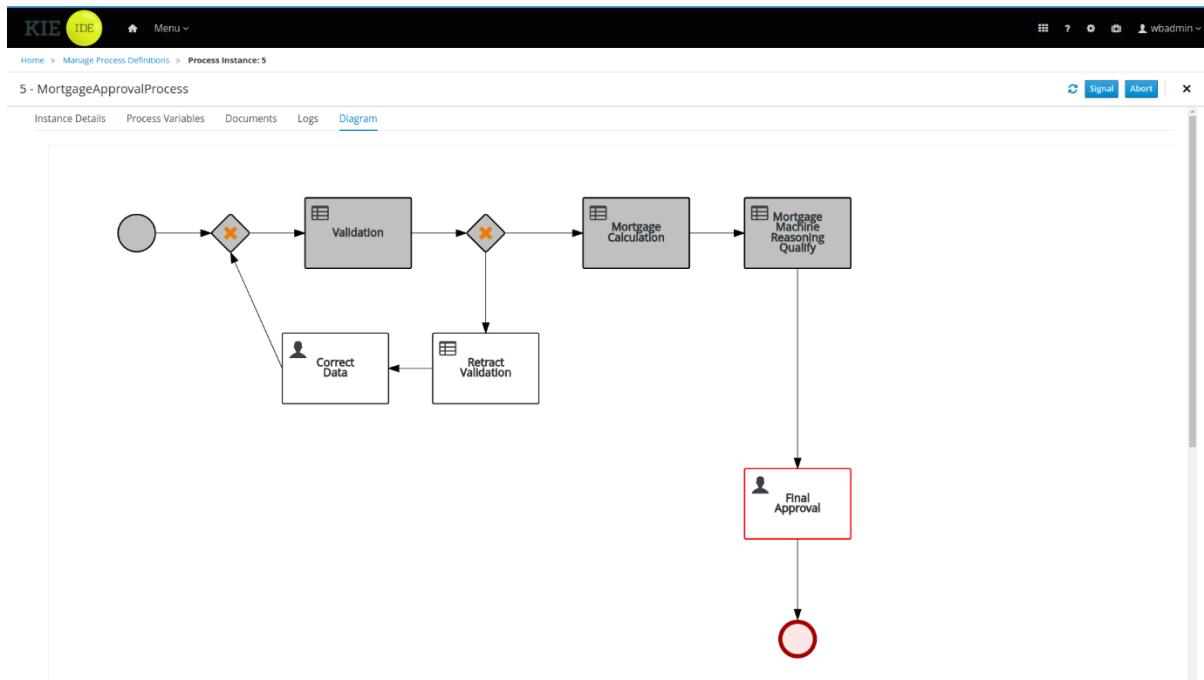
Home > Manage Process Definitions > Process Instance: 5

5 - MortgageApprovalProcess

Instance Details

Definition Id	Mortgage_Process.MortgageApprovalProcess
Instance State	Active
Deployment	mortgage-process_4.0.0-SNAPSHOT
Definition Version	1.0
SLA Compliance	N/A
Correlation key	5
Parent Process Instance	No Parent Process Instance
Active user tasks	Final Approval (Ready) owner: ---
Current Activities	Thu Feb 21 20:24:37 SGT 2019: 6 - Final Approval (HumanTaskNode)

Signal Abort



- 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 'Filters' expanded, showing various status options like Completed, Created, Error, etc., with 'InProgress' and 'Ready' checked. Below it are sections for 'Filter By' (Id), 'Process Definition Id' (Select), and 'Created On' (date input). The main area is titled 'Task Inbox' and displays a table with one row. The row contains 'Final Approval' under 'Task', 'Mortgage\_Process.MortgageApprovalProc...' under 'Process Definition Id', 'Ready' under 'Status', and '21-Feb-2019 20:24:37' under 'Created On'. There are also 'Actions' and pagination controls at the bottom.

The screenshot shows the KIE IDE Task details view for the '8 - Final Approval' task. The top navigation bar shows 'Home > Task Inbox > Task: 8'. The main content area has tabs for 'Work' (which is selected), 'Details', 'Assignments', 'Comments', 'Admin', and 'Logs'. The 'Work' tab displays form fields for 'Application' (Mortgage amount: 200000, Down Payment: 50000), 'Years of amortization' (20), and 'Inlimit Machine Reasoning' (checkbox checked). Below these are sections for 'Applicant' (Name: Sam GU, Annual Income: 23456, SSN: 0) and 'Property' (Age of property: 3, Address of property: 25 IMM, Singapore, Locale: Urban, Sale Price: 250000). At the bottom of the form is a 'Claim' button.

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

**MortgageApprovalProcess**

**Application**

Down Payment	Years of amortization
40000	20

**Applicant**

Name	Sam GU
Annual Income	123456
SSN	SSN

**Property**

Age of property	3
Address of property	25 HMKT, Singapore
Locale	Urban
Sale Price	250000

**Submit**

**9 - Final Approval**

**Inputs:**

**Application**

Mortgage amount	<input checked="" type="checkbox"/> InLimit Machine Reasoning
200000	
Down Payment	Years of amortization
40000	20

**Applicant**

Name	Sam GU
Annual Income	123456
SSN	0

**Property**

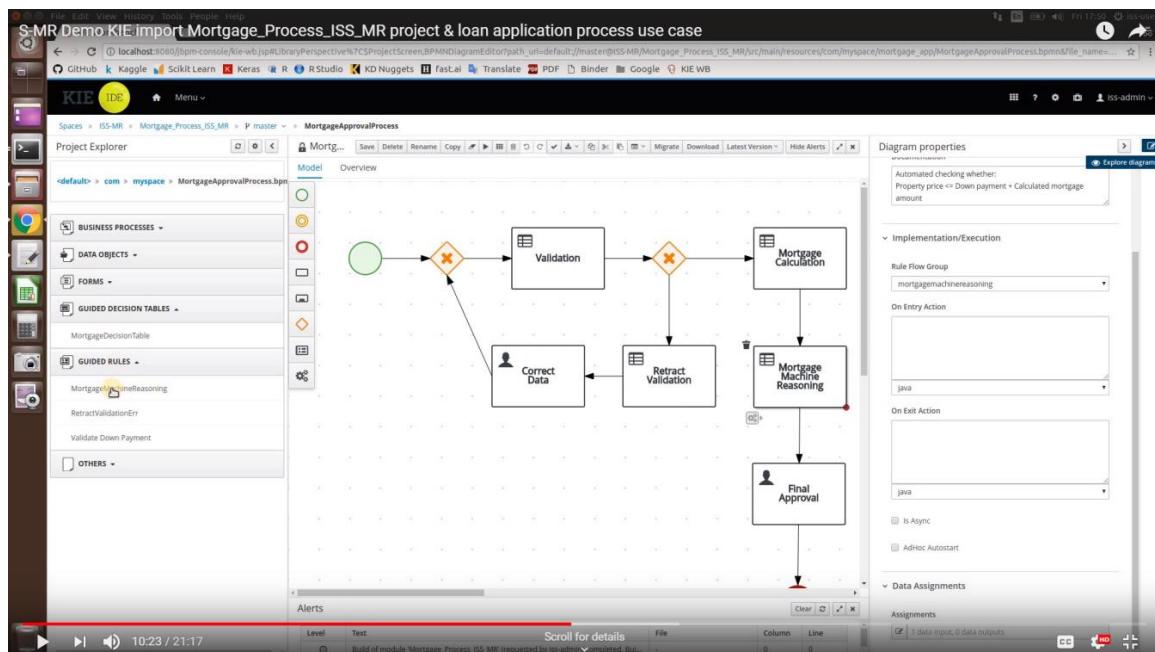
Age of property	3
Address of property	25 HMKT, Singapore
Locale	Urban
Sale Price	250000

**InLimit**

**Claim**

{ 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](https://www.youtube.com/watch?v=s_8rct45b84)

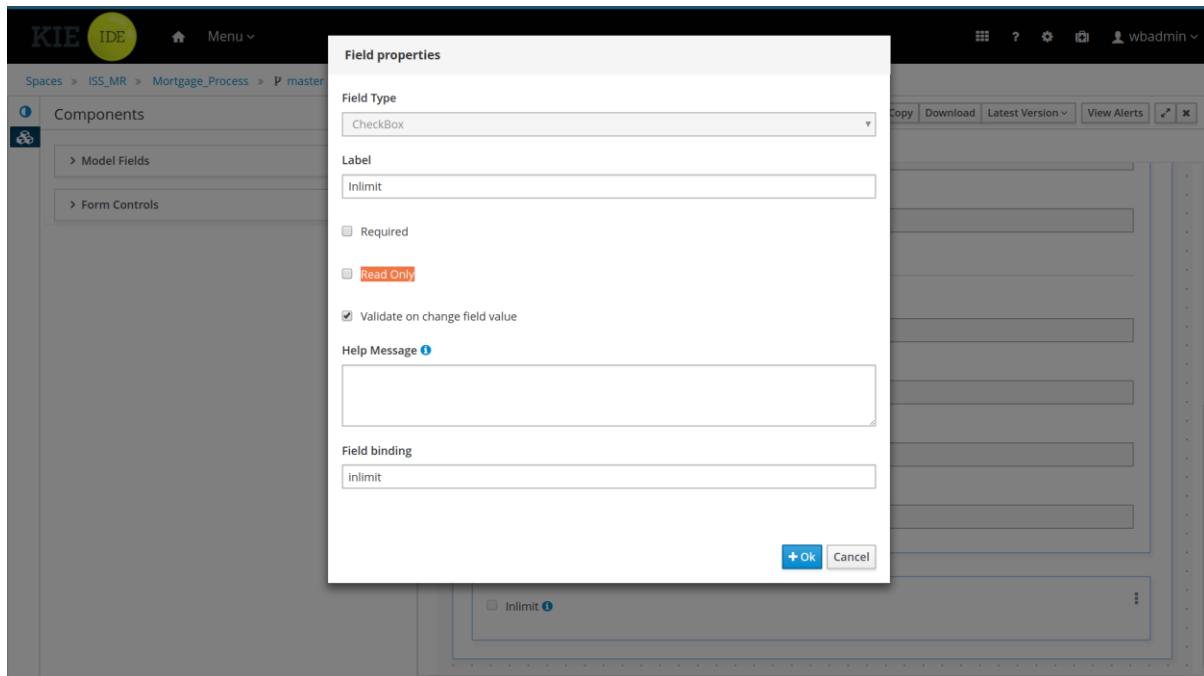
## 2.2.6. Business system enhancement [ User Task ] v5.0.0 [ Optional ]

{ 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 IDE

Home > Manage Process Definitions

MortgageApprovalProcess

Manage Process Definitions

Name

Application

Down Payment: 50000 | Years of amortization: 20

Applicant

Name: Sam GU  
Annual Income: 123456  
SSN: 123456

Property

Age of property: 3  
Address of property: 25 HMT, Singapore  
Locale: Urban  
Sale Price: 250000

Submit

KIE IDE

Home > Task Inbox > Task: 10

10 - Final Approval

Work Details Assignments Comments Admin Logs

Inputs:

Application

Mortgage amount: 200000 | Inlimit Machine Reasoning

Down Payment: 50000 | Years of amortization: 20

Applicant

Name: Sam GU  
Annual Income: 123456  
SSN: 123456

Property

Age of property: 3  
Address of property: 25 HMT, Singapore  
Locale: Urban  
Sale Price: 250000

Inlimit

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**

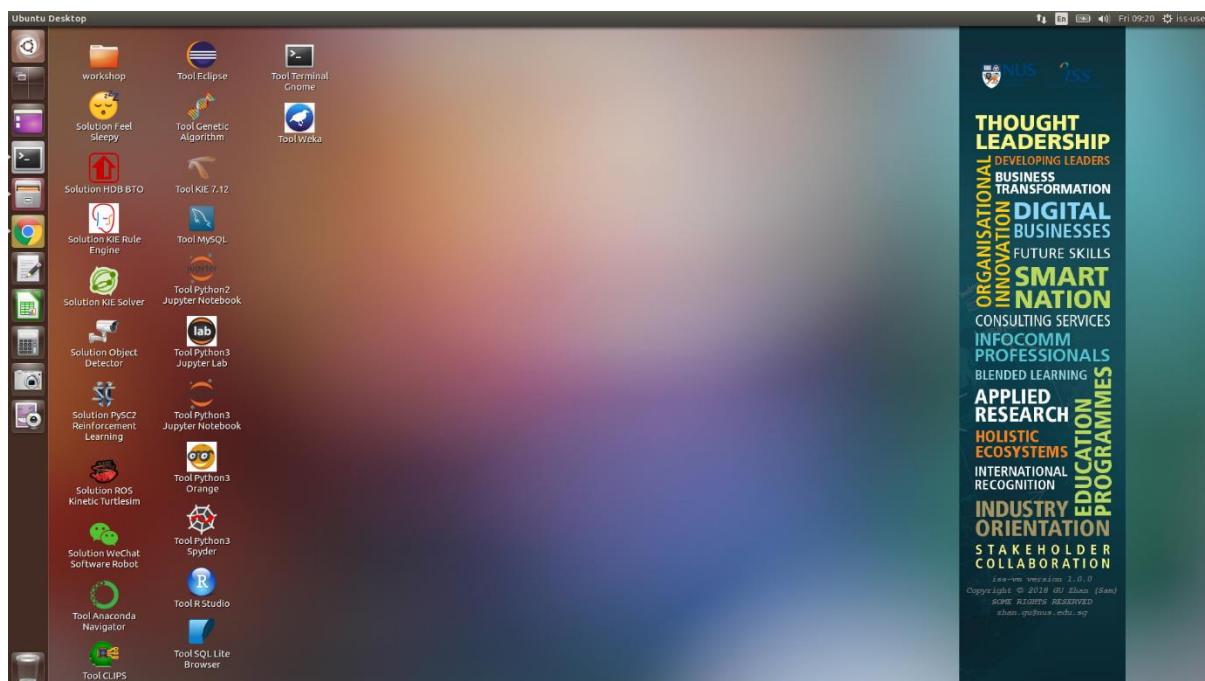


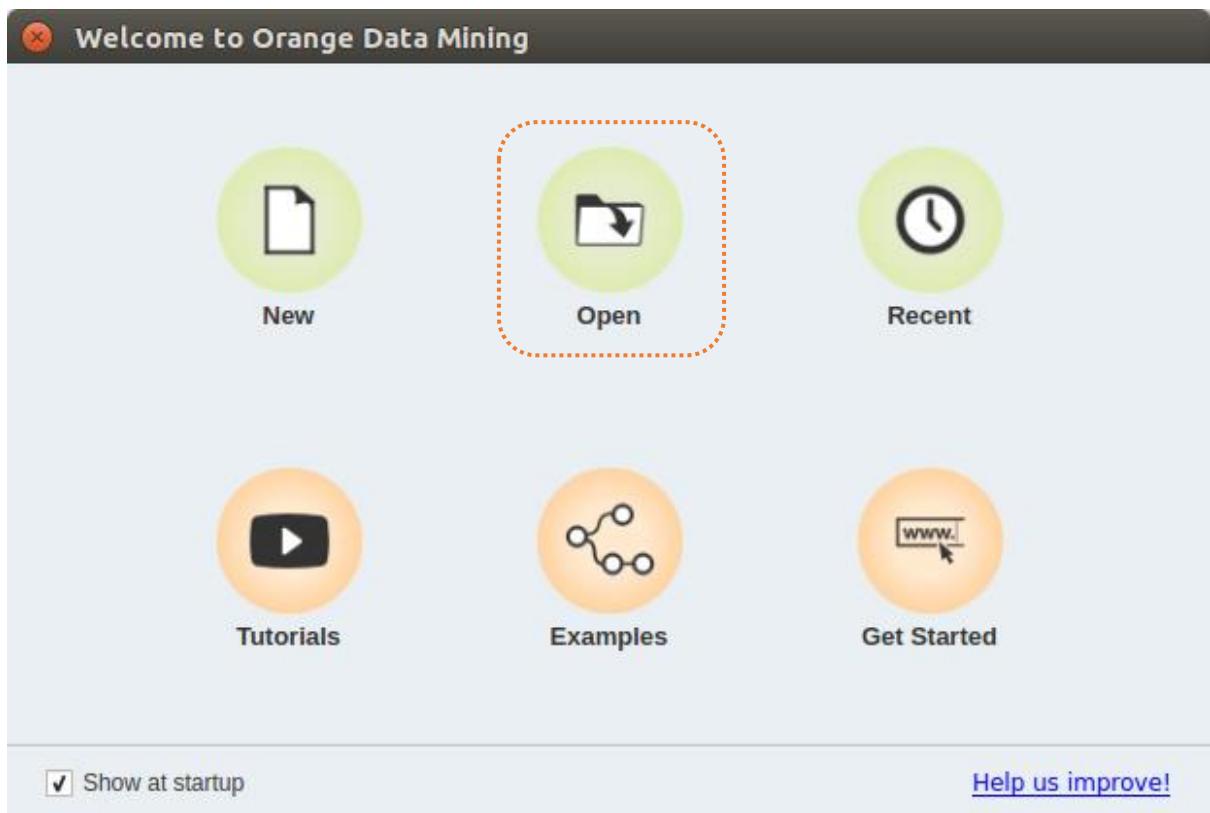
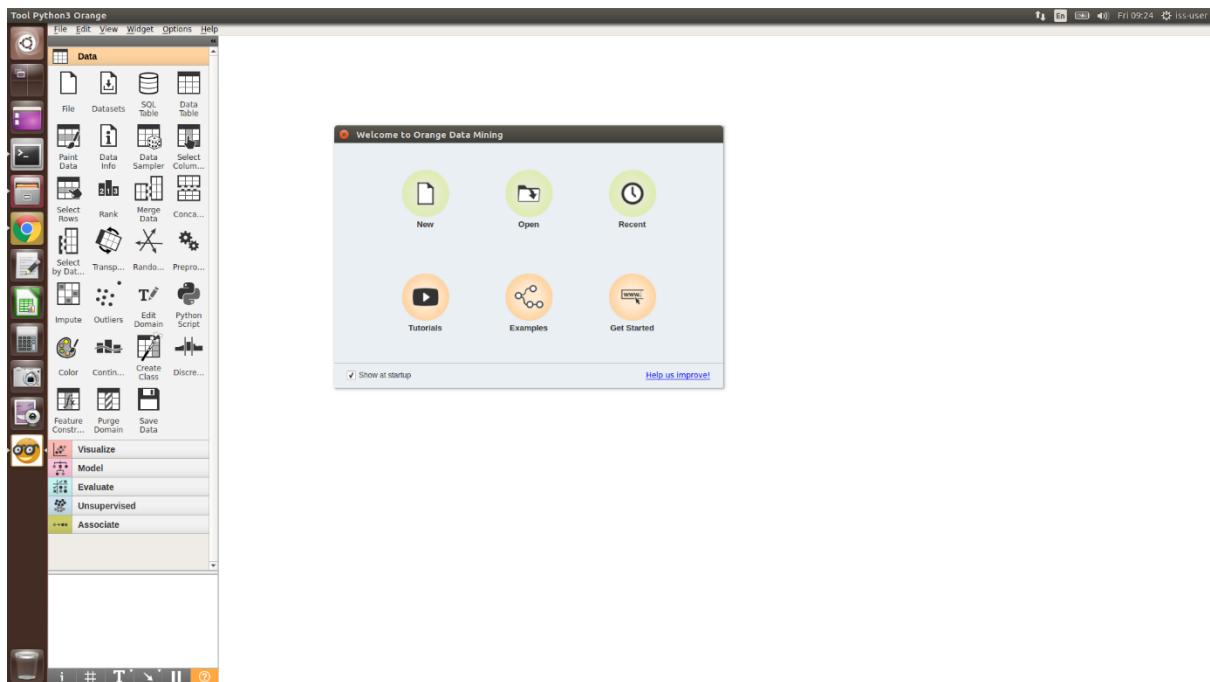
#### 3.1. Knowledge Discovery [ Orange3 ]

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

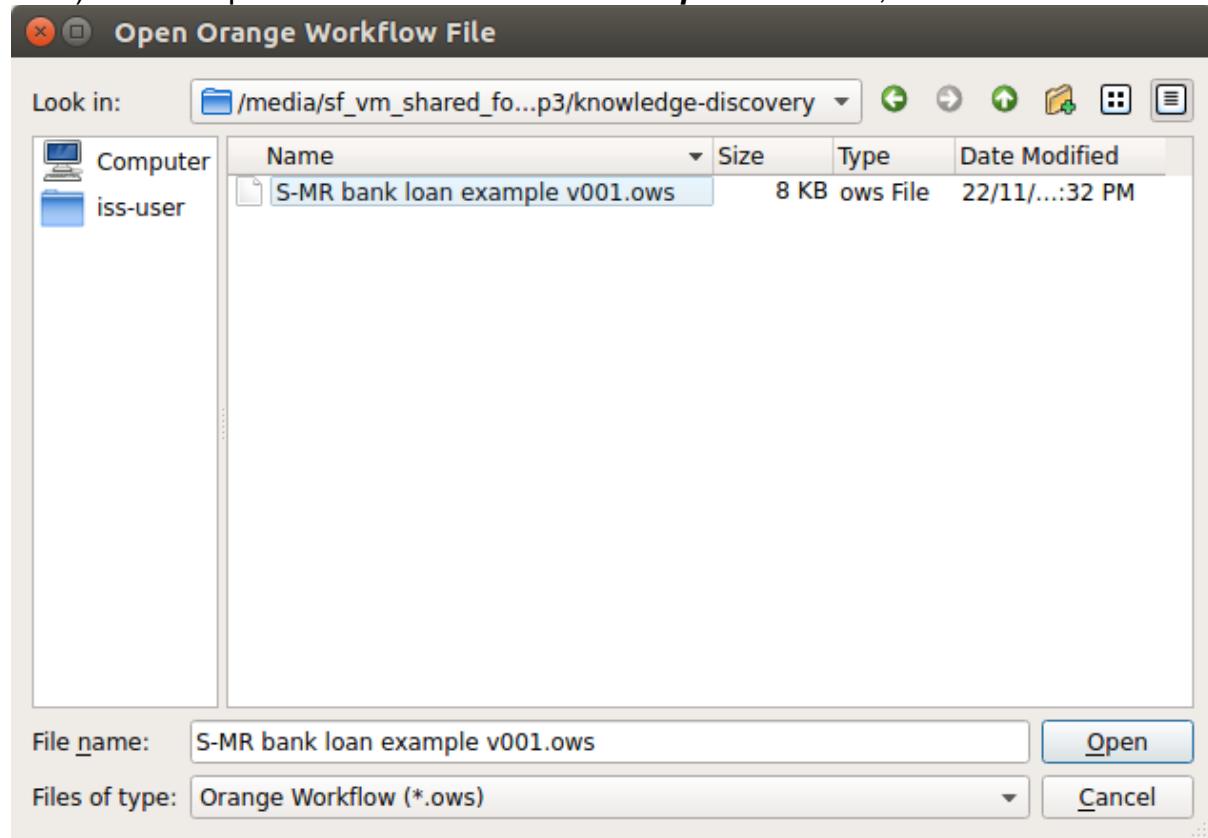
- Extract business rules from data using inductive reasoning: historic bank loan approval data; Use tool: **Orange3** (Python)
- Update **Mortgage\_Process** system using the discovered knowledge: business rules; Use tool: **KIE BPMS/BRMS**

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

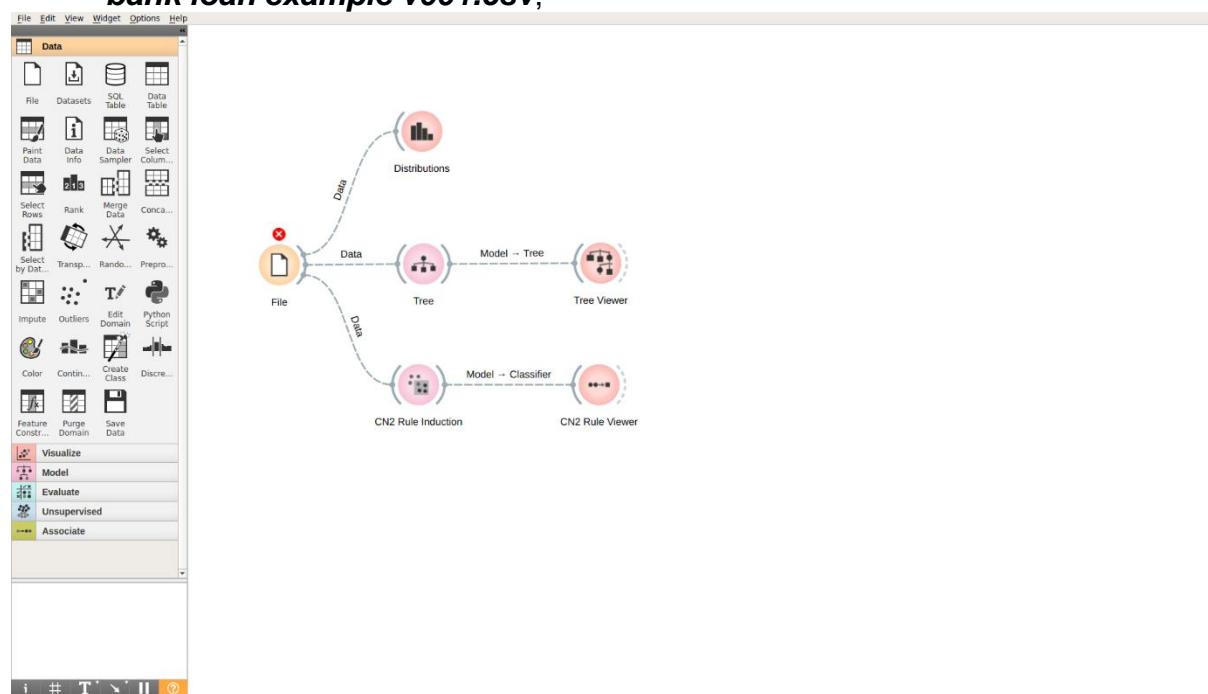


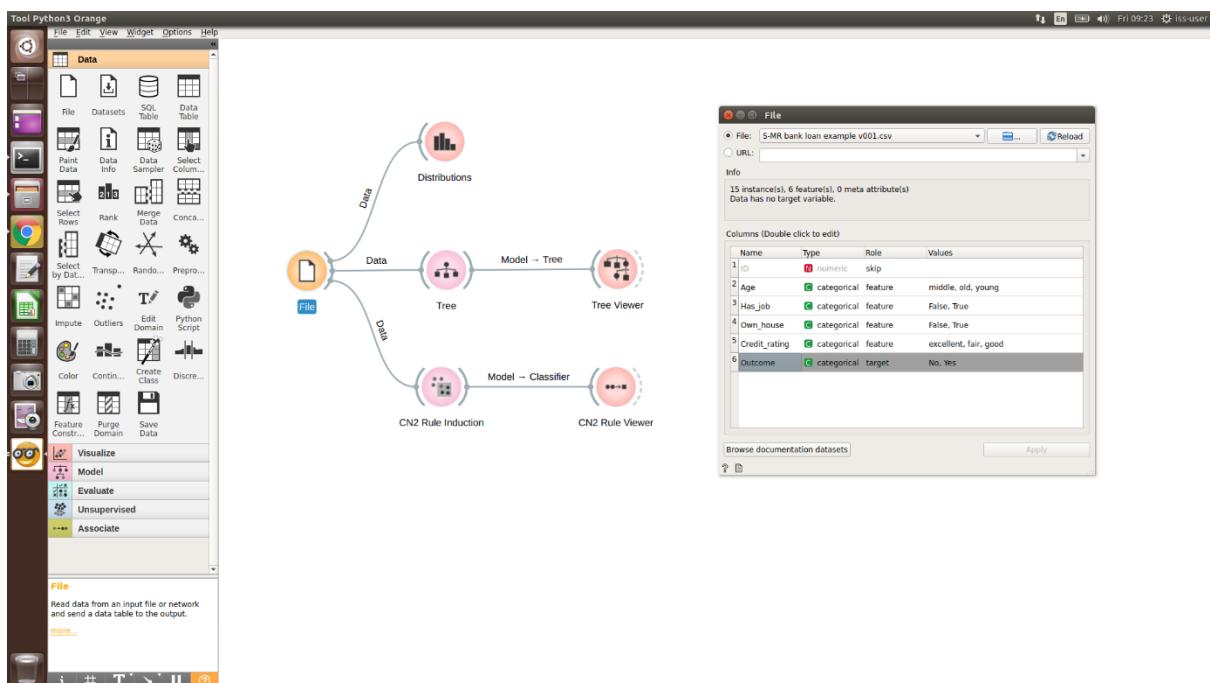
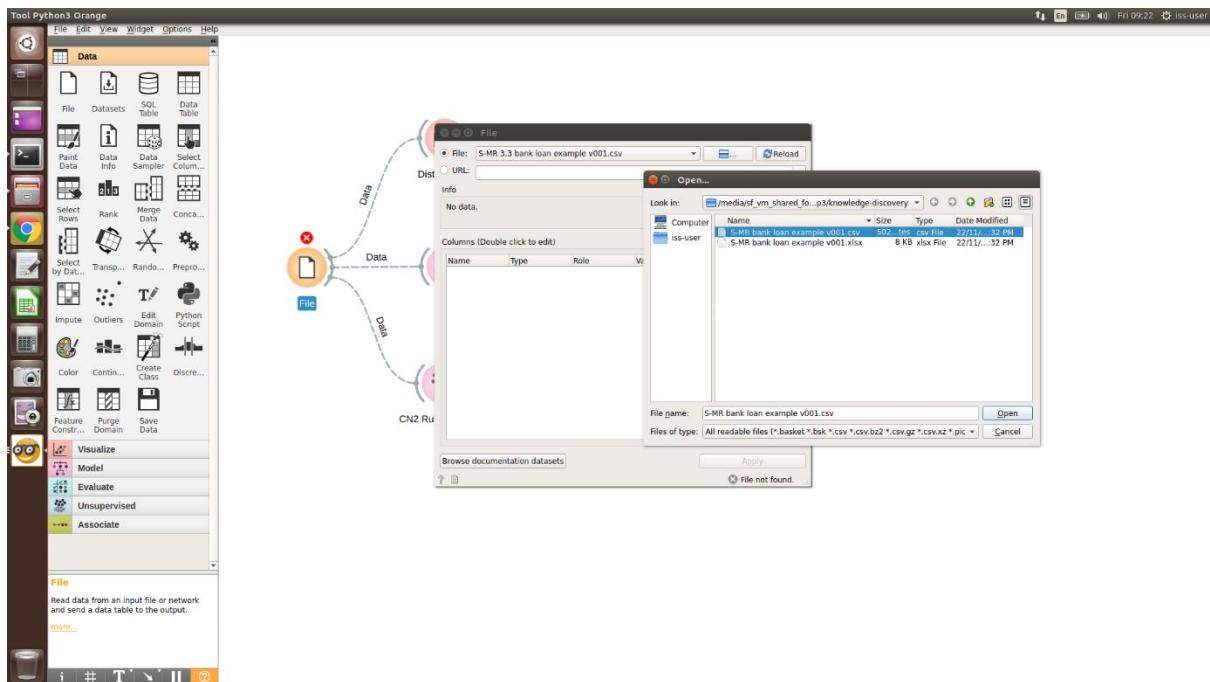


2) Select/Open file: **S-MR bank loan example v001.ows**;

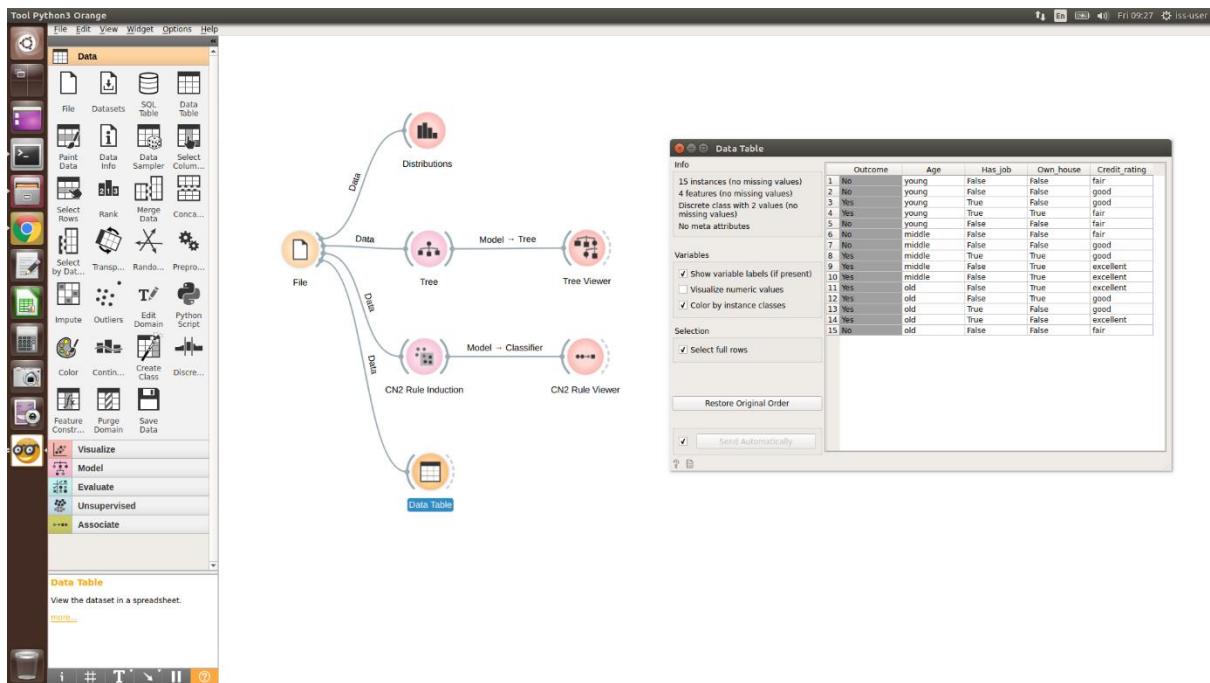


3) If **File** indicates error, click the **File** icon to locate the required data file: **S-MR bank loan example v001.csv**;

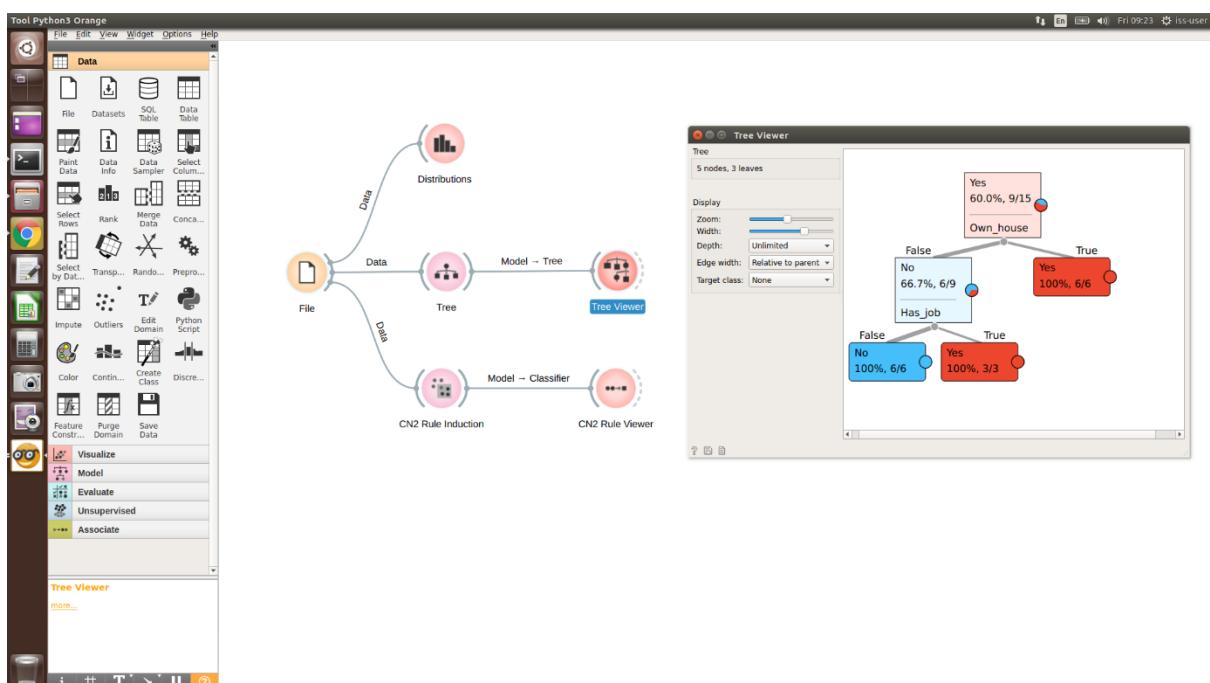




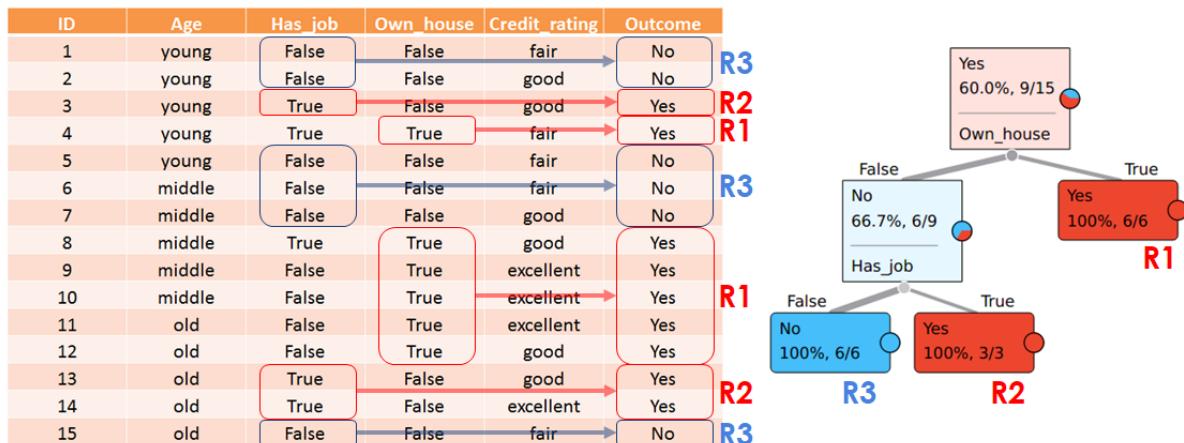
- 4) Optionally, add a **Data Table** node to view the input data table/file;



- 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'**

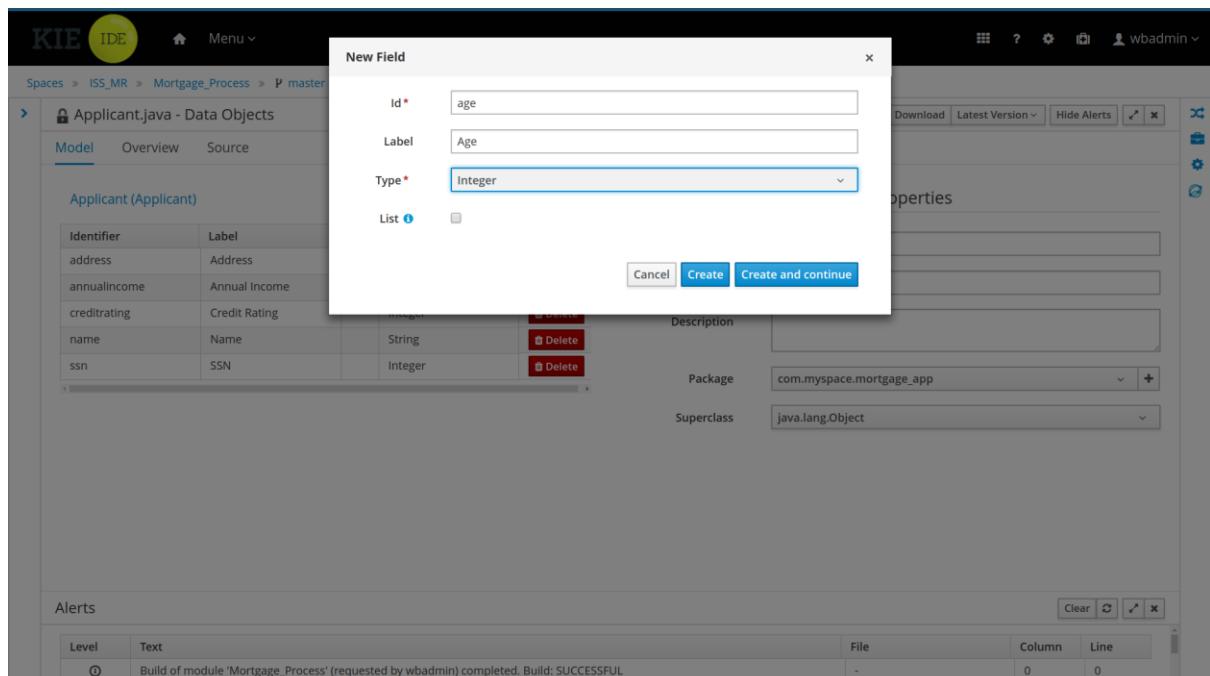
Identifier	Applicant
Label	Applicant
Description	(empty)
Package	com.myspace.mortgage_app
Superclass	java.lang.Object

**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 are buttons for **Cancel**, **Create**, and **Create and continue**. The background shows a table of existing fields for the "Applicant" entity, including address, annualincome, creditrating, name, ssn, and age. An "Alerts" section 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 are buttons for **Cancel**, **Create**, and **Create and continue**. The background shows a table of existing fields for the "Applicant" entity, including address, annualincome, creditrating, name, ssn, age, and hasJob. An "Alerts" section at the bottom indicates a successful build.

The screenshot shows the KIE IDE interface for managing data objects. The left sidebar displays the navigation path: Spaces > ISS\_MR > Mortgage\_Process > master > Applicant. The main area is titled 'Applicant.java - Data Objects' and shows the 'Model' tab selected. A table lists fields for the 'Applicant' class:

Identifier	Label	Type	Action
address	Address	String	Delete
annualincome	Annual Income	Integer	Delete
creditrating	Credit Rating	Integer	Delete
name	Name	String	Delete
ssn	SSN	Integer	Delete
age	Age	Integer	Delete
hasJob	Has Job	Boolean	Delete
ownHouse	Own House	Boolean	Delete

To the right, the 'general properties' of the 'Applicant' class are displayed:

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

Below the table, an 'Alerts' section shows one entry:

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

3) **Save** changes;

The screenshot shows the KIE IDE interface. A 'Confirm Save' dialog box is open in the center, asking 'Save changes for this Asset?'. Below the dialog, the 'Applicant.java - Data Objects' editor is visible, showing a table of fields:

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	

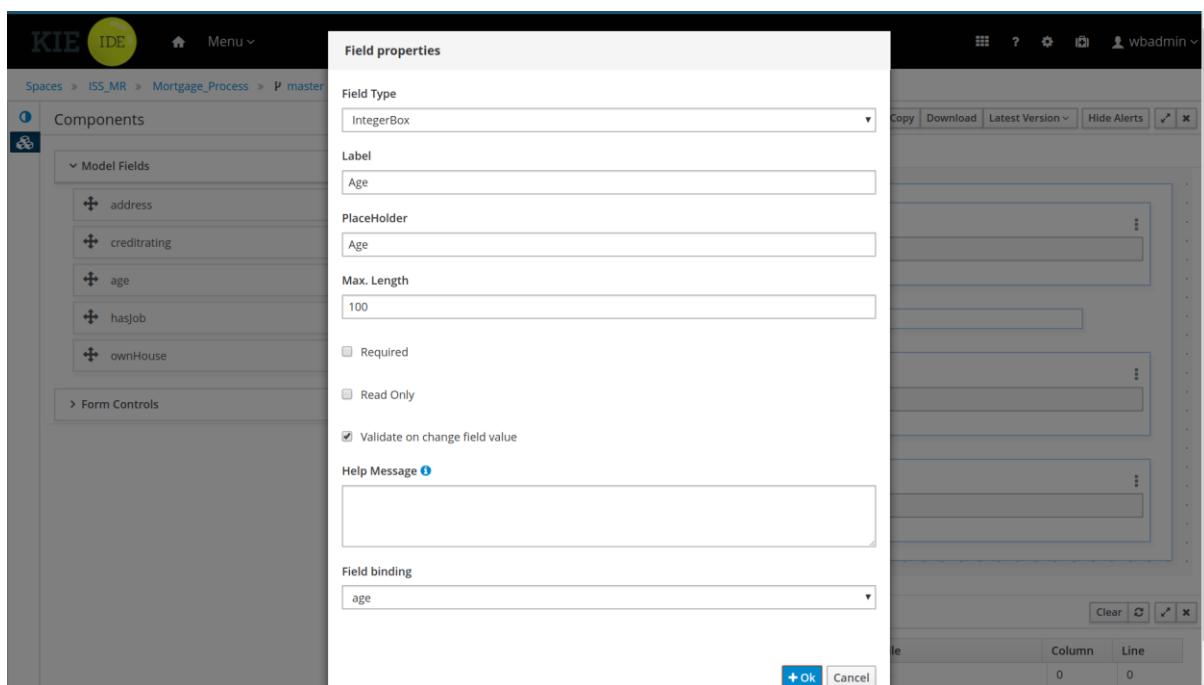
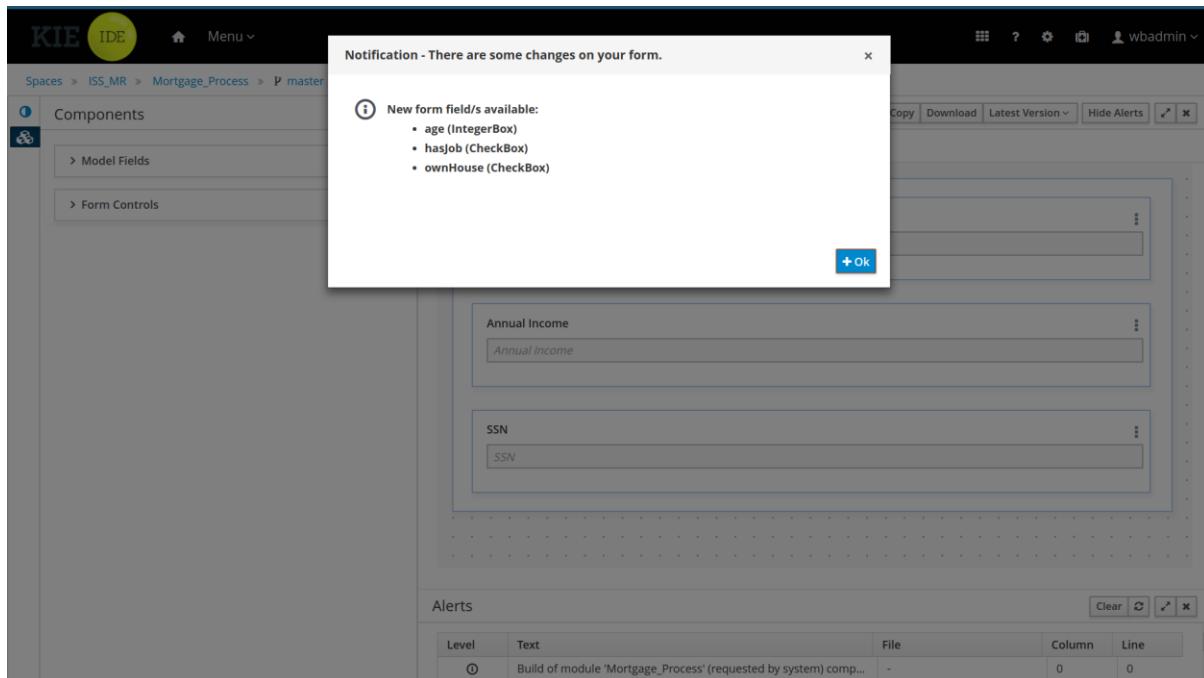
To the right of the table, there is a panel for 'Applicant (Applicant)- general properties' with fields like Identifier, Label, Description, Package, and Superclass. At the bottom, an 'Alerts' section shows a single build log entry.

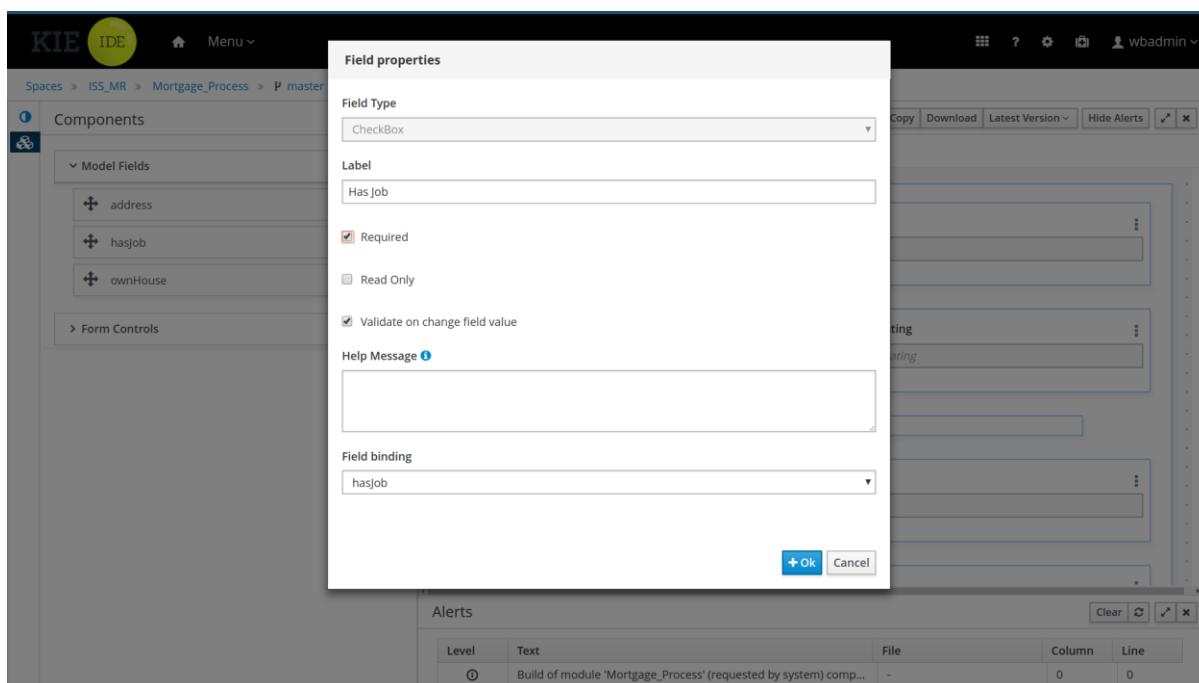
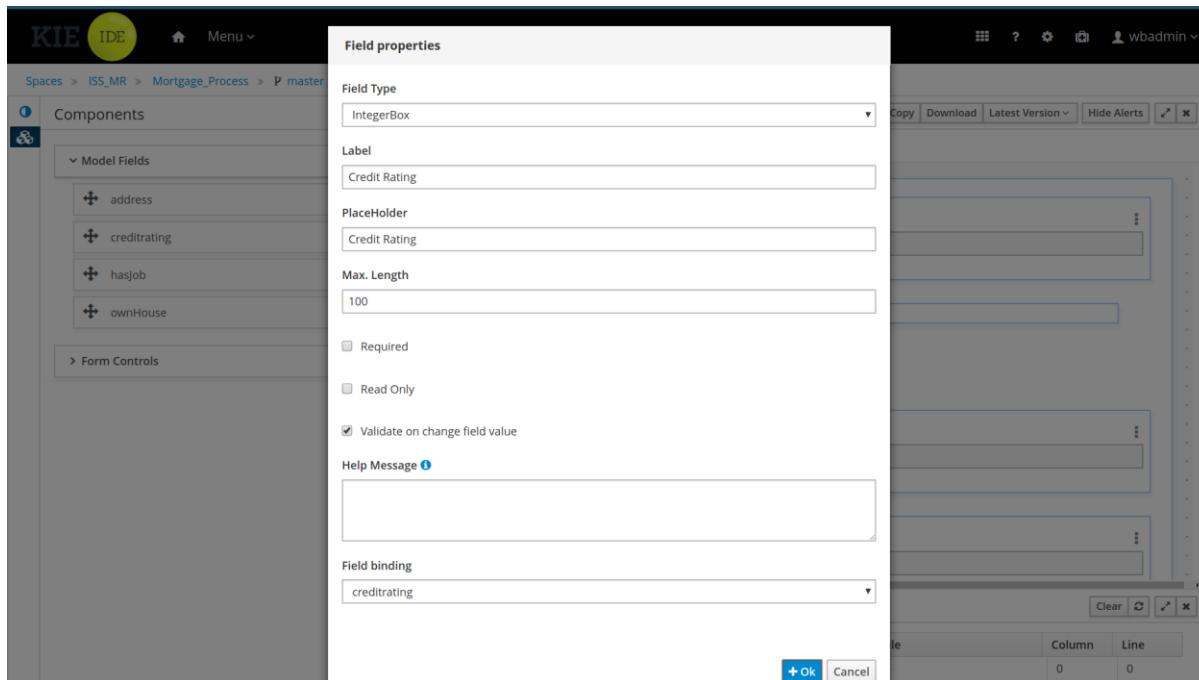
4) Go to **Assets** list of project **Mortgage\_Process**; Edit [ Forms: **Applicant** ]; Add new fields onto the form;

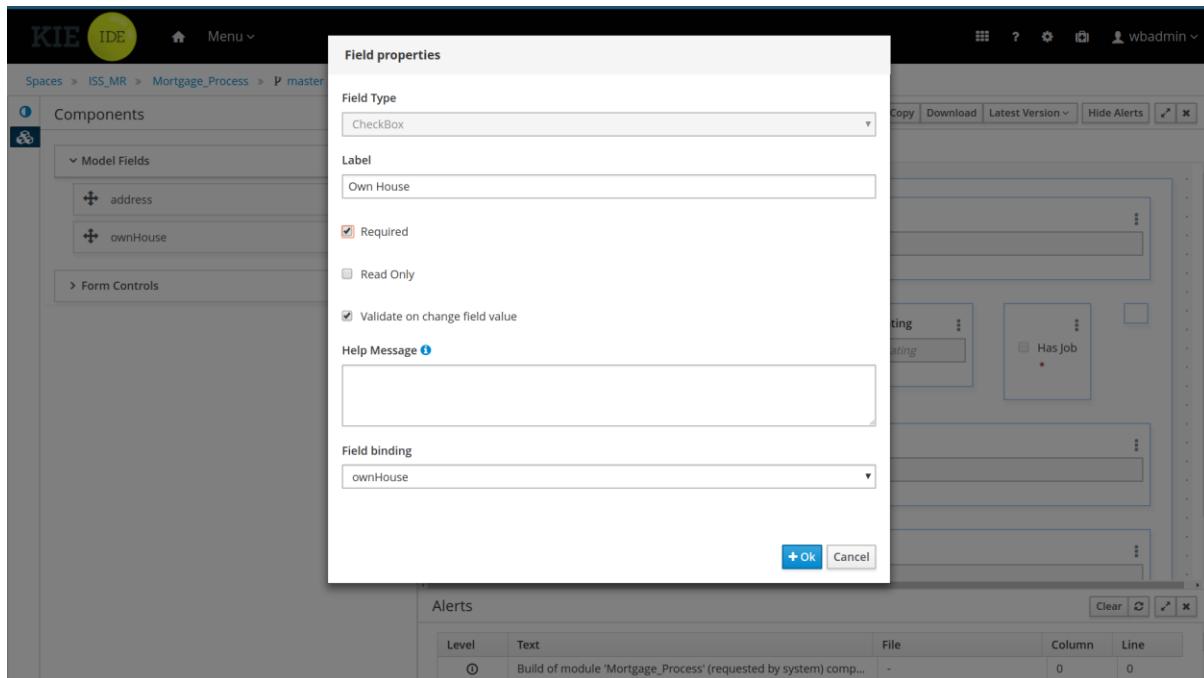
The screenshot shows the KIE IDE interface with the 'Assets' tab selected. The 'Mortgage\_Process' project is listed. The asset list shows the following items:

- Applicant** (Forms)
- Applicant** (Data Objects)
- Application** (Forms)
- Application** (Data Objects)

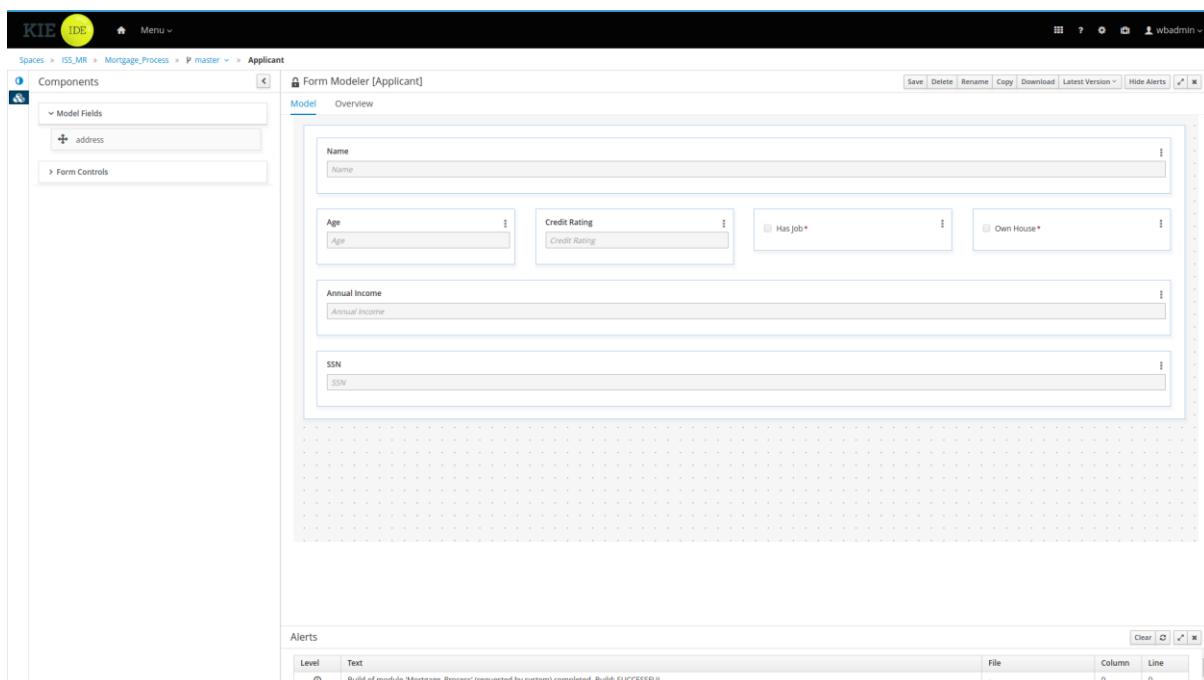
At the bottom, an 'Alerts' section shows a single build log entry.



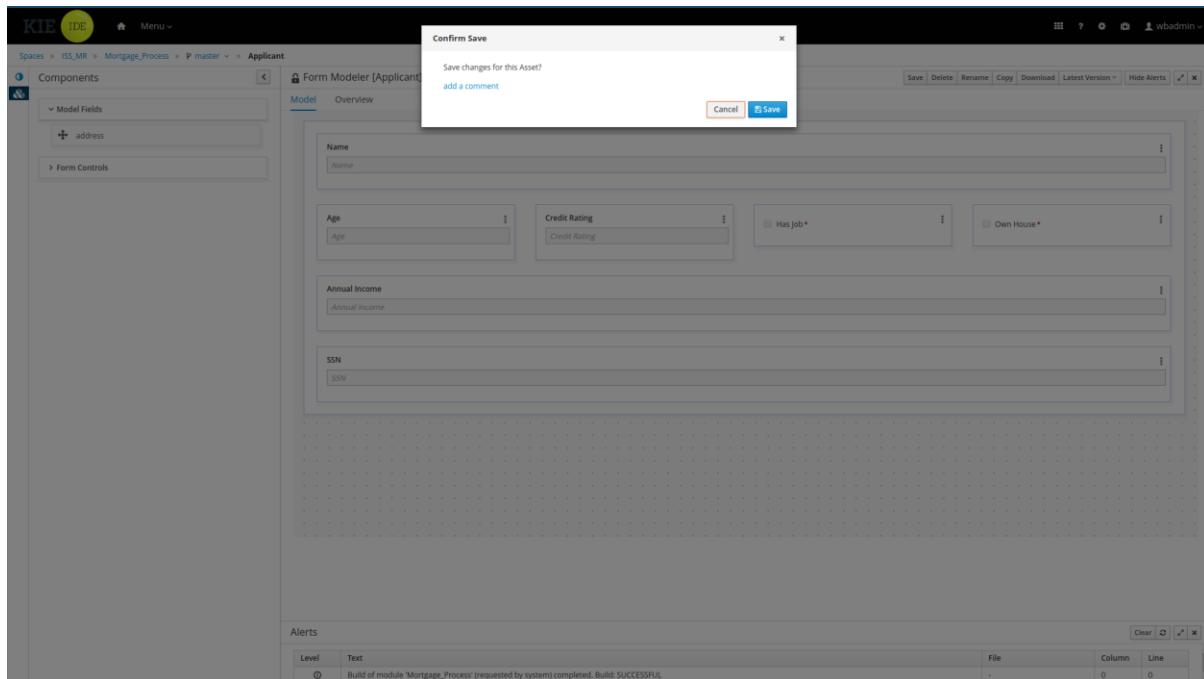




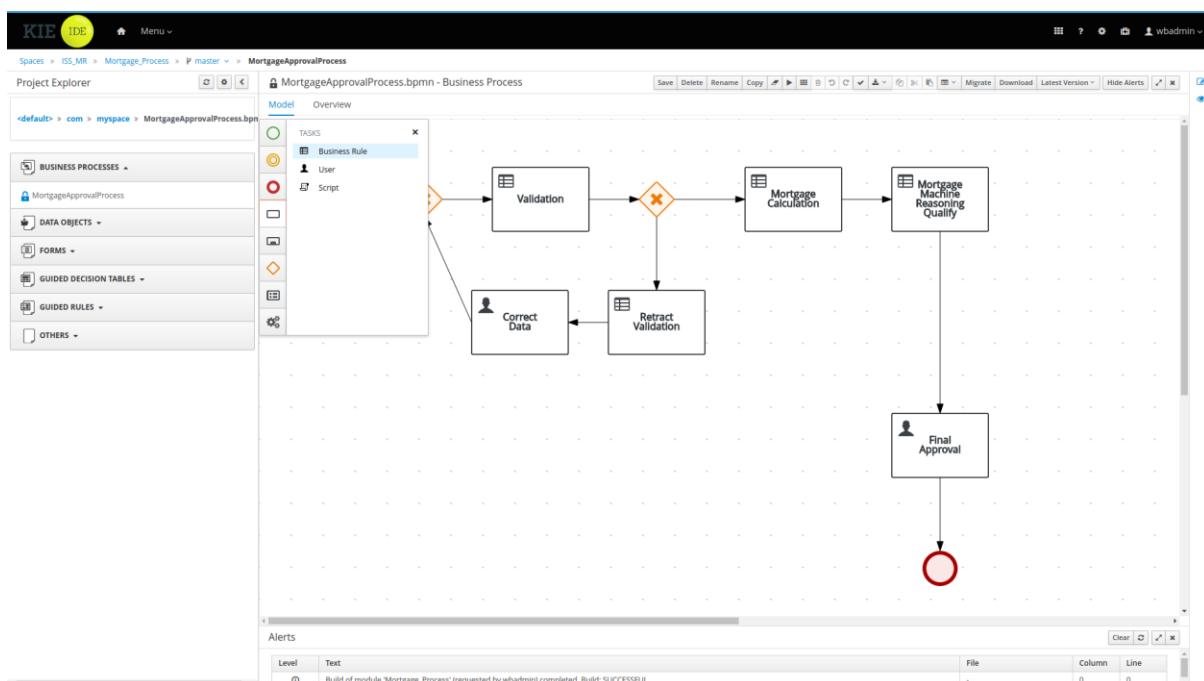
## 5) Adjust field width aesthetically;

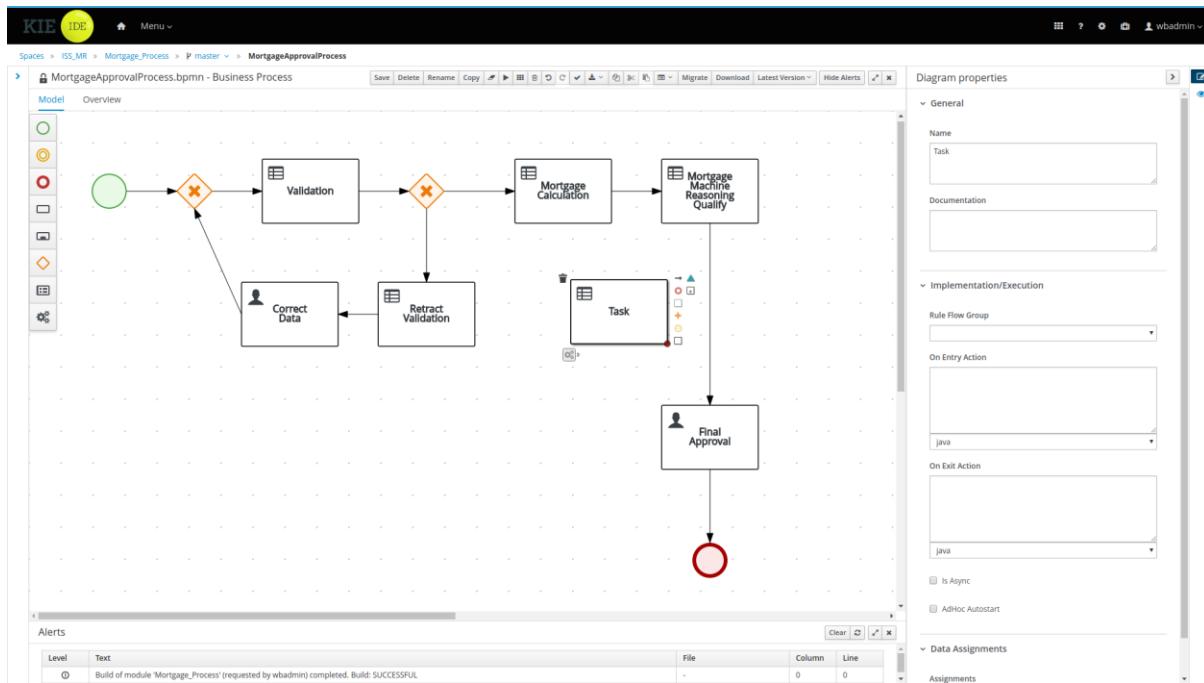


6) **Save** changes of **Form** updates;

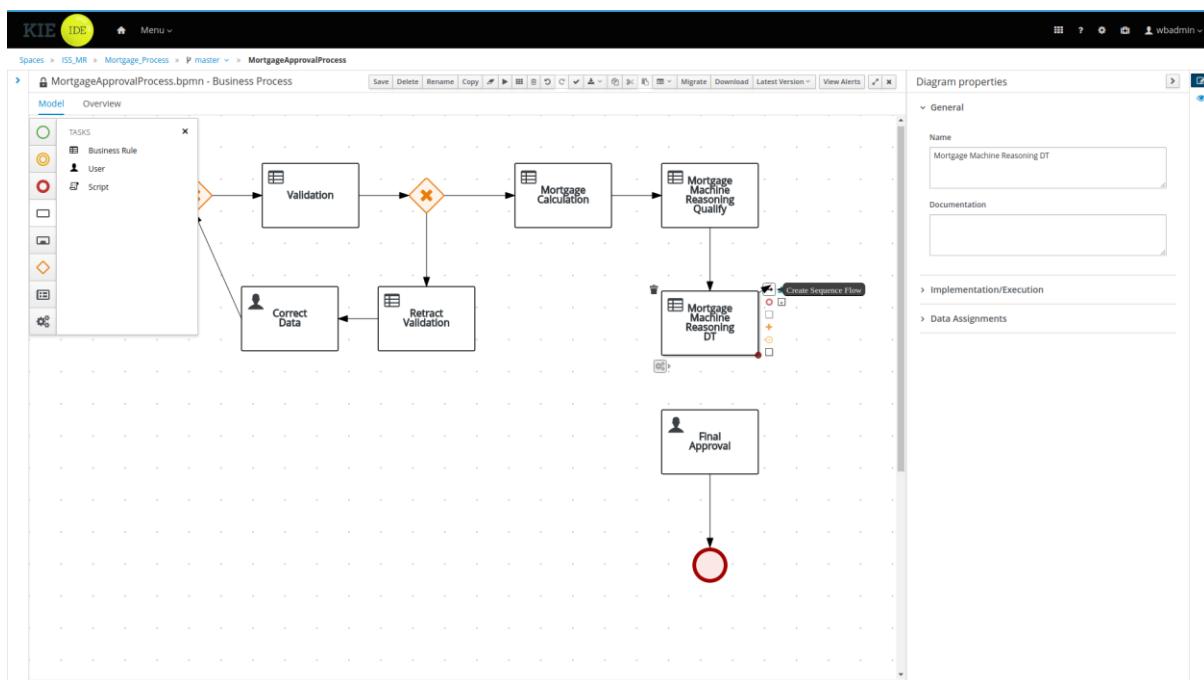


7) Go to **Assets** list of project **Mortgage\_Process**; Edit [ Business Processes: **MortgageApprovalProcess** ]; Add a **Business Rule** process task;

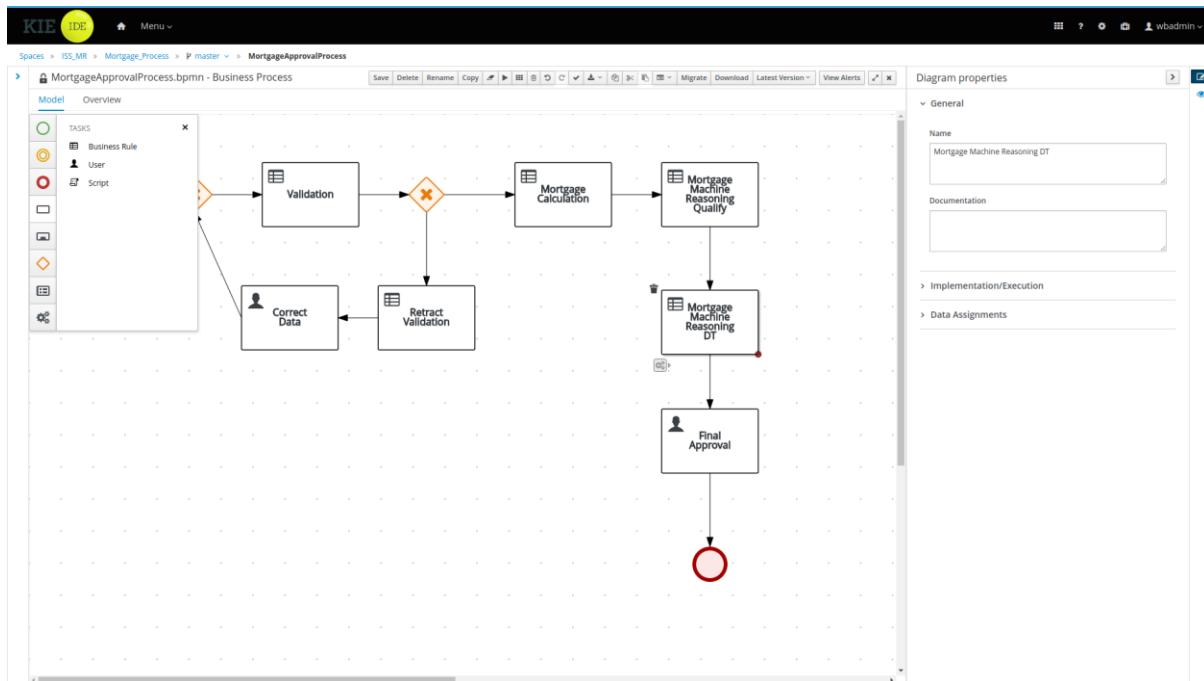




## 8) Rename the task name to ***Mortgage Machine Reasoning DT***;



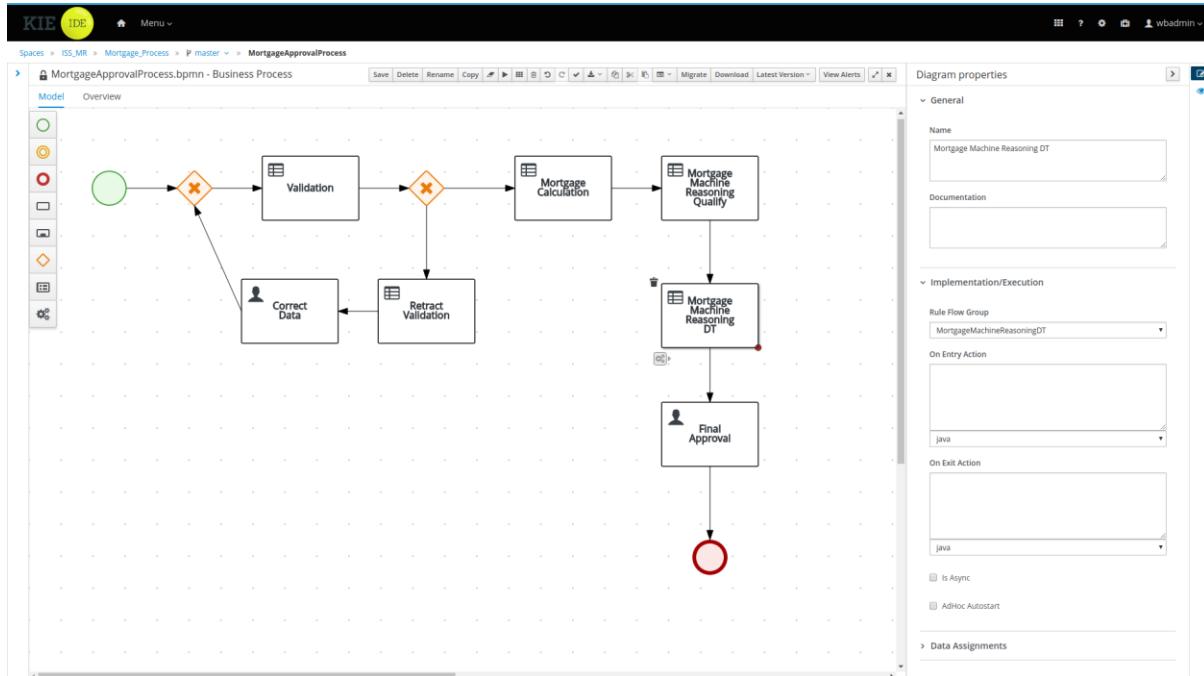
- 9) Update flow link to place the task in between [ **Rule Task: Mortgage Machine Reasoning Qualify** ] and [ **User Task: Final Approval** ];



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

Name : **Mortgage Machine Reasoning DT**

Rule Flow Group : **MortgageMachineReasoningDT**

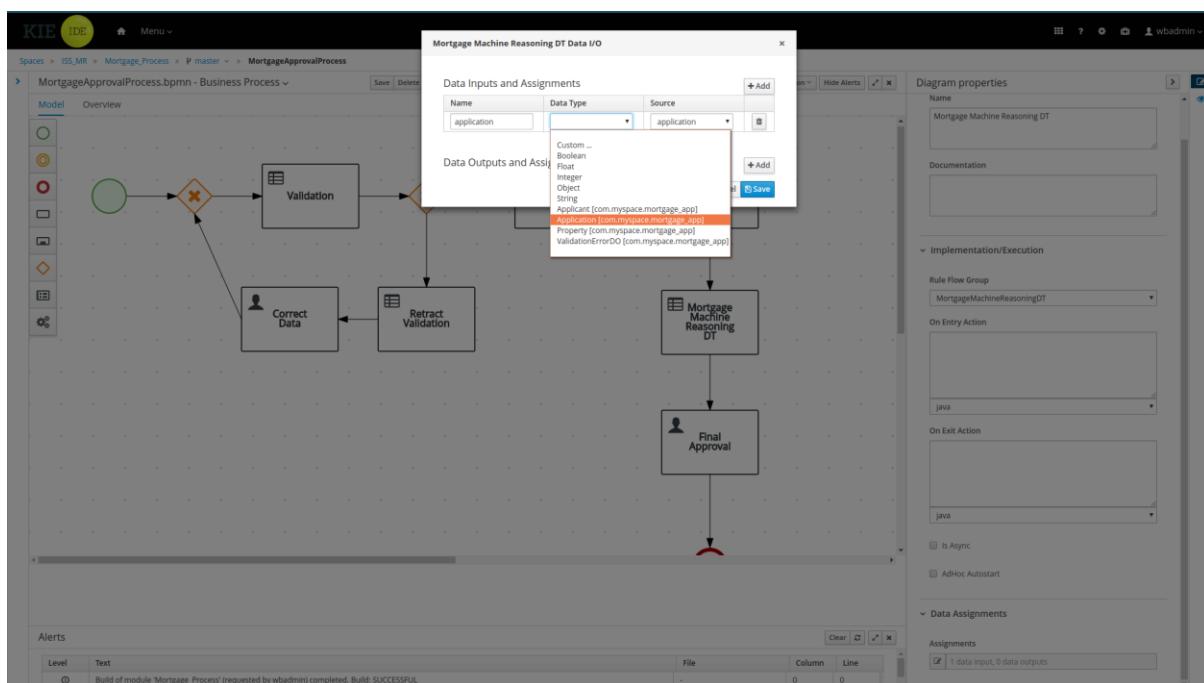
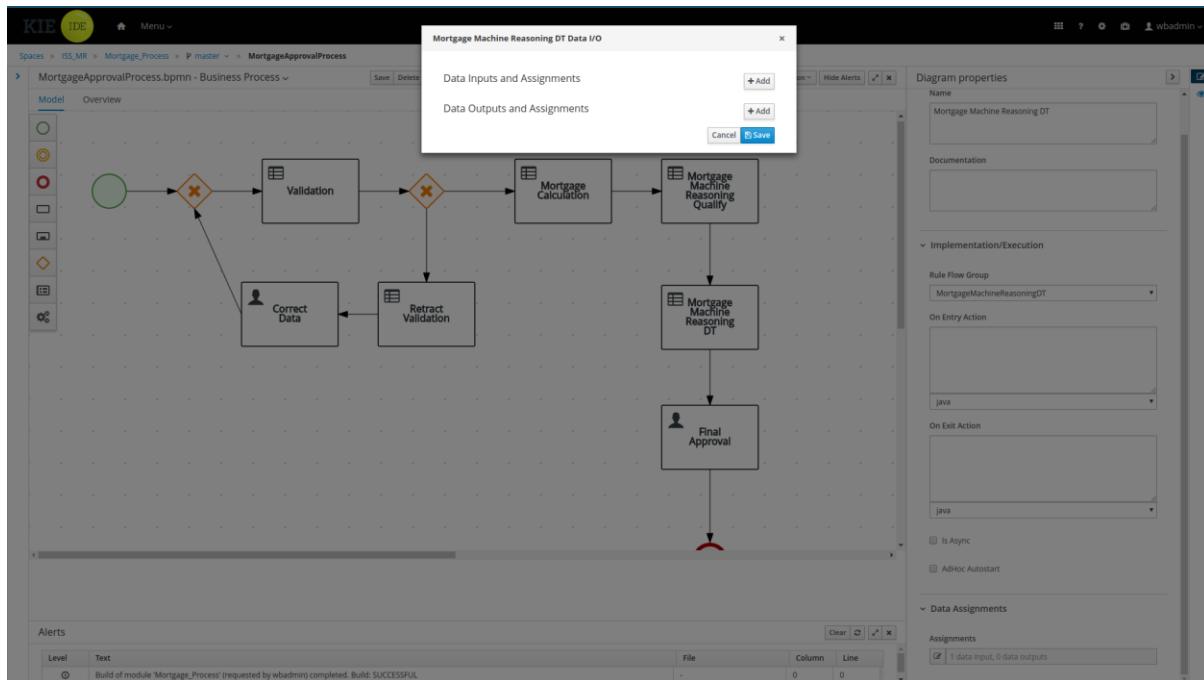


11) In **Diagram properties** panel at right, open **Assignments of Data Assignments**; Key in or select below values from drop down list; **Save**

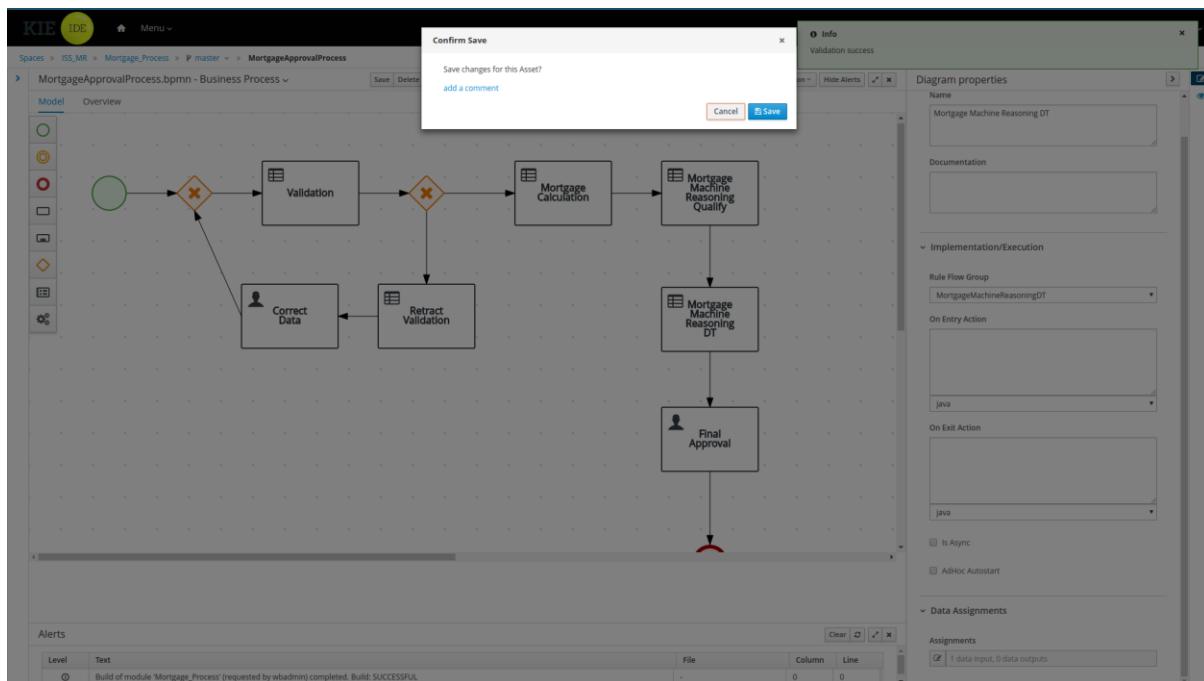
changes at last;

### 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

1	Applicant	Forms	Last modified today	Created 2 days ago
2	Applicant	Data Objects	Last modified today	Created 2 days ago
3	Application	Forms	Last modified today	Created 2 days ago
4	Application	Data Objects	Last modified today	Created 2 days ago
5	ApplicationError	Forms	Last modified today	Created 2 days ago
6	ApplicationMortgage	Data Objects	Last modified today	Created 2 days ago
7	ApplicationMortgage	Forms	Last modified today	Created 2 days ago

Add Asset

Business Process	Business Process (legacy)	Data Object	Decision Table (Spreadsheet)
DMN (Preview)	DRL file	Global Variable(s)	Enumeration Model
Form	Guided Decision Table	Guided Decision Table Graph	
Guided Decision Tree	Guided Rule	Guided Rule Template	Guided Score Card
Package	Score Card (Spreadsheet)	Solver configuration Optimization	Test Scenario
Work Item definition	Case definition		

Create new Guided Decision Table

Guided Decision Table \*

MortgageMachineReasoningDT

Package

com.myspace.mortgage\_app

Hit Policy:

None

This is the normal hit mode. Old decision tables will use this by default, but since 7.0 uses PHREAK the row order now matters. There is no migration tooling needed for the old tables. Multiple rows can fire. Verification warns about rows that conflict.

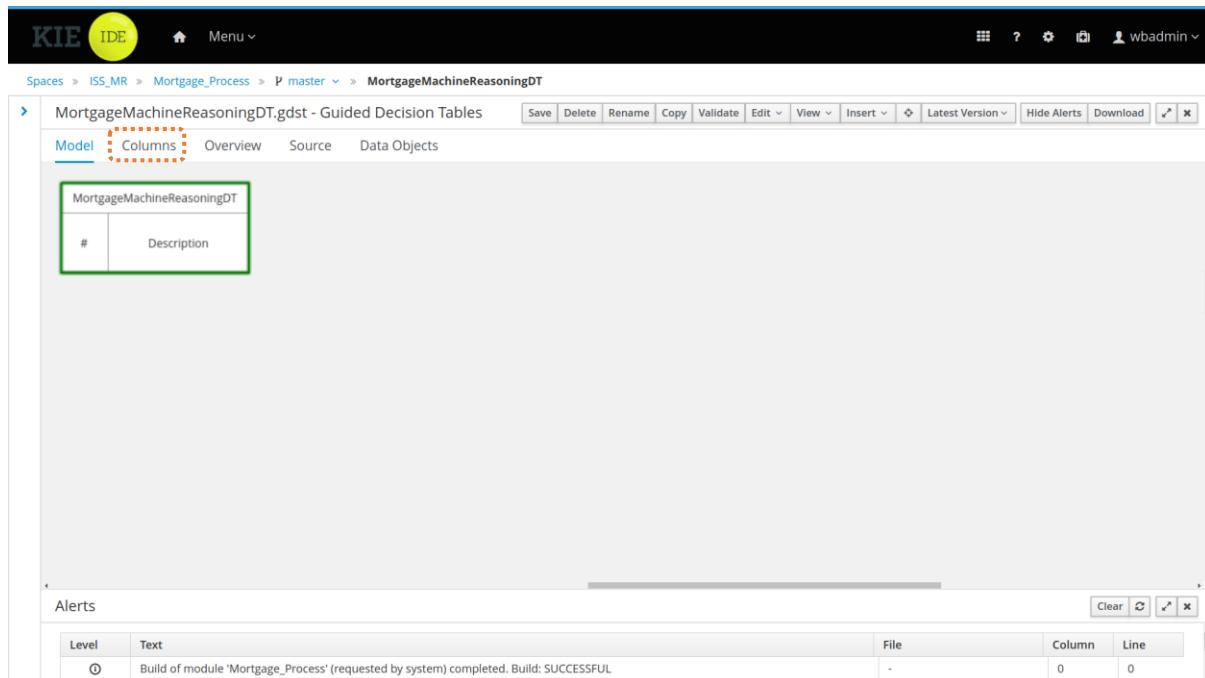
Table Format:

- Extended entry, values defined in table body
- Limited entry, values defined in columns

+ OK Cancel

Alerts

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



KIE IDE

Spaces > ISS\_MR > Mortgage\_Process > master > MortgageMachineReasoningDT

MortgageMachineReasoningDT.gdst - Guided Decision Tables

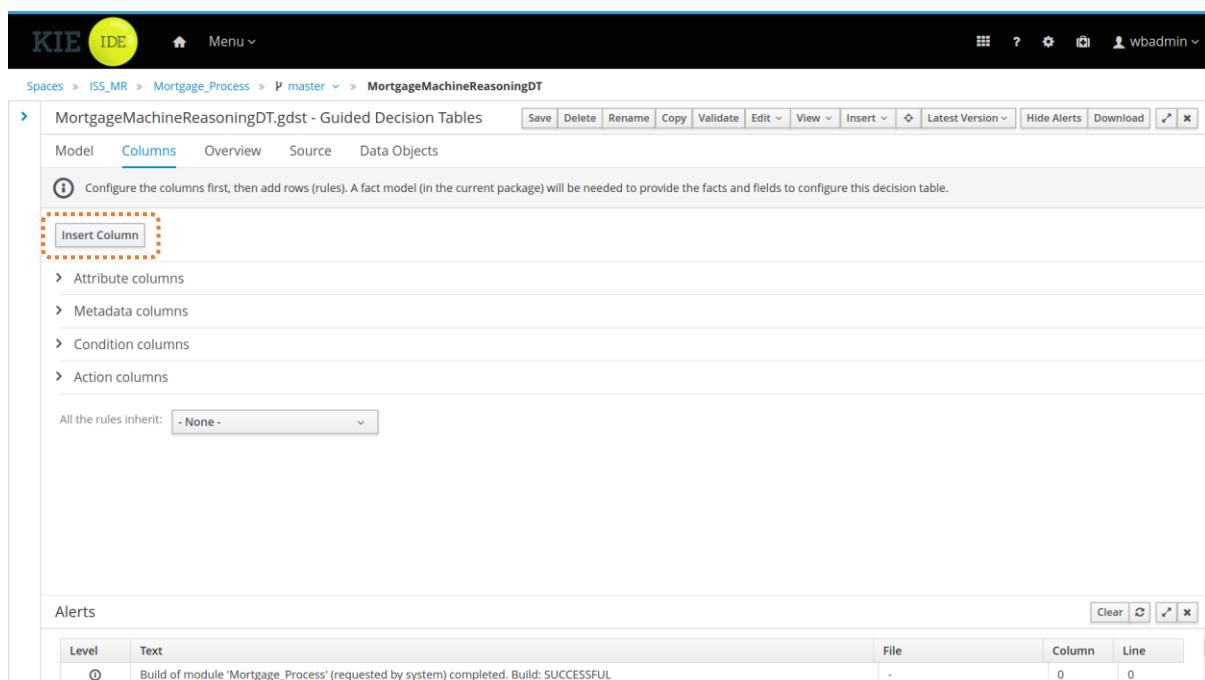
Model Columns Overview Source Data Objects

MortgageMachineReasoningDT

#	Description

Alerts

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



KIE IDE

Spaces > ISS\_MR > Mortgage\_Process > master > MortgageMachineReasoningDT

MortgageMachineReasoningDT.gdst - Guided Decision Tables

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

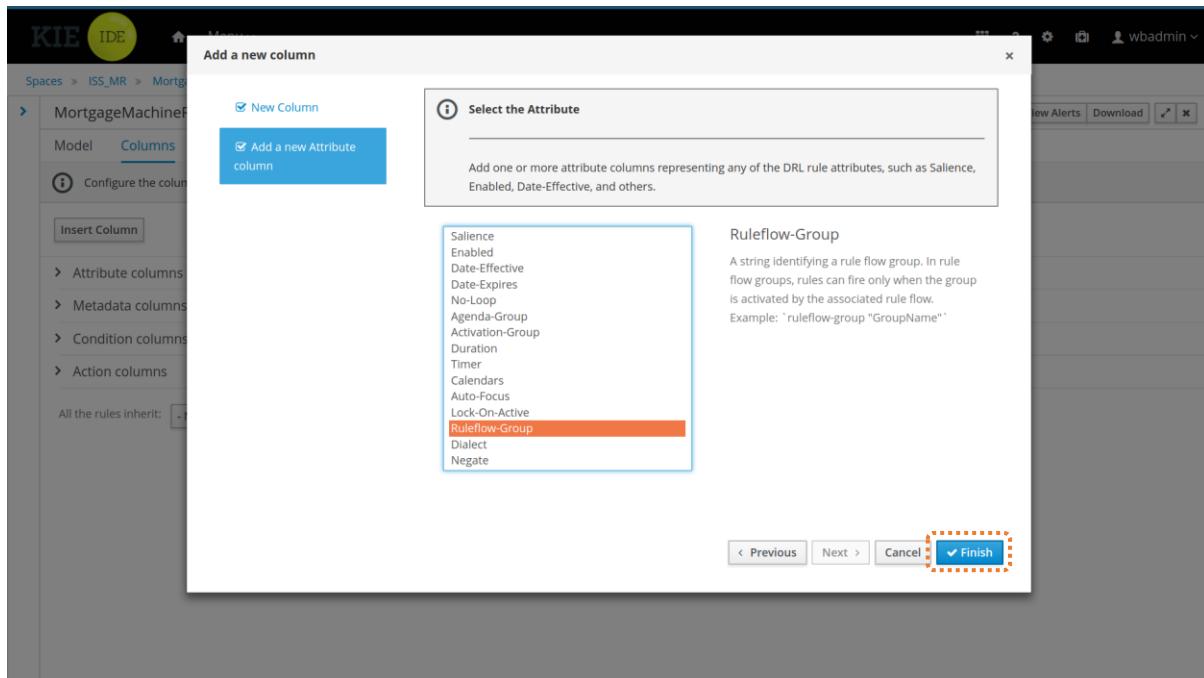
All the rules inherit: - None -

Alerts

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

The screenshot shows the 'Add a new column' wizard in the KIE IDE. The left sidebar shows the project structure: Spaces > ISS\_MR > MortgageMachineP. The 'Columns' tab is selected. A modal window titled 'Add a new column' is open, with the 'New Column' button checked. The first step, 'Select the type of column', is displayed. It includes a note: 'Add a new column to the guided decision table. (Select **Include advanced options** to view all options). The parameters required for each column type are presented as additional pages in the wizard.' Below this are several options: 'Add a Condition', 'Delete an existing fact', 'Set the value of a field', and a checkbox for 'Include advanced options' which is unchecked and highlighted with a red dotted border. At the bottom of the modal are buttons for '< Previous', 'Next >', 'Cancel', and a checked 'Finish' button.

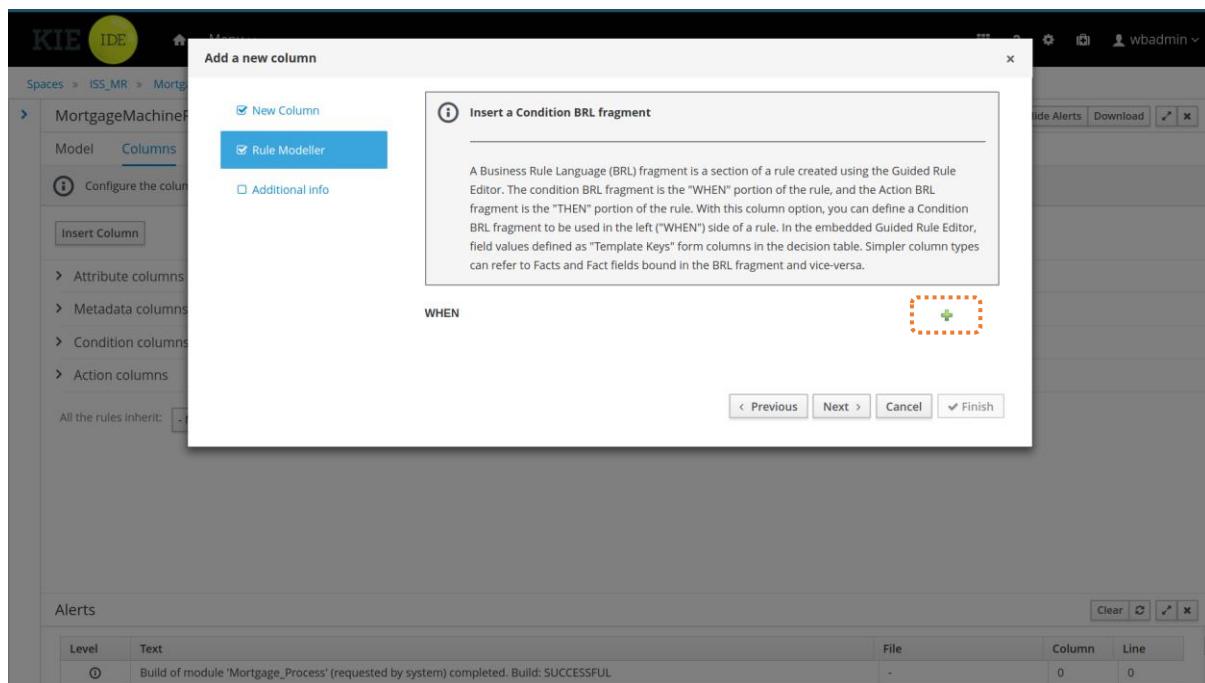
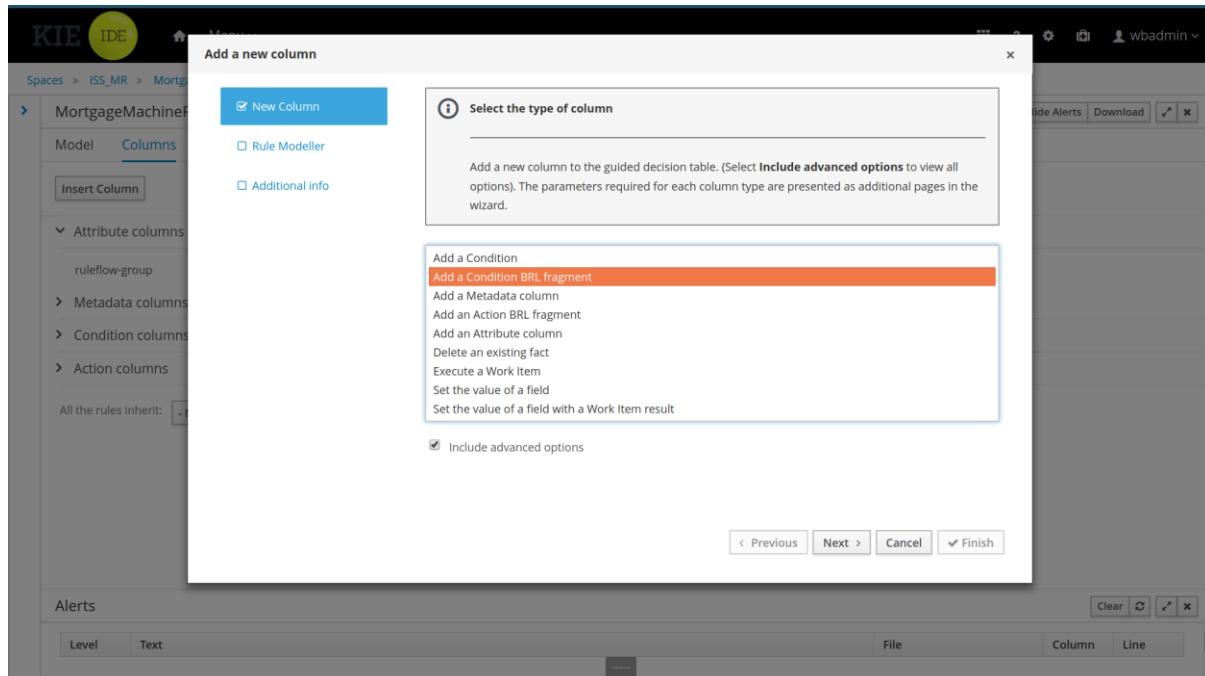
The screenshot shows the 'Add a new column' wizard in the KIE IDE. The left sidebar shows the project structure: Spaces > ISS\_MR > MortgageMachineP. The 'Columns' tab is selected. A modal window titled 'Add a new column' is open, with the 'New Column' button checked. The second step, 'Select the type of column', is displayed. It includes a note: 'Add a new column to the guided decision table. (Select **Include advanced options** to view all options). The parameters required for each column type are presented as additional pages in the wizard.' Below this are several options: 'Add a Condition', 'Add a Condition BRL fragment', 'Add a Metadata column', 'Add an Action BRL fragment', 'Add an Attribute column' (which is selected and highlighted with an orange background), 'Delete an existing fact', 'Execute a Work Item', 'Set the value of a field', and 'Set the value of a field with a Work Item result'. A checkbox for 'Include advanced options' is checked and located at the bottom left of the list. At the bottom of the modal are buttons for '< Previous', 'Next >' (which is highlighted with a red dotted border), 'Cancel', and a checked 'Finish' button.

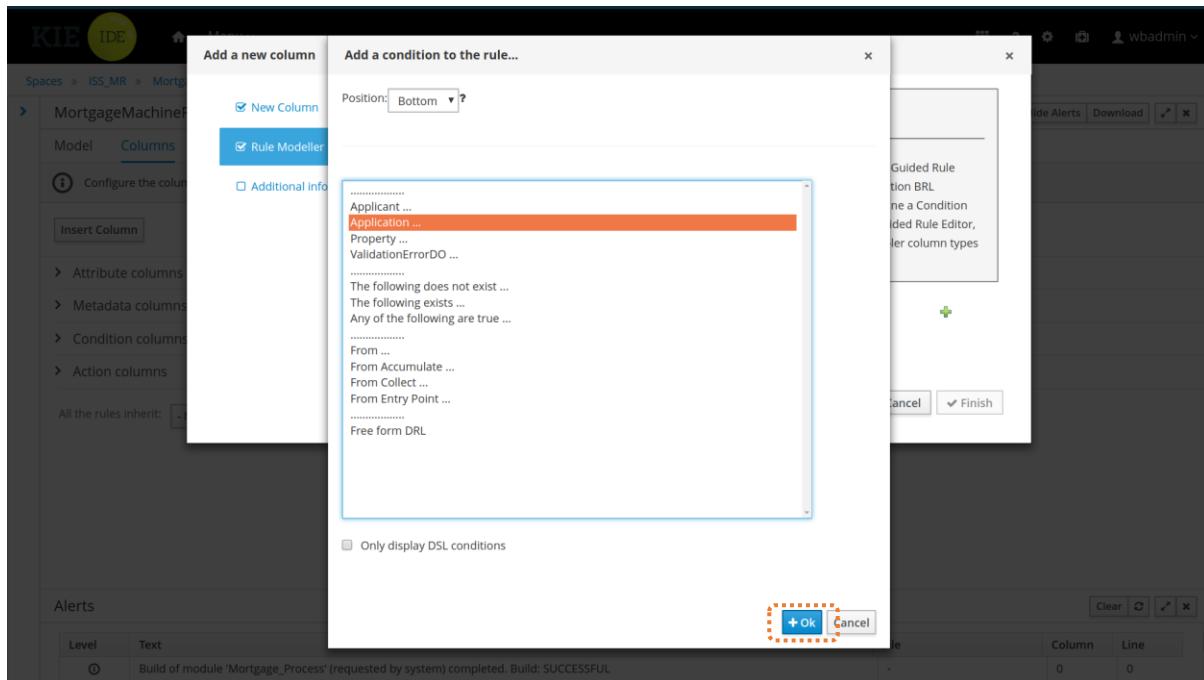


14) Key in Rule Flow Group value: ***MortgageMachineReasoningDT***,

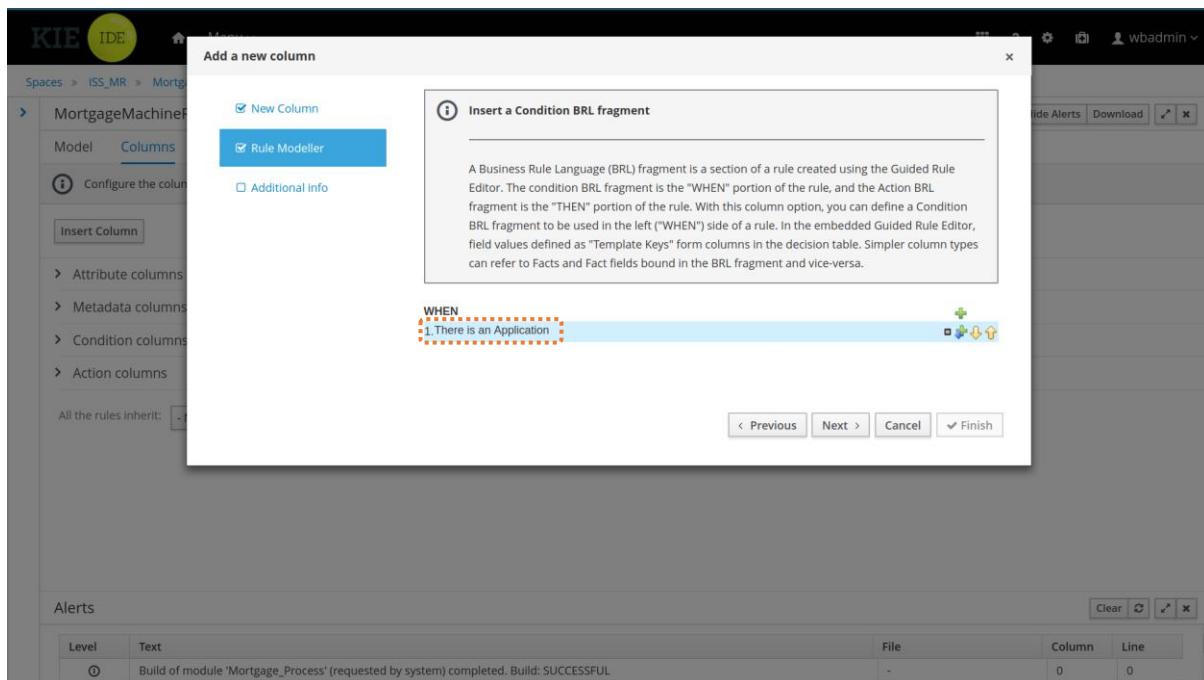
The screenshot shows the KIE IDE interface with the 'MortgageMachineReasoningDT.gdst - Guided Decision Tables' page open. The 'ruleflow-group' column is selected, and its 'Default value:' field contains 'MortgageMach', which is highlighted with a red box. The 'Columns' tab is selected in the top navigation bar. The 'ruleflow-group' column is part of the 'Attribute columns' group.

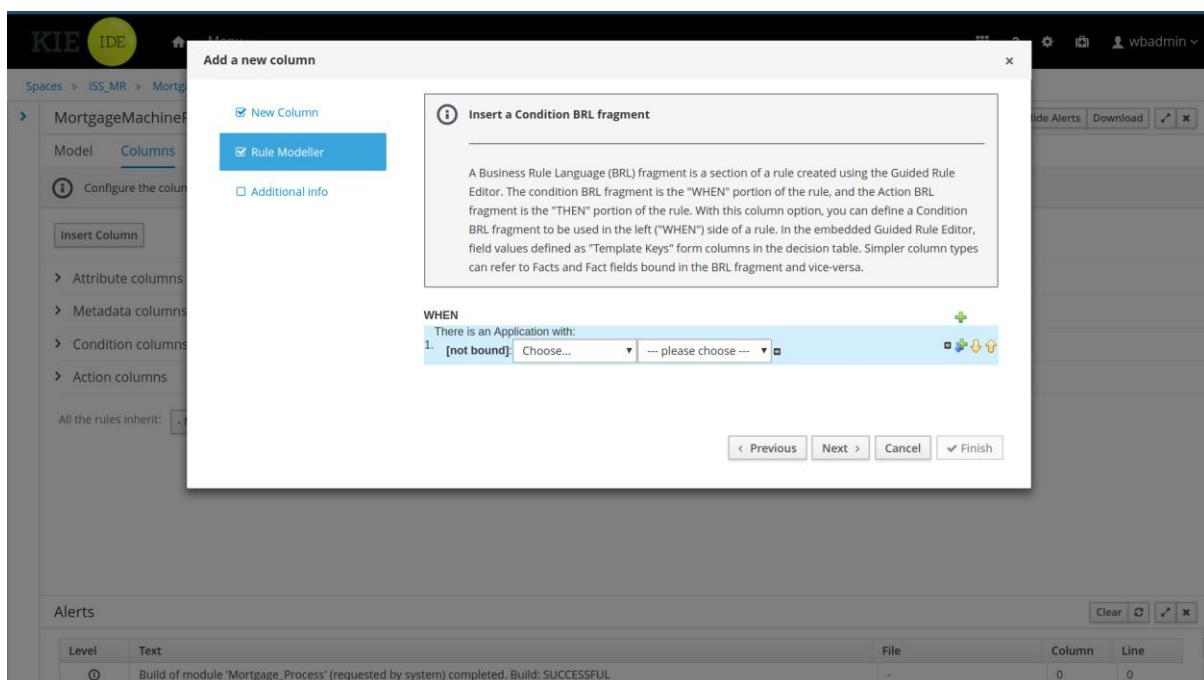
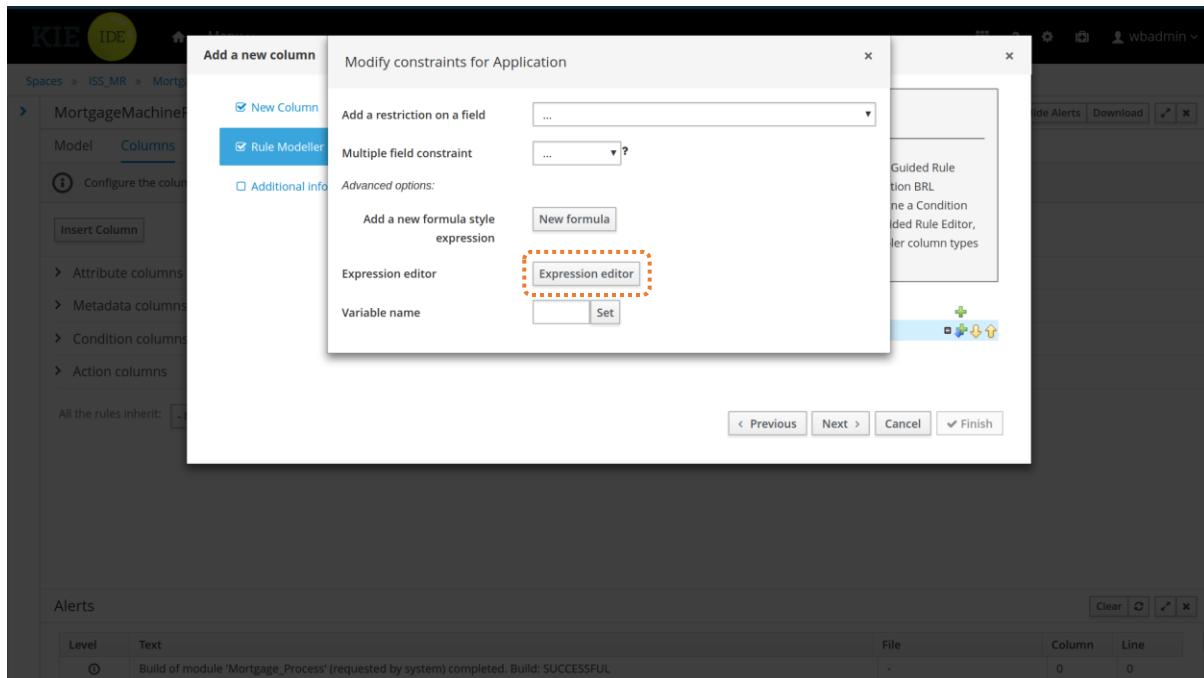
**15) Add Decision Table Condition columns for *Applicant.ownHouse*; (WHEN part of Rule)**

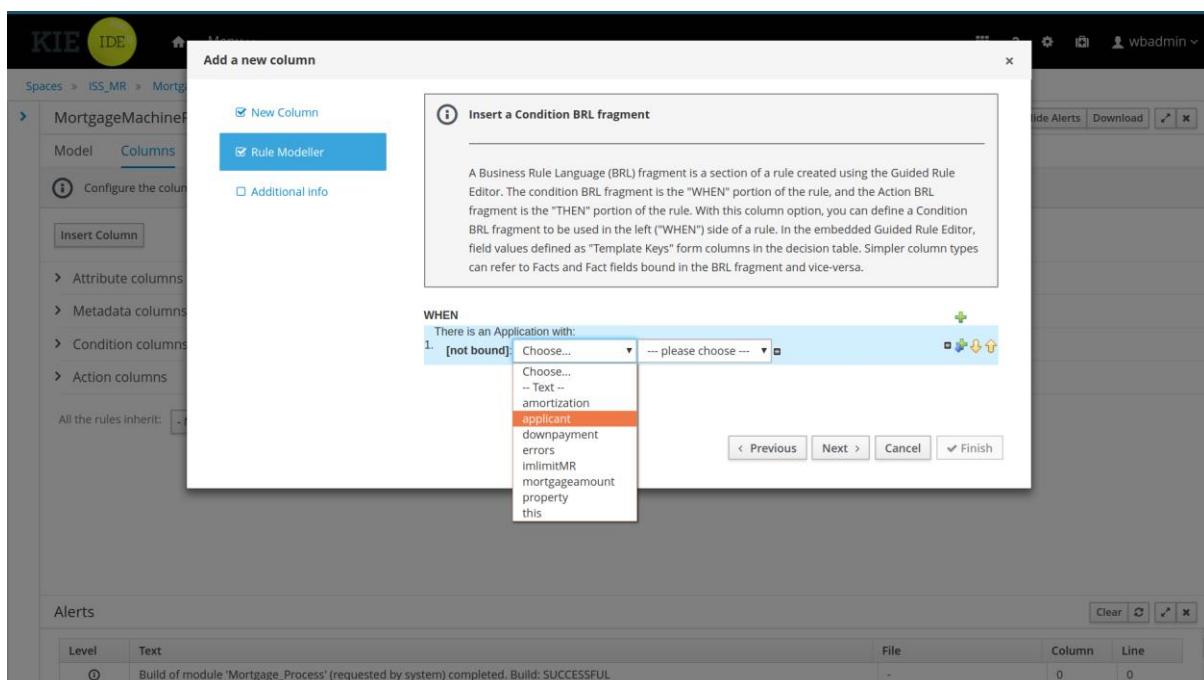
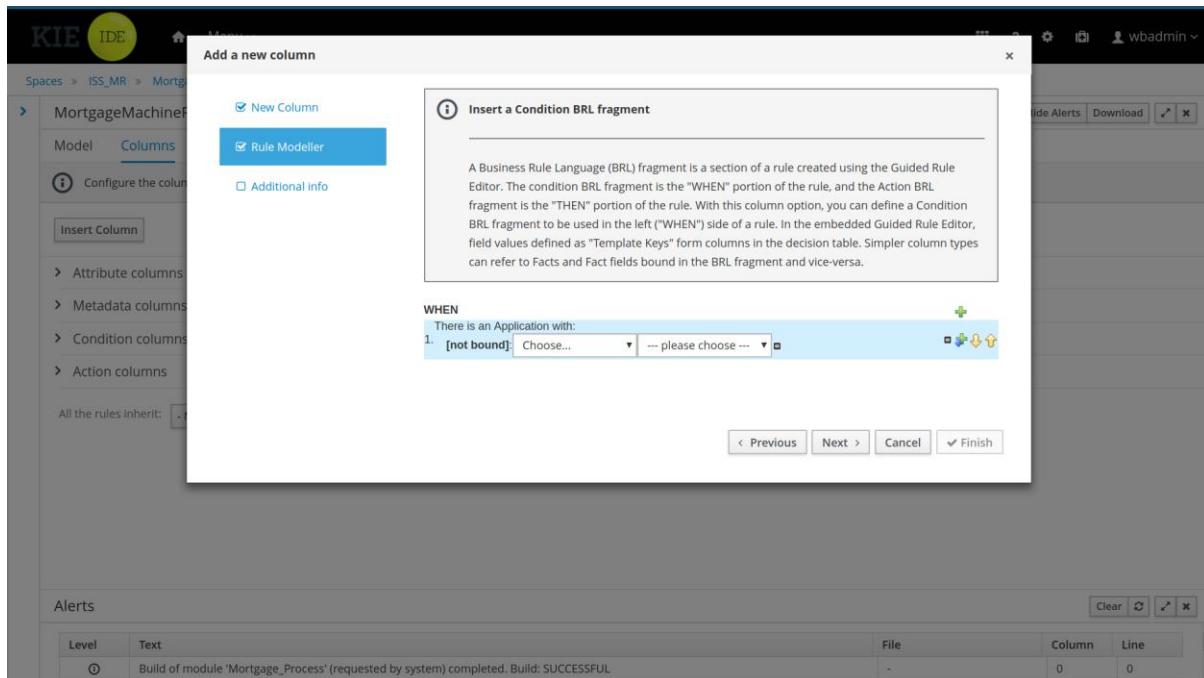




Click 'There is an Application with:'







KIE IDE

Add a new column

New Column

Rule Modeller

Additional info

WHEN

There is an Application with:

1. [not bound] applicant

Choose... --- please choose ---

- Choose...
- <=Delete item.
- Text -- address
- age
- annualincome
- creditrating
- hasJob
- name
- ownHouse**
- ssn

< Previous Next > Cancel ✓ Finish

Alerts

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

KIE IDE

Add a new column

New Column

Rule Modeller

Additional info

WHEN

There is an Application with:

1. [not bound]: applicant.ownHouse

Choose... --- please choose ---

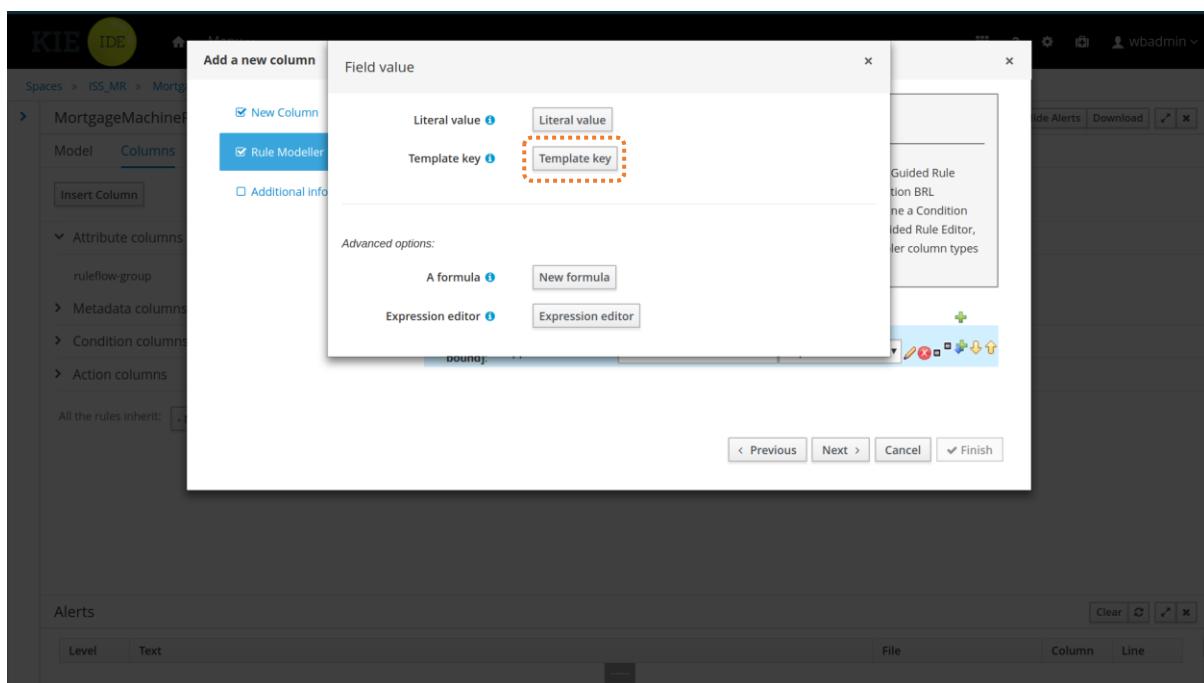
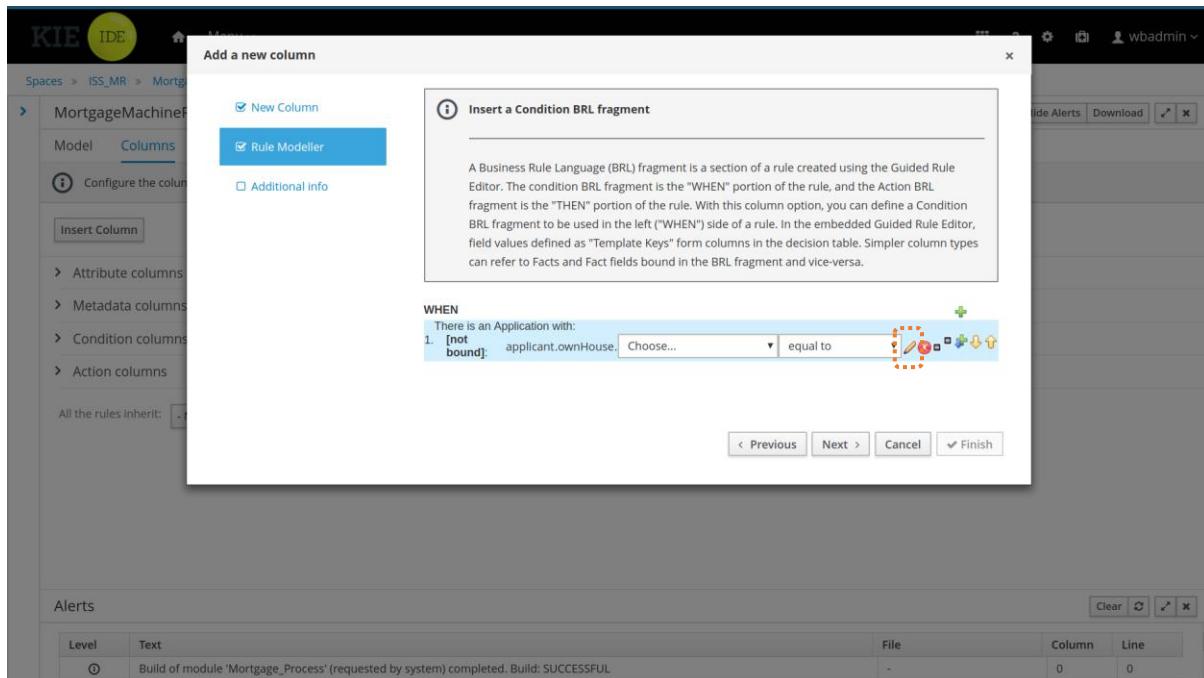
- Choose...
- <=Delete item...
- Text -- address
- age
- annualincome
- creditrating
- hasJob
- name
- ownHouse
- ssn

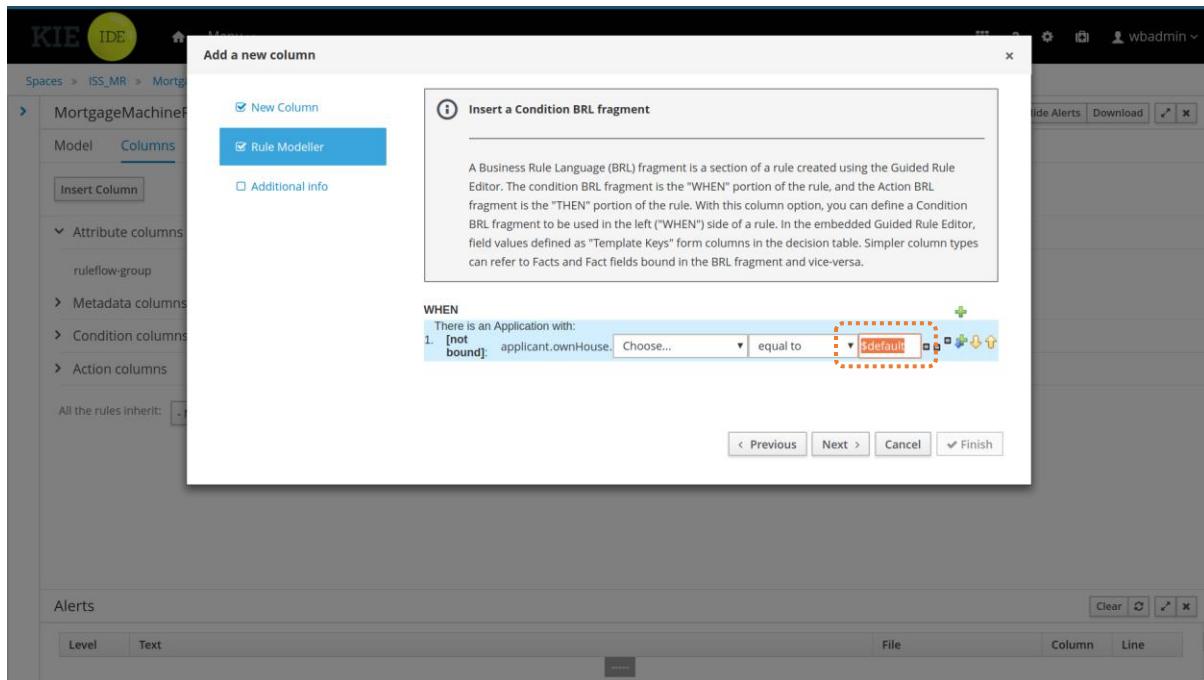
- ... please choose ...
- equal to**
- not equal to
- is null
- is not null

< Previous Next > Cancel ✓ Finish

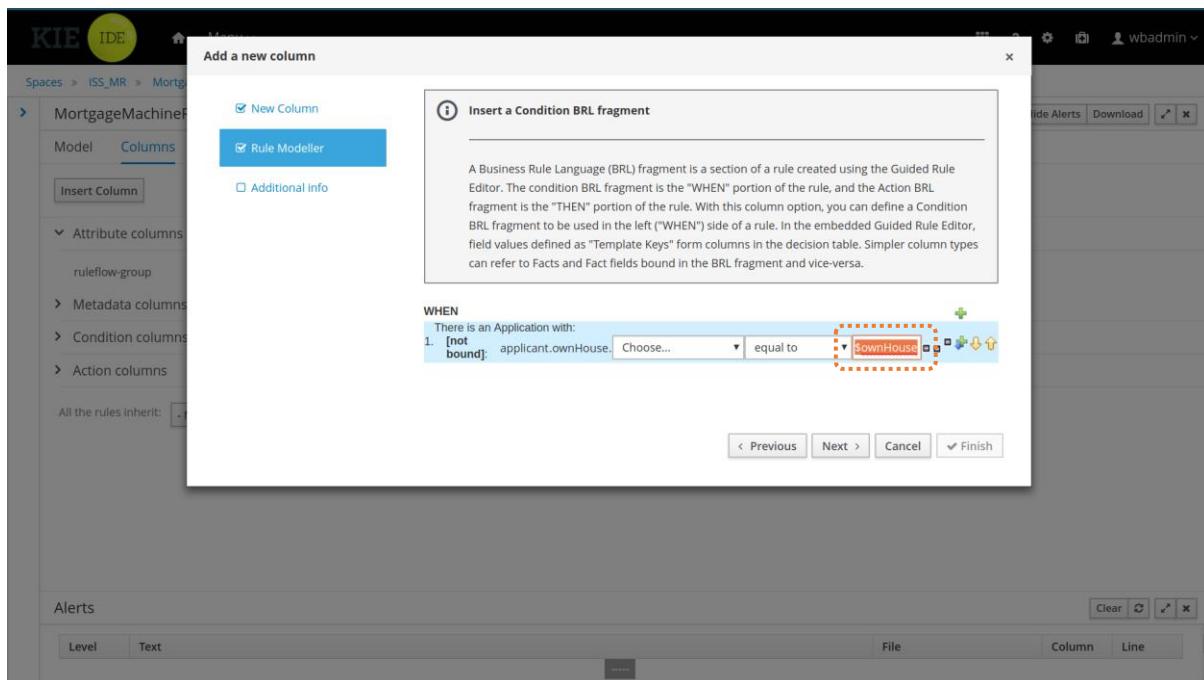
Alerts

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

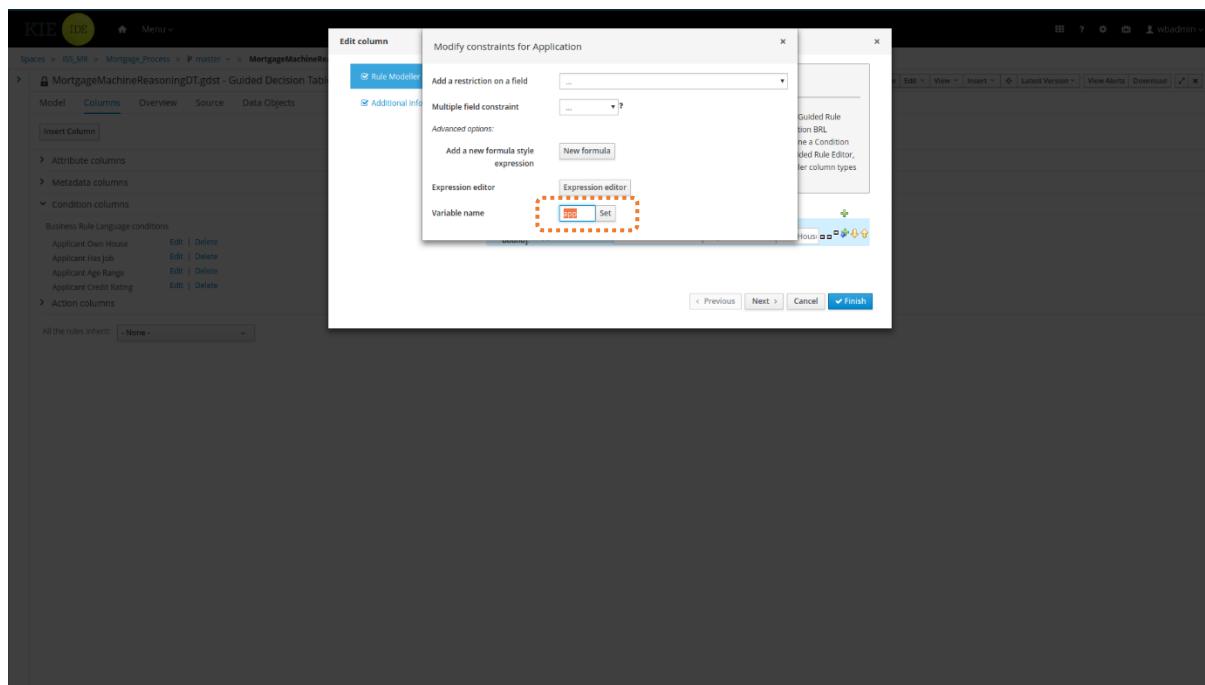
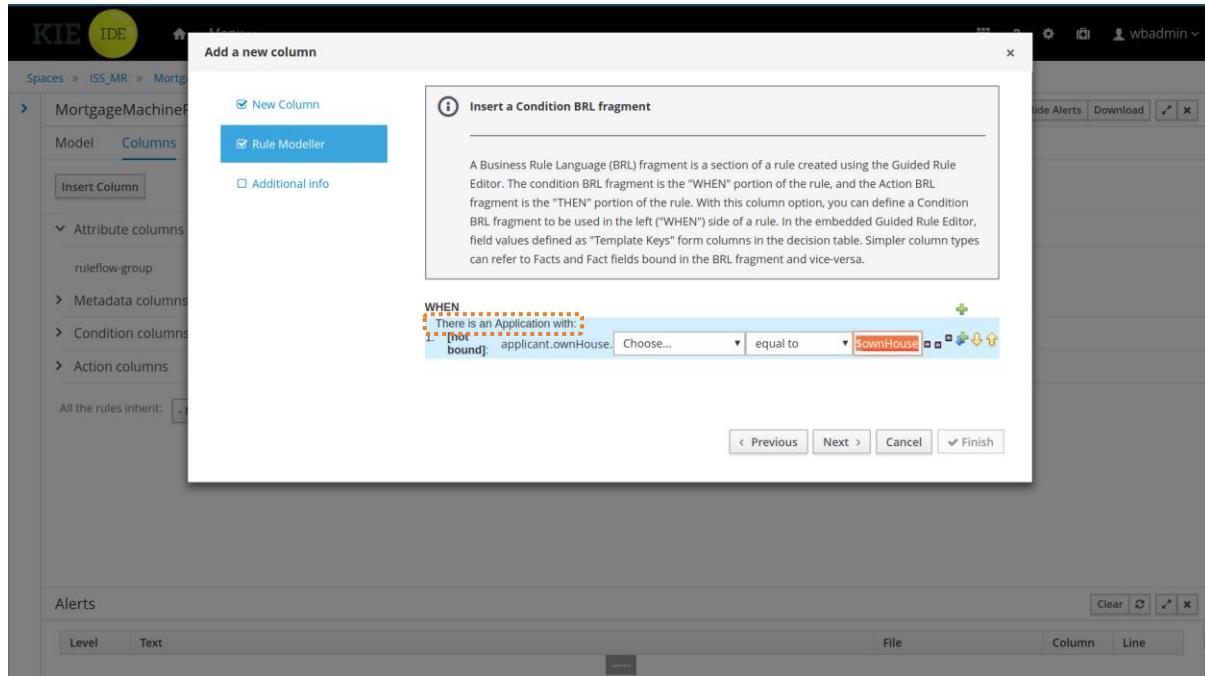


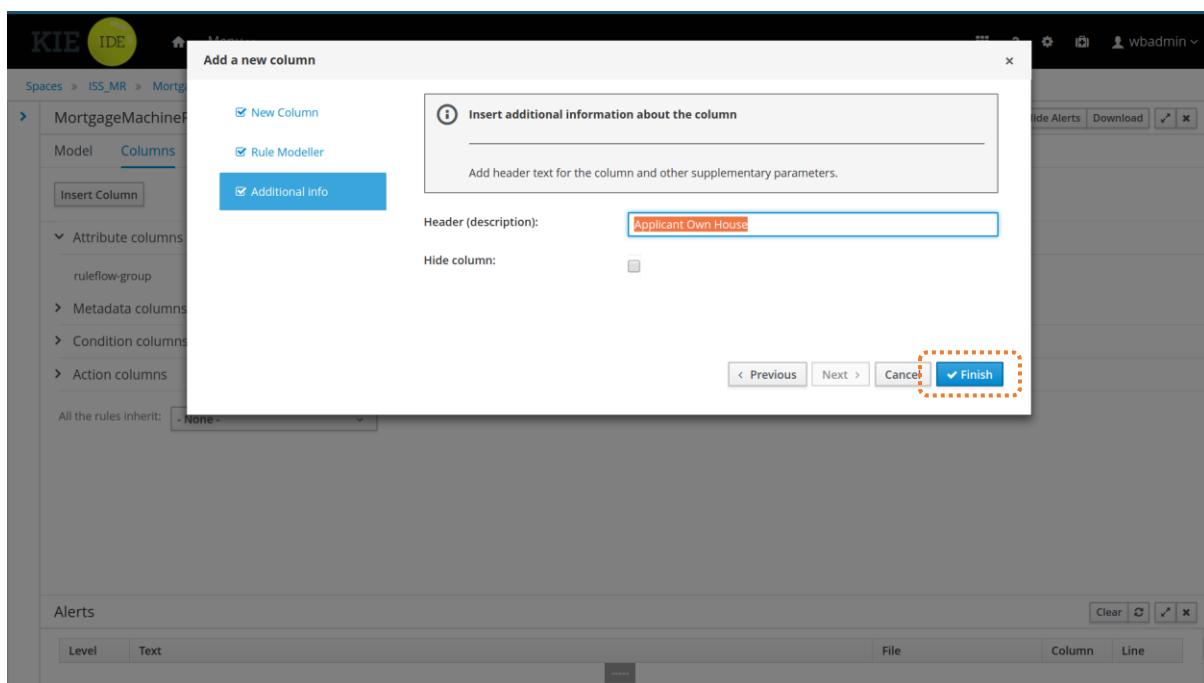
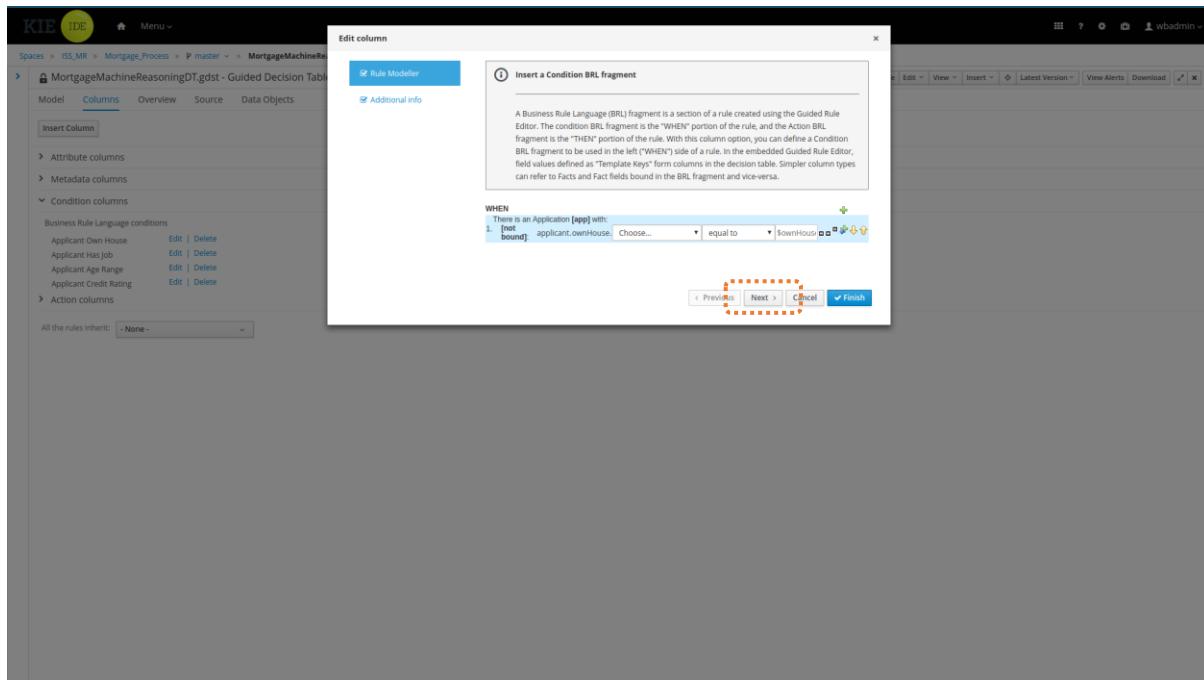


Update filed (**Template key**) value to: **\$ownHouse**



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 > master > 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

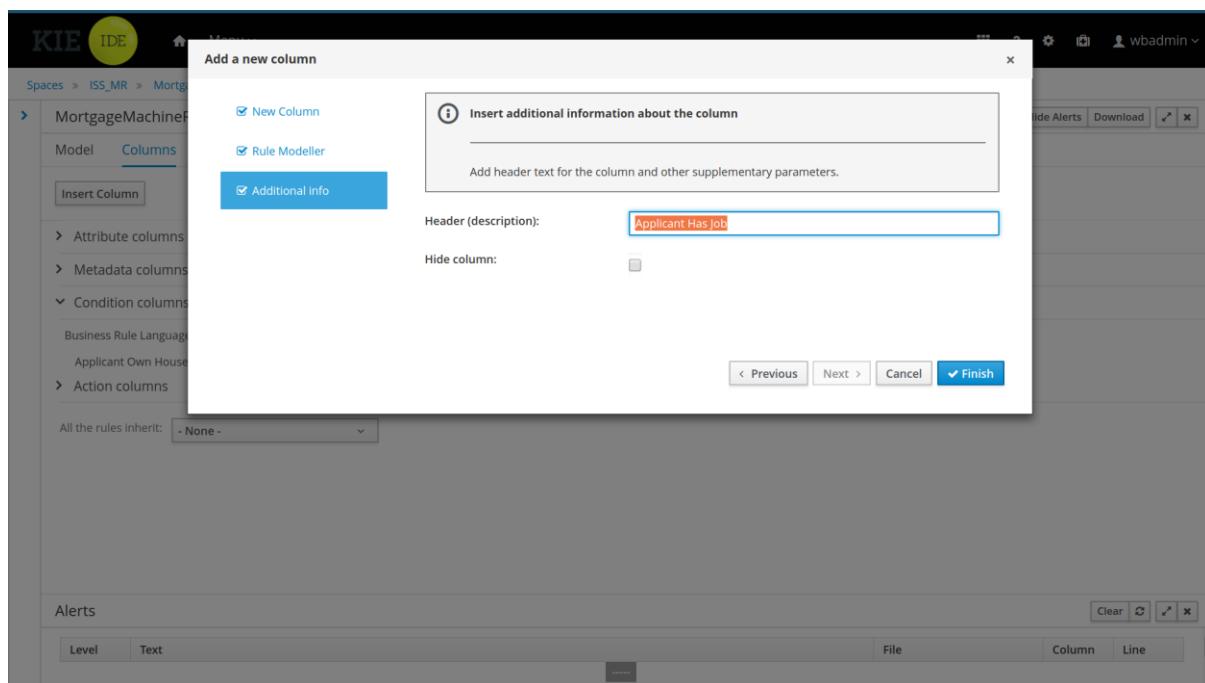
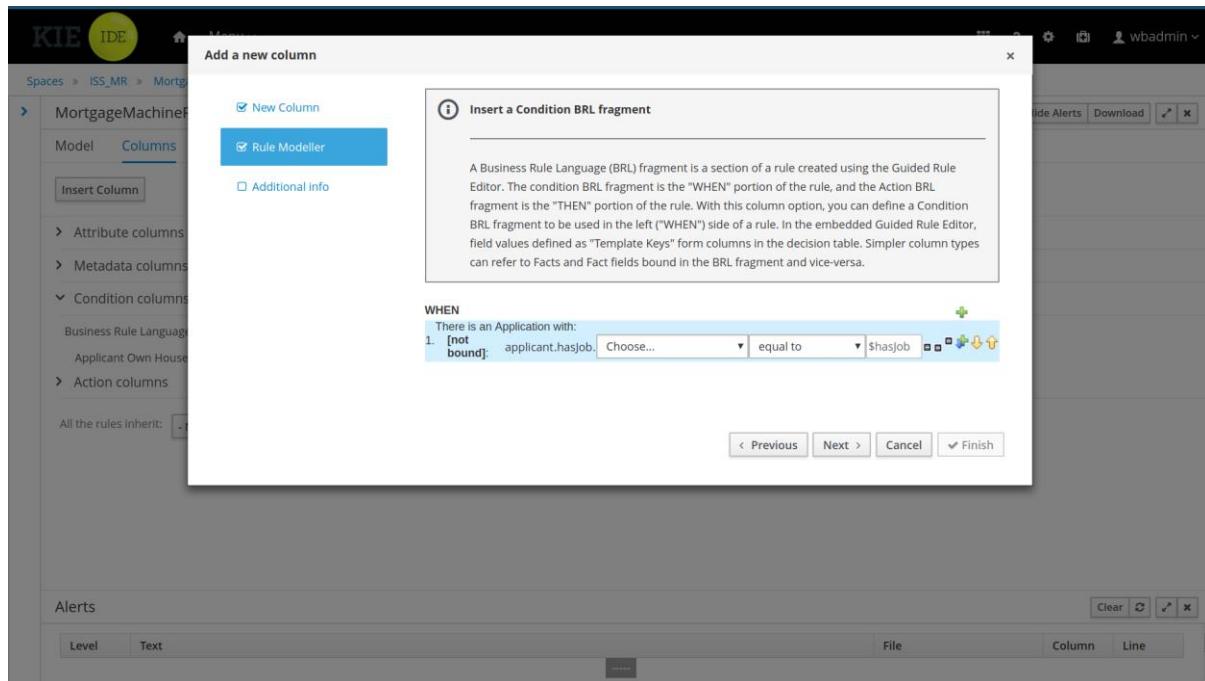
All the rules inherit: - None -

Alerts

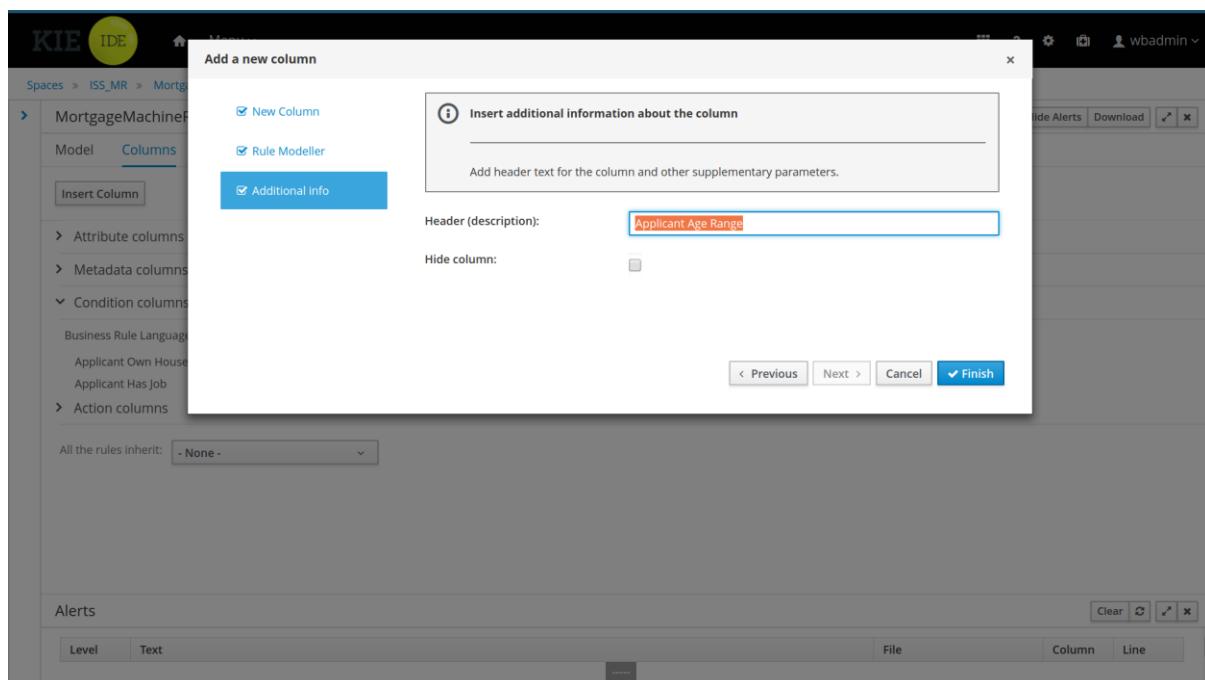
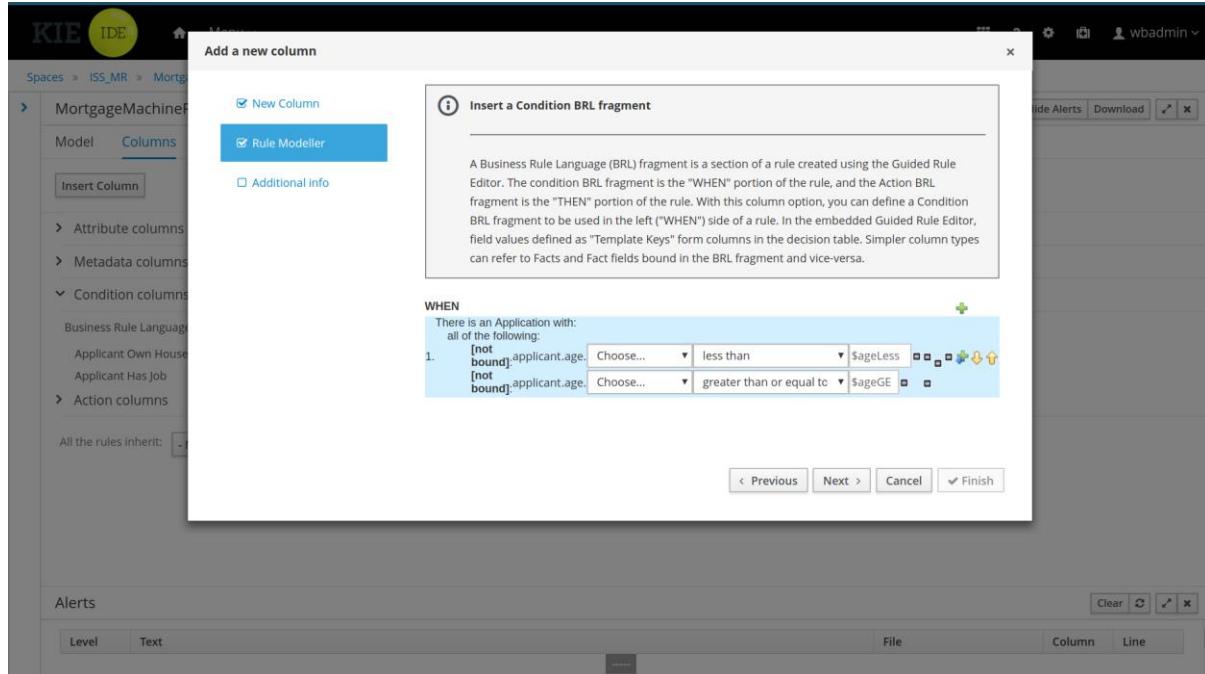
Clear

Level	Text
File	Column
Line	

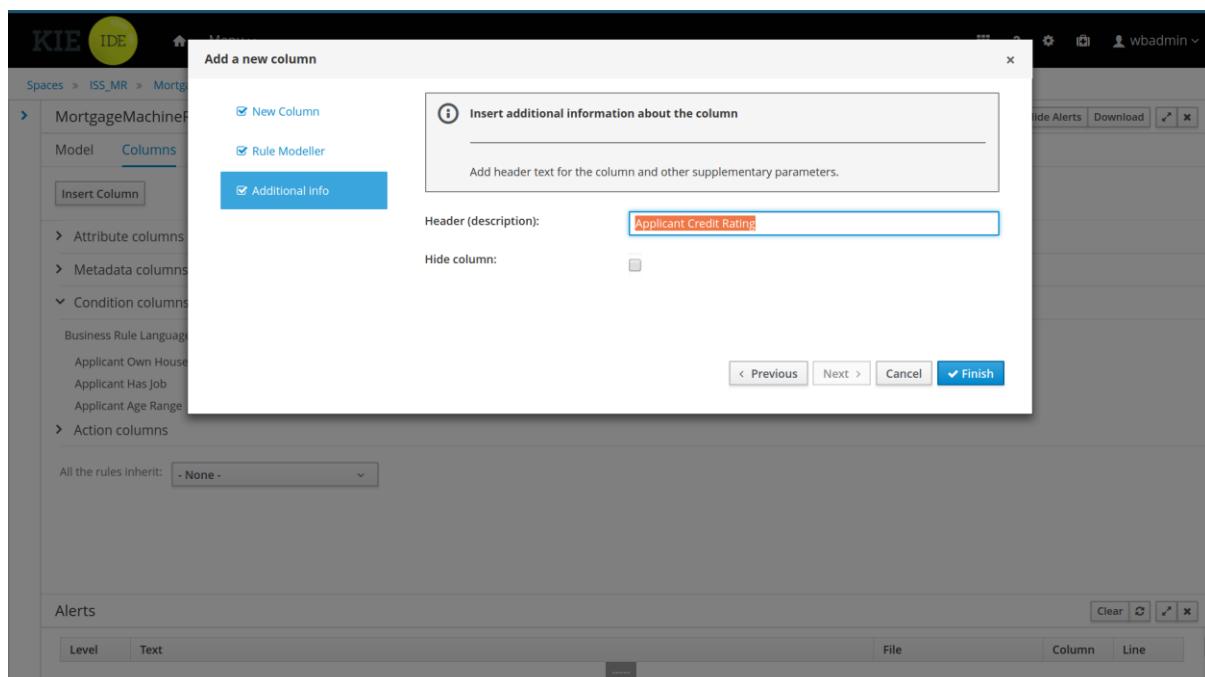
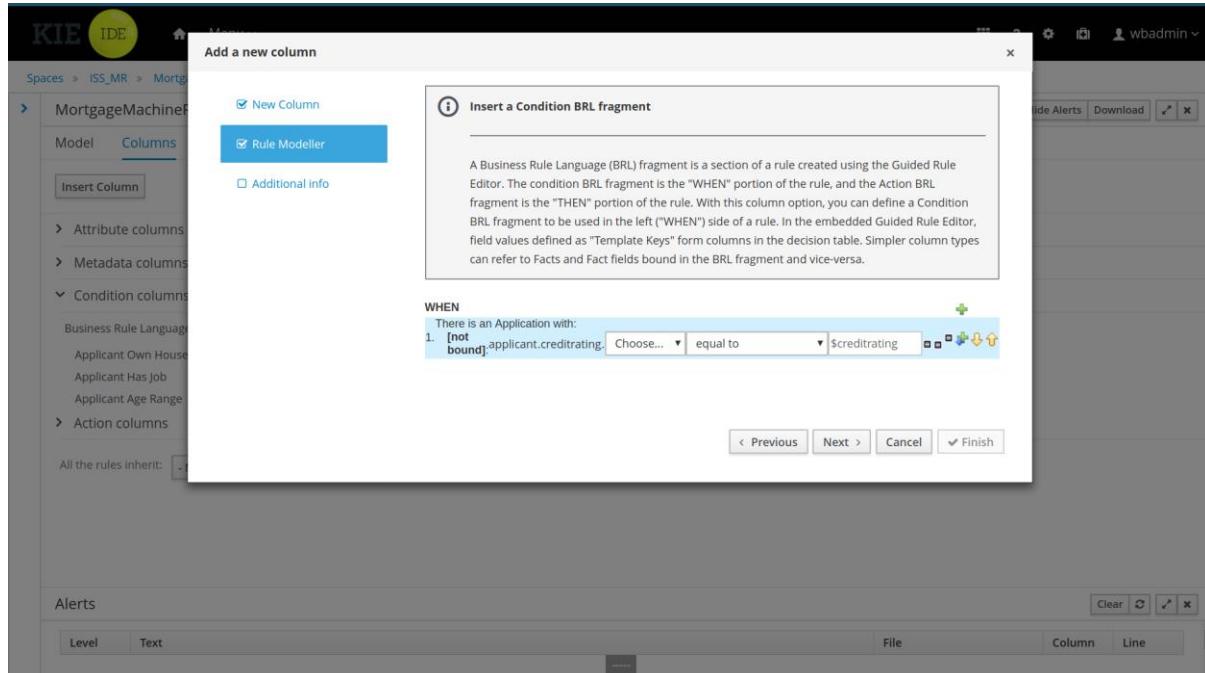
- 16) Similarly, add **Decision Table Condition columns** for *Applicant.hasJob*; (WHEN part of Rule)  
 Update filed (**Template key**) value to: **\$hasJob**



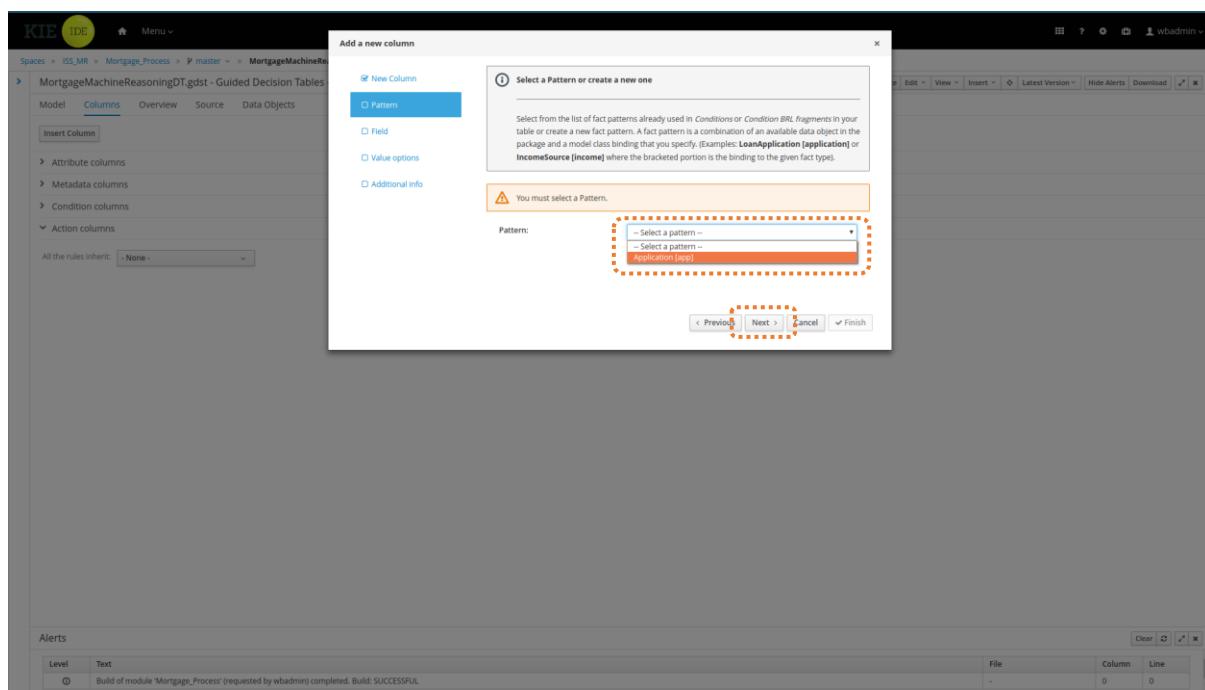
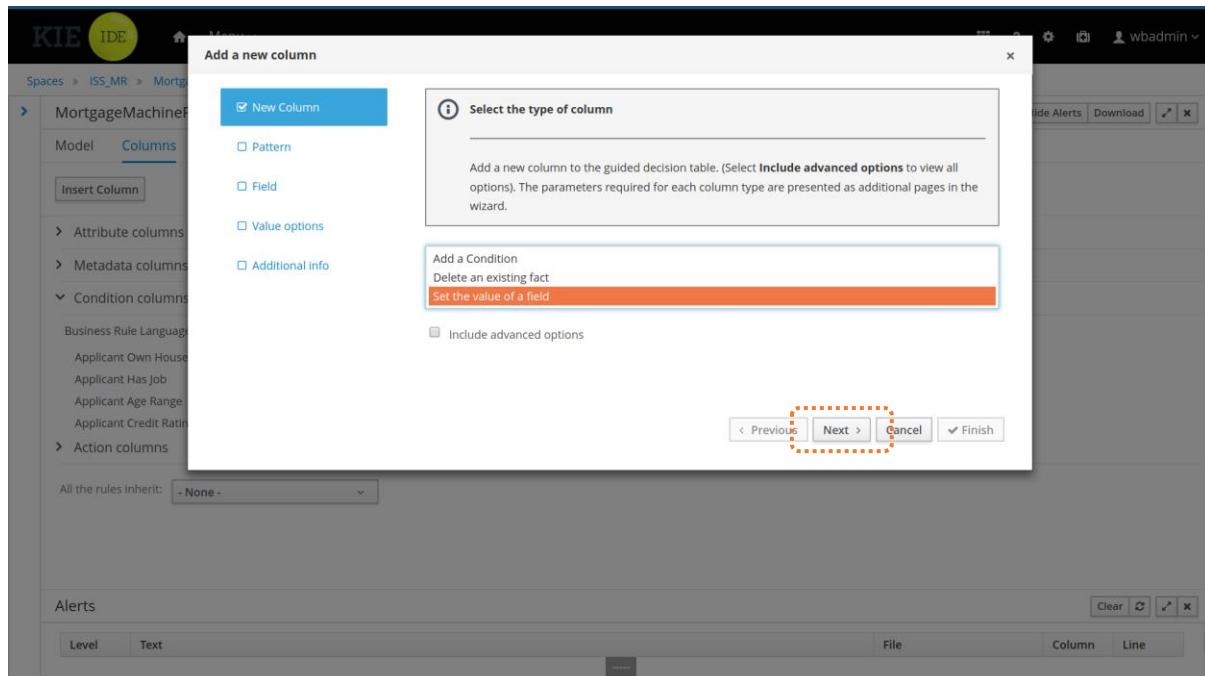
- 17)[ Optional ] Add **Decision Table Condition columns** for ***Applicant.age***; (WHEN part of Rule)  
 Update filed (**Template key**) value to: **\$ageLess**  
 Update filed (**Template key**) value to: **\$ageGE**



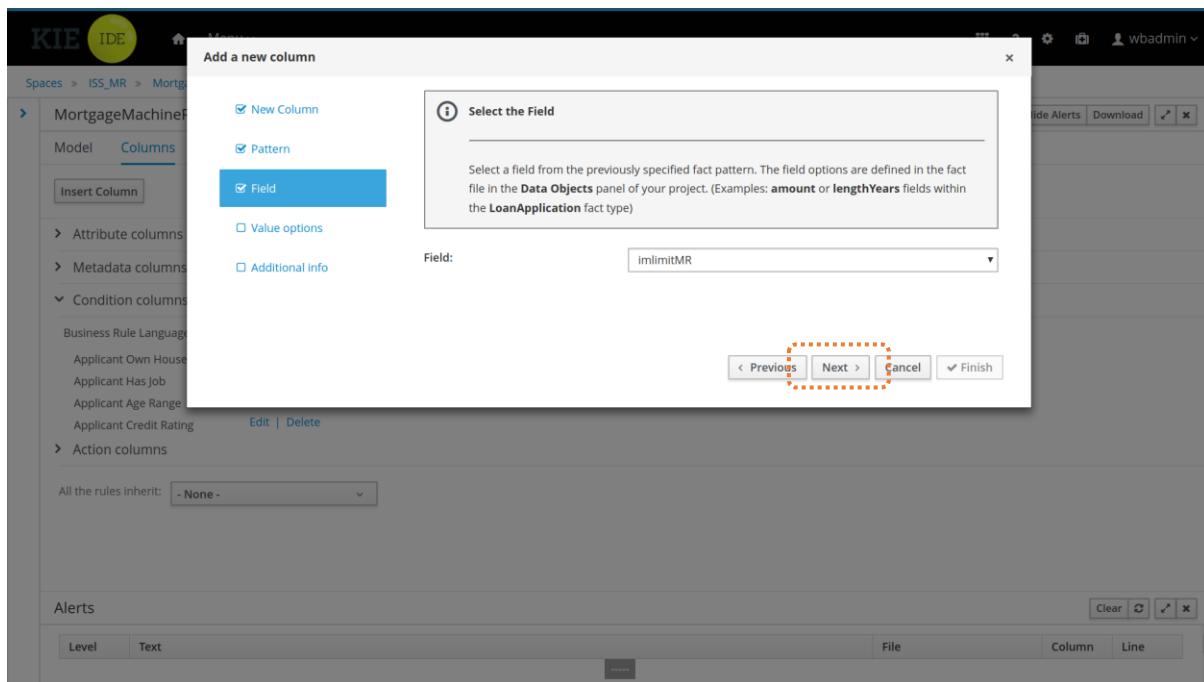
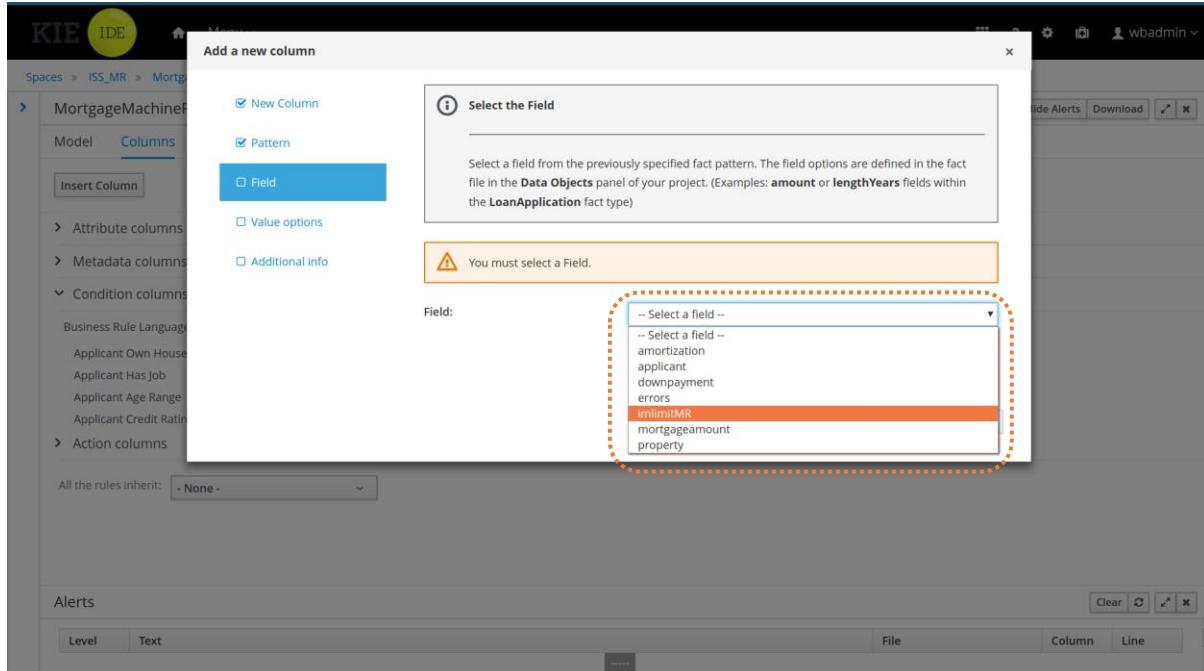
**18)[ Optional ] Add Decision Table Condition columns for  
*Applicant.creditrating*; (WHEN part of Rule)  
 Update filed (Template key) value to: **\$creditrating****

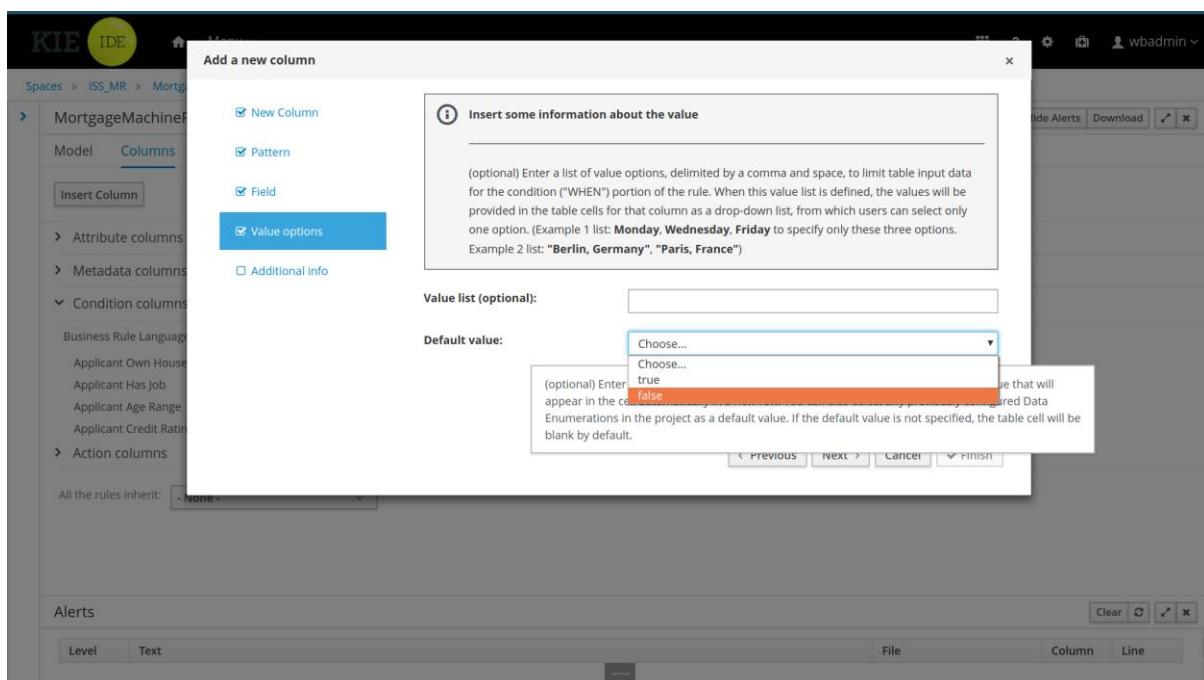
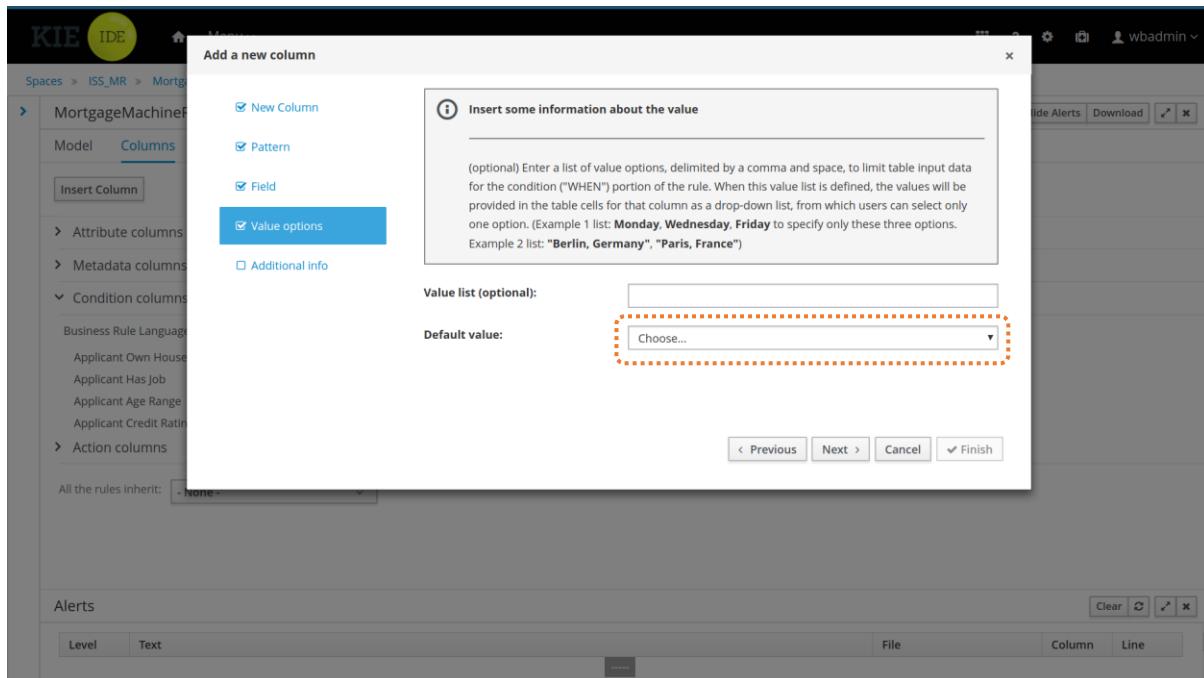


19) Set target decision value for ***Application.inlimitMR***; (THEN part of Rule)

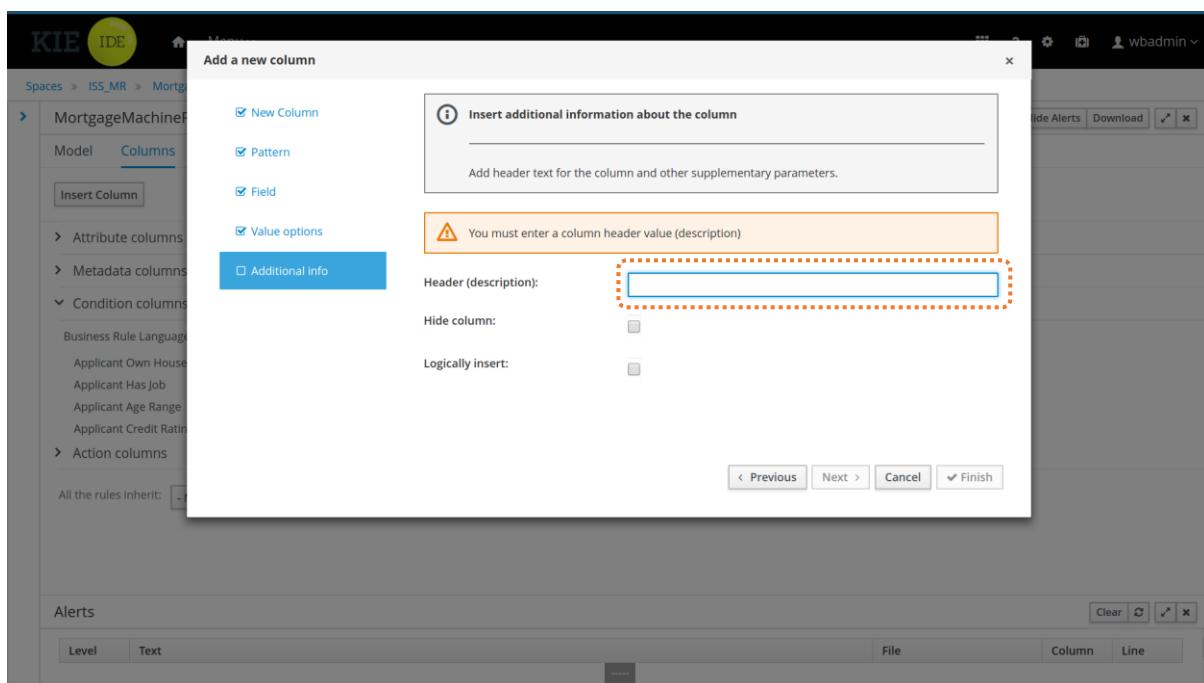
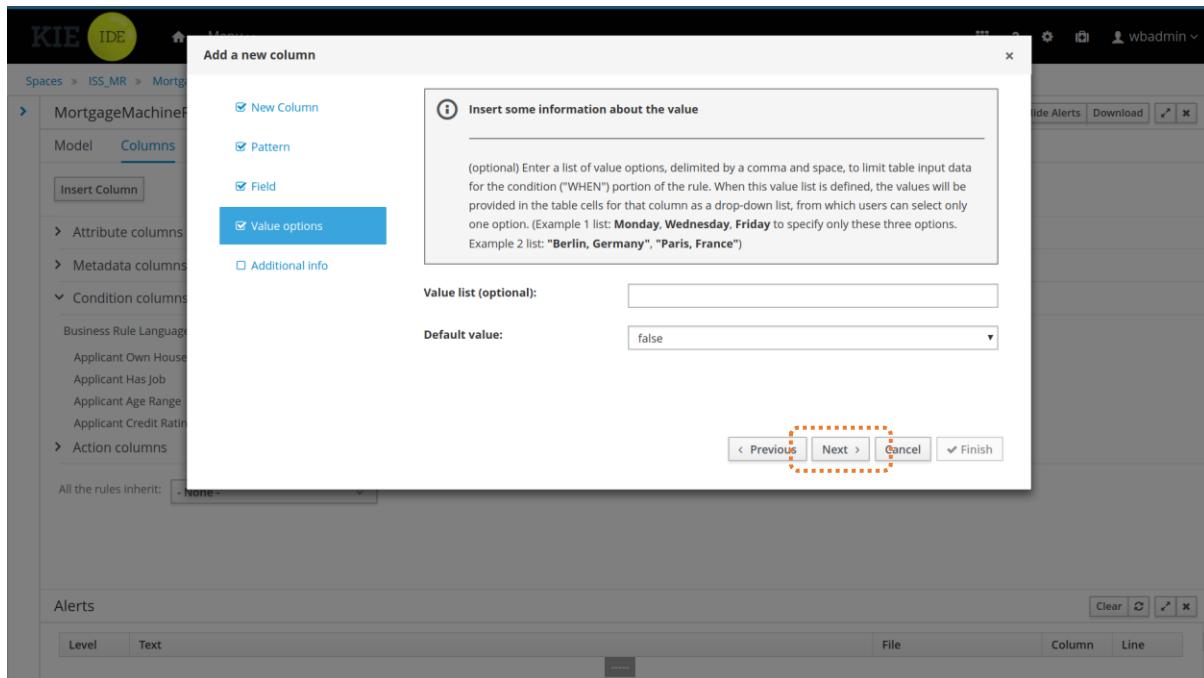


Select: ***inlimitMR***

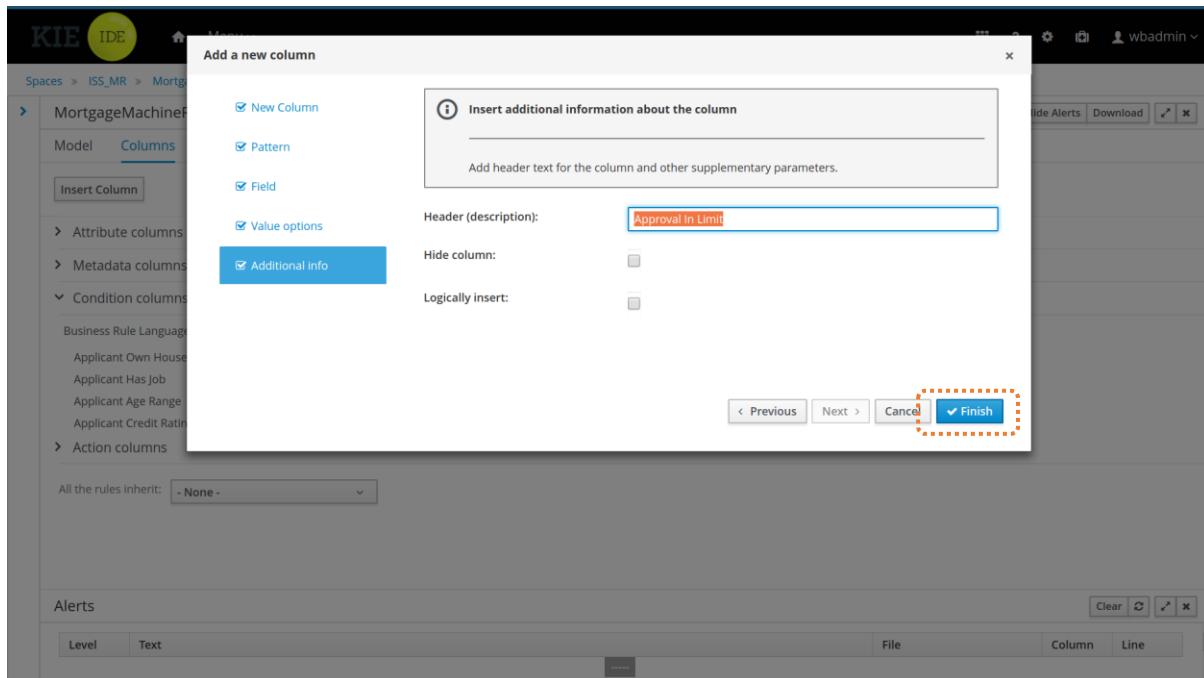




Select default value: **false**



**Key in Header (description): Approval In Limit**



The screenshot shows the 'MortgageMachineReasoningDT' model details in the KIE IDE. The 'Model' tab is highlighted with a red dashed box. A new column named 'Approval In Limit' has been added, indicated by the 'Edit | Delete' link next to it. The 'Alerts' section shows a single build log entry: 'Build of module 'Mortgage\_Process' (requested by wbadmin) completed. Build: SUCCESSFUL'.

MortgageMachineReasoningDT.gdst - Guided Decision Tables

Model Columns Overview Source Data Objects

MortgageMachineReasoningDT

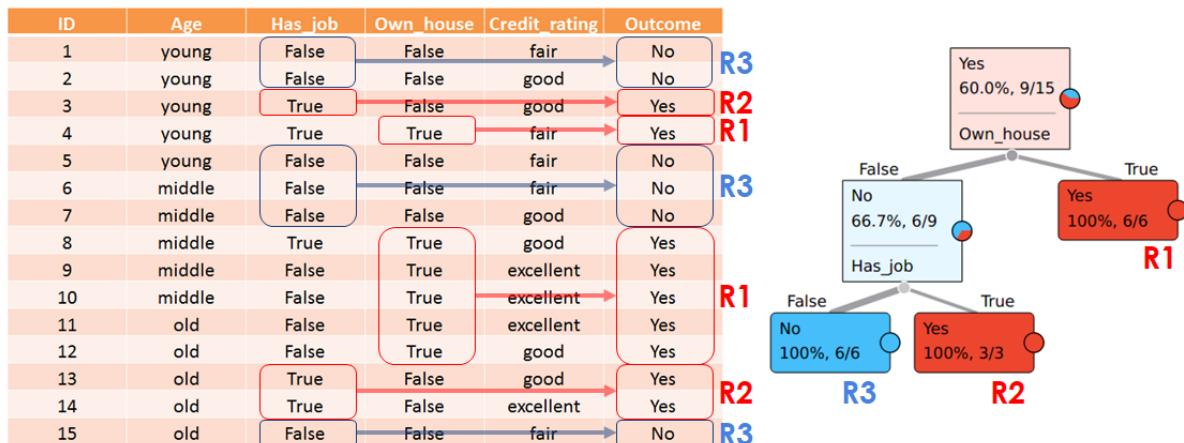
#	Description	ruleflow-group	Applicant Own House	Applicant Has job	Applicant Age Range	Applicant Credit Ratification : Approval In Limit		
			\$ownHouse	\$hasJob	\$ageLess	\$ageGE	\$creditrating	\$ApprovalInLimit

Append row  
Insert row above  
Insert row below  
Insert column

Alerts

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

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



KIE IDE

Spaces > ISS\_MR > Mortgage\_Process > master > MortgageMachineReasoningDT

MortgageMachineReasoningDT.gdst - Guided Decision Tables

Model Columns Overview Source Data Objects

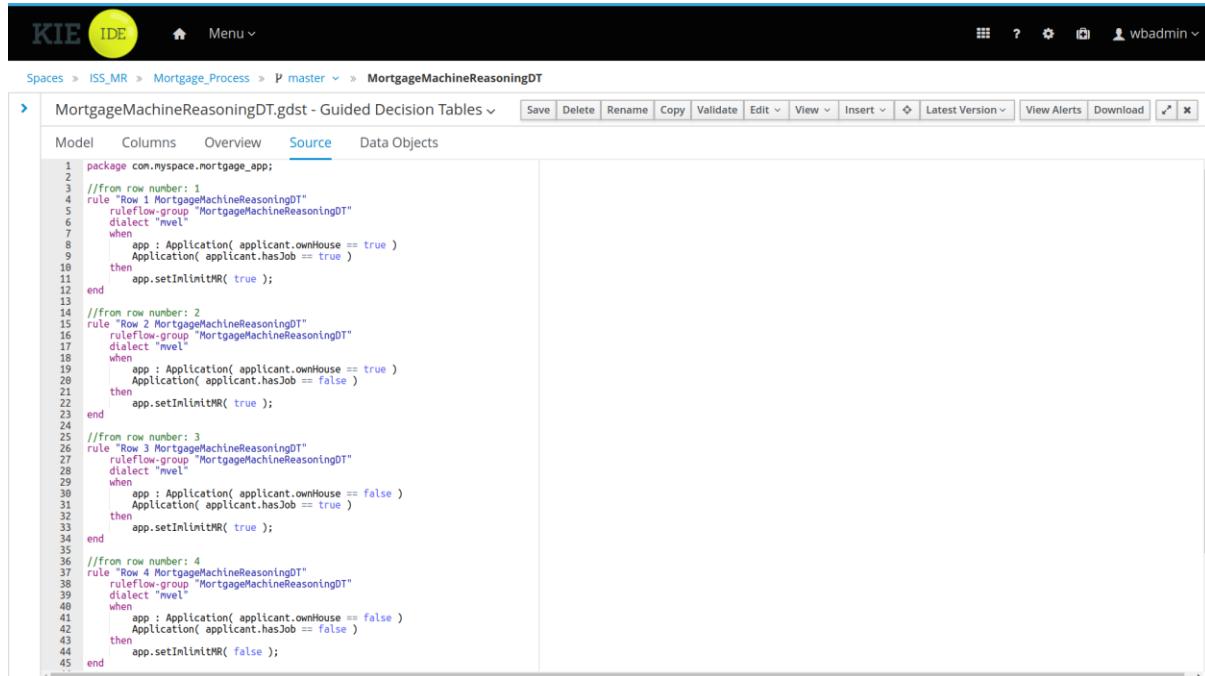
MortgageMachineReasoningDT

#	Description	ruleflow-group	Applicant Own House	Applicant Has Job	Applicant Age Range	Applicant Credit Rating	application : Application
		\$ownHouse	\$hasjob	\$ageLess	\$ageGE	\$creditrating	Approval In Limit
1	MortgageMachineReasoningDT	<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;**

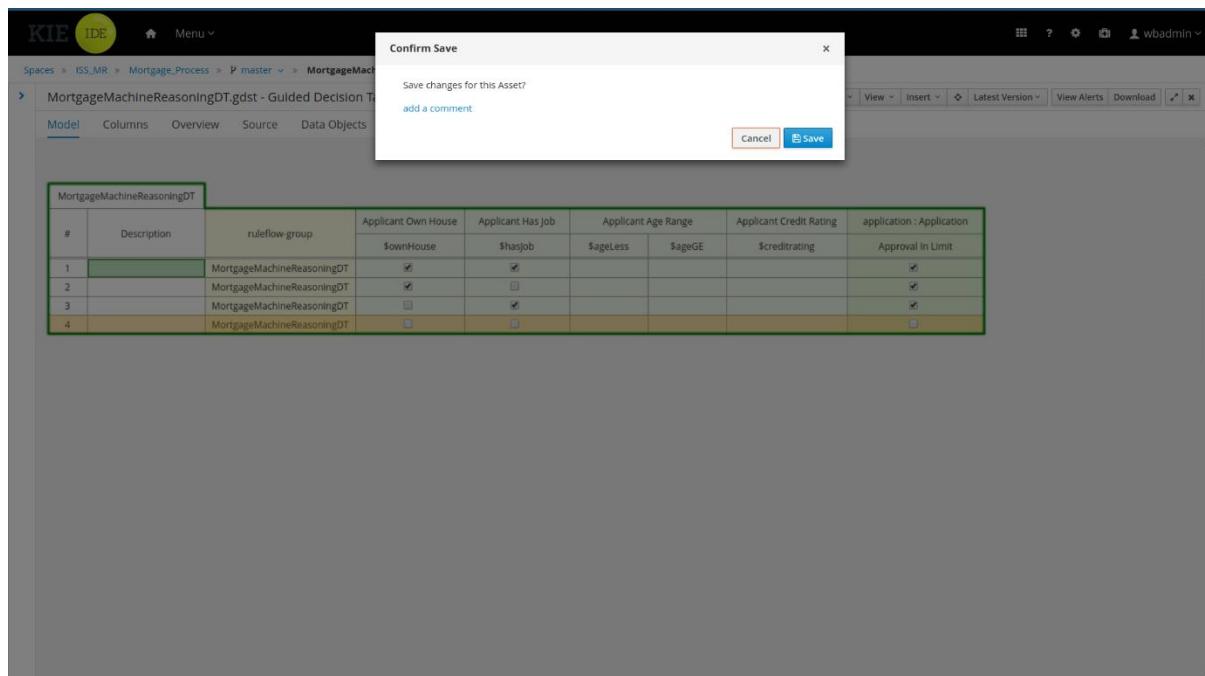


```

1 package com.myspace.mortgage_app;
2
3 //from row number: 1
4 rule "Row_1_MortgageMachineReasoningDT"
5   ruleflow-group "MortgageMachineReasoningDT"
6   dialect "mvel"
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 "mvel"
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 "mvel"
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 "mvel"
40   when
41     app : Application( applicant.ownHouse == false )
42     Application( applicant.hasJob == false )
43    then
44      app.setInLimitMR( false );
45  end

```

**22)Save changes;**

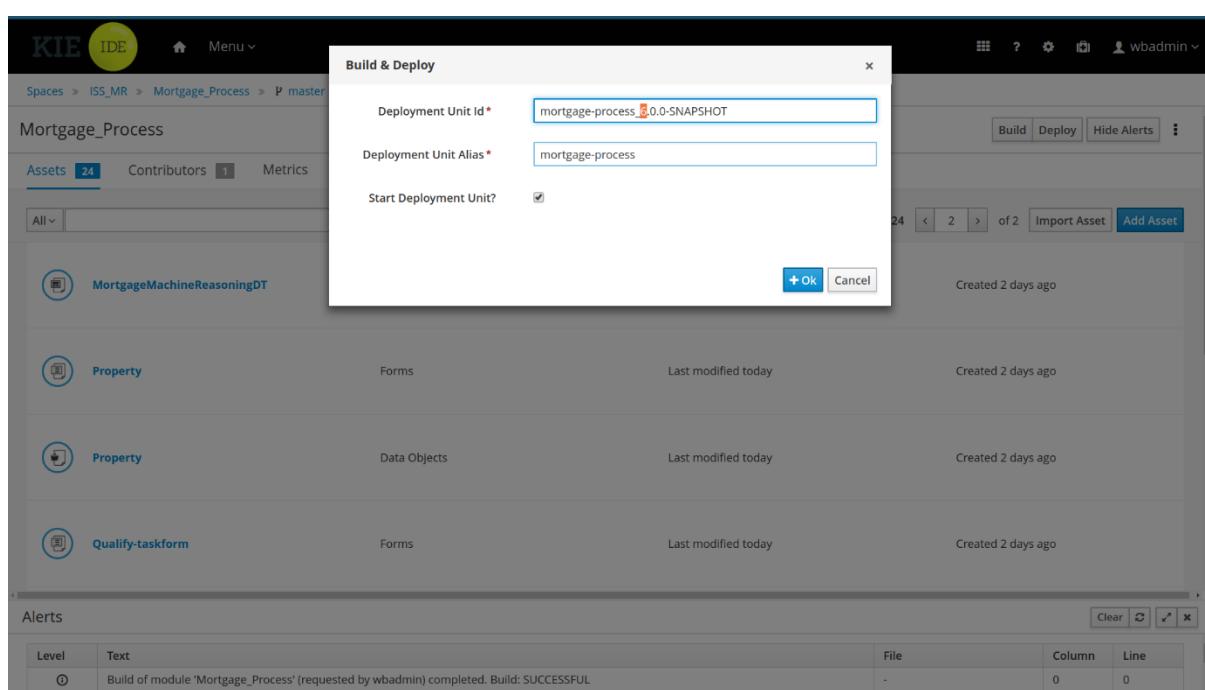


#	Description	ruleflow-group	Applicant Own House	Applicant Has Job	Applicant Age Range	Applicant Credit Rating	application : Application
			\$ownHouse	\$hasJob	\$ageLess	\$ageGE	\$creditrating
1	MortgageMachineReasoningDT		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
2	MortgageMachineReasoningDT		<input checked="" type="checkbox"/>	<input type="checkbox"/>			<input checked="" type="checkbox"/>
3	MortgageMachineReasoningDT		<input 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' sidebar is open, showing a list of deployment units under 'mortgage-process'. One item, 'mortgage-process\_6.0.0-SNAPSHOT', is highlighted in blue. The main panel displays the deployment status for 'sample-server@localhost:8080', which is marked as 'OK' with a green checkmark. Below the status message is a link to the deployment details: [http://localhost:8080/kie-server/services/rest/server/containers/mortgage-process\\_6.0.0-SNAPSHOT](http://localhost:8080/kie-server/services/rest/server/containers/mortgage-process_6.0.0-SNAPSHOT). The status bar at the bottom indicates 'v1.0.0-SNAPSHOT'.

- 2) Select the mortgage system with intended version, e.g., ***mortgage-process\_6.0.0-SNAPSHOT***, then click: **Start**

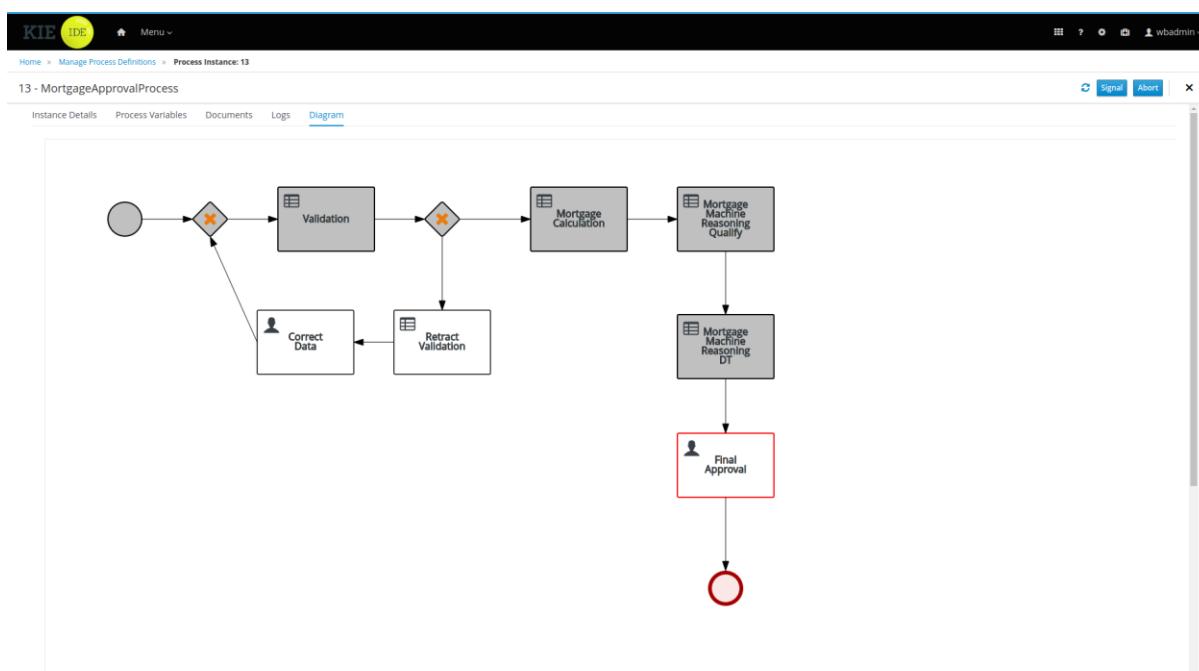
The screenshot shows the 'Manage Process Definitions' page. A table lists six rows of process definitions, each named 'MortgageApprovalProcess' and version 1.0, deployed to different snapshot versions. The third row, 'mortgage-process\_6.0.0-SNAPSHOT', is highlighted with a blue background. A context menu is open over this row, with the 'Start' option highlighted in blue. The URL 'localhost:8080/bpm-console/kie-wb.jsp?locale=en\_US#' is visible in the browser address bar at the bottom.

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' form in the KIE IDE. The 'Application' section includes fields for 'Down Payment' (50000), 'Years of amortization' (20), 'Name' (Sam GU), 'Age' (21), 'Credit Rating' (25 HMKT), 'Annual Income' (123456), 'SSN' (SSN), and 'Property' details like 'Age of property' (3), 'Address of property' (25 HMKT), 'Locale' (Urban), and 'Sale Price' (250000). The 'Has job' checkbox is checked, while 'Own House' is unchecked. A 'Submit' button is at the bottom right.



KIE  Menu ▾

Home > Task Index > Task: 14

14 - Final Approval

Work Details Assignments Comments Admin Logs

Inputs:

Application

Mortgage amount

Down Payment

Years of amortization

Applicant

Name

Age  Credit Rating  Has job  Own House

Annual Income

SSN

Property

Age of property

Address of property

Locale

Sale Price

Inlimit  Sam

## { Tips }

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

2<sup>nd</sup> 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 GU case 2

Age: 21 | Credit Rating: 123456

Annual Income: 123456

SSN: SSN

Property

Age of property: 3

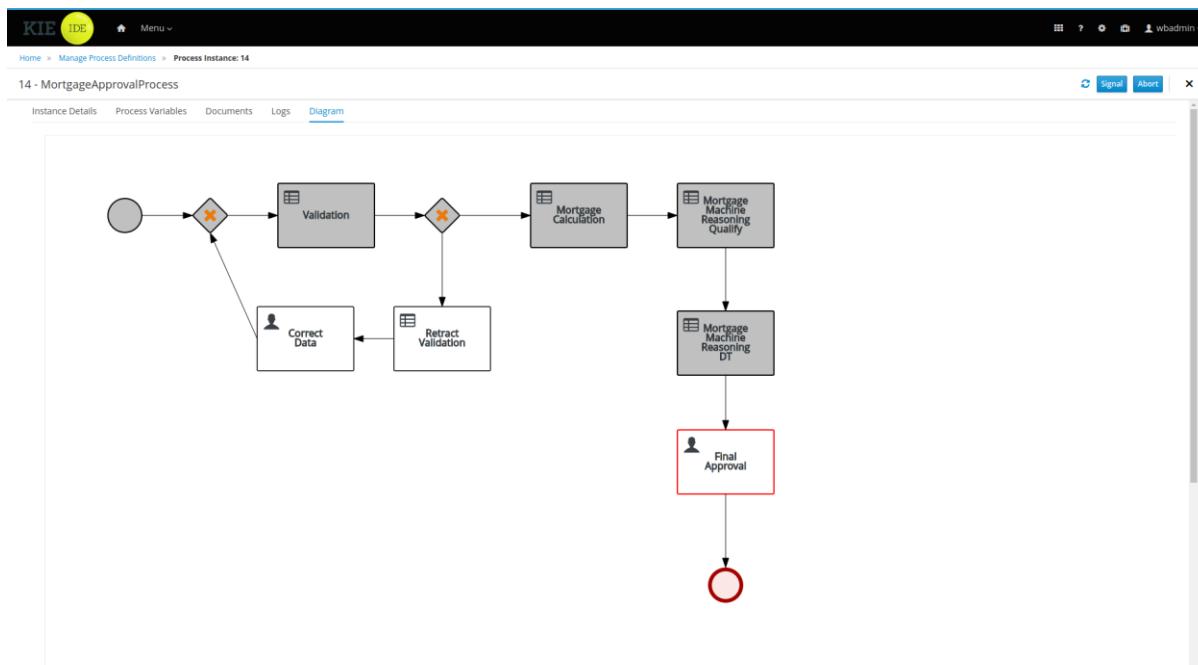
Address of property: 25 HMRKT

Locale: Urban

Sale Price: 250000

Actions

Submit



The screenshot shows a web-based application interface for '15 - Final Approval'. The top navigation bar includes 'Home', 'Task Index', 'Task: 15', 'Menu', and user information 'wadmin'. Below the title, there are tabs for 'Work', 'Details', 'Assignments', 'Comments', 'Admin', and 'Logs'. The main area is labeled 'Inputs:' and contains sections for 'Application' and 'Applicant'. In the 'Application' section, fields include 'Mortgage amount' (\$200000), 'Down Payment' (\$50000), and 'Years of amortization' (20). A red dashed box highlights the 'inlimit Machine Reasoning' step, which has a status of 'Inprogress'. The 'Applicant' section includes fields for 'Name' (Sam GU case 2), 'Age' (31), 'Credit Rating' (0), 'Has job?' (unchecked), 'Own House?' (checked), 'Annual Income' (\$123456), and 'SSN' (0). The 'Property' section includes fields for 'Age of property' (1), 'Address of property' (25 HNKRT), 'Locale' (Urban), and 'Sale Price' (\$250000). At the bottom left, there are checkboxes for 'Inlimit' and 'Inarm'.

## { Tips }

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

2<sup>nd</sup> stage Approved: **inlimitMR** checked: jobless applicant owning a house

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

KIE IDE | Home > Manage Process Definitions | MortgageApprovalProcess | Form

**MortgageApprovalProcess**

Correlation key

Form

**Application**

Down Payment: 50000 | Years of amortization: 20

**Applicant**

Name: Sam GU case 3

Age: 21 | Credit Rating: 123456

Annual Income: 123456

SSN: SSN

**Property**

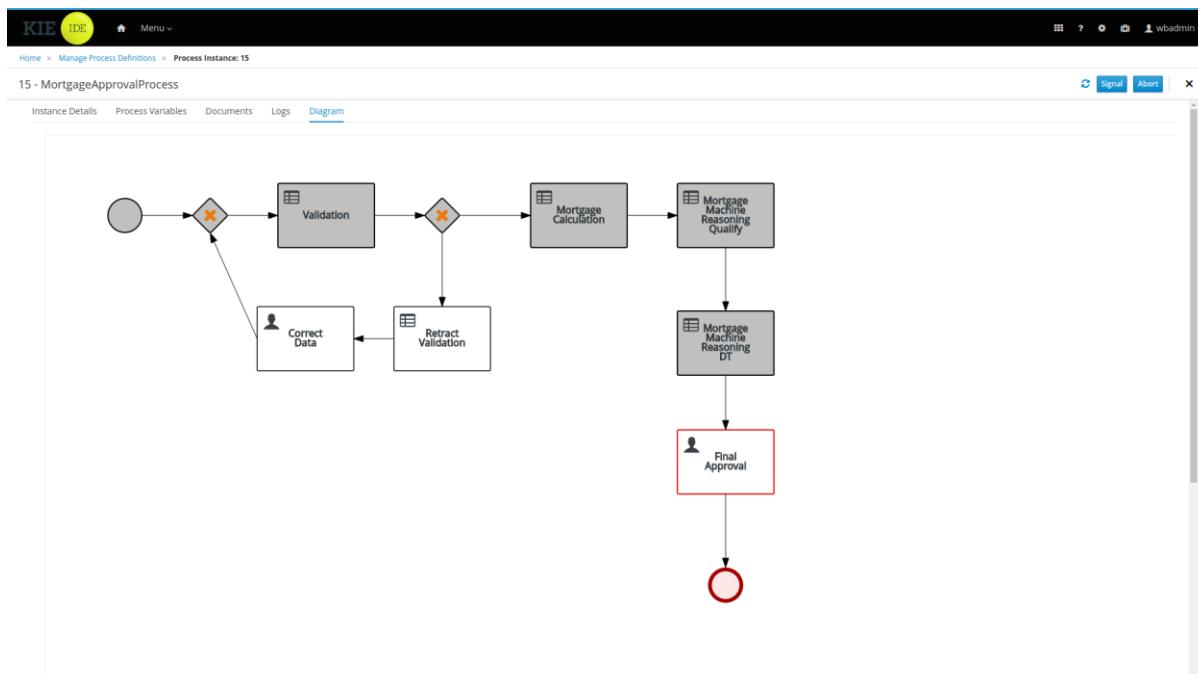
Age of property: 3

Address of property: 25 HMKT

Locale: Urban

Sale Price: 250000

Submit



KIE

Menu ▾

Home > Task Inbox > Task: 16

16 - Final Approval

Work Details Assignments Comments Admin Logs

Inputs:

Application

Mortgage amount:

Down Payment:

Years of amortization:

Inlimit Machine Reasoning

Applicant

Name: Sam GU case 3

Age: 21

Credit Rating: 0

Has job:

Own House:

Annual Income: \$123456

SSN: 0

Property

Age of property: 3

Address of property: 25 HNKRT

Locale: Urban

Sale Price: \$250000

Inlimit

**Submit**

## { Tips }

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

2<sup>nd</sup> 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 ]

The screenshot shows the KIE Workbench interface with a navigation bar at the top. The 'Menu' dropdown is open, and the 'Settings' option is selected. A red dashed box highlights the 'wbadmin' dropdown menu. Below the navigation, the word 'Settings' is displayed. The main area contains three cards: 'Roles' (6 items), 'Groups' (7 items), and 'Users' (10 items). Each card has a corresponding icon: a padlock for Roles, a group of people for Groups, and a person silhouette for Users. Below these cards are three more icons: a download arrow, a database, and a folder.

**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:

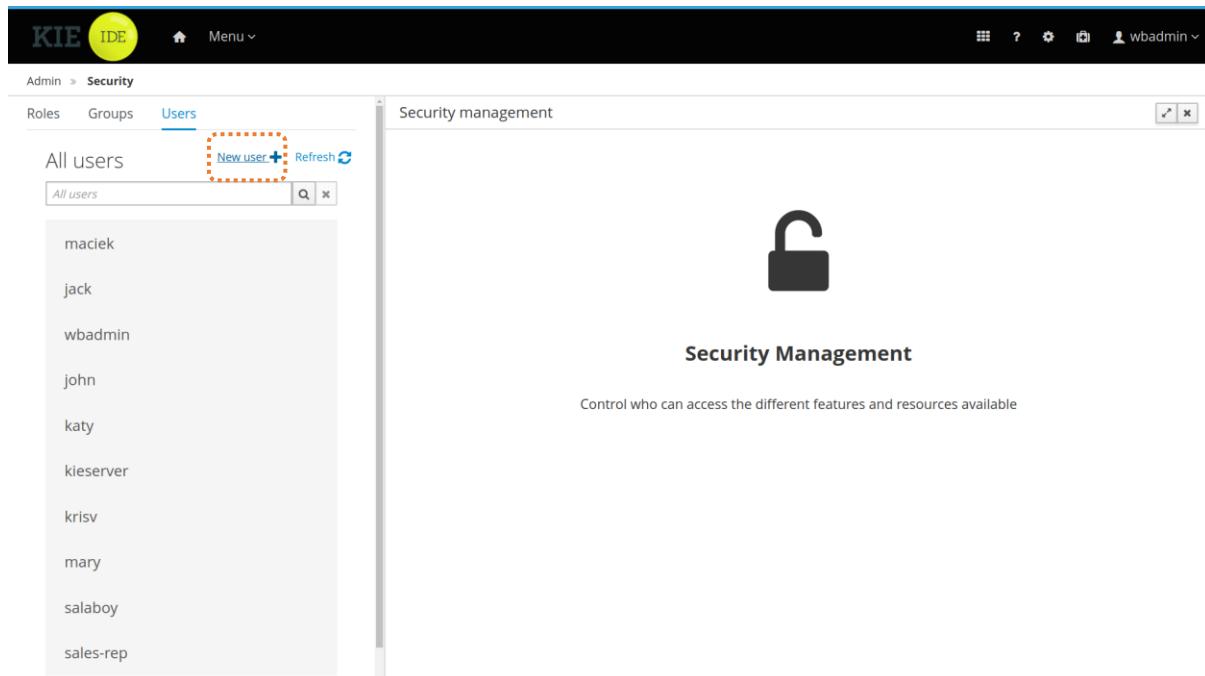
- Step 1 Create all new users, and assign them relevant **Roles** (No new **Group** is ready).
- Step 2 Create new **Group**, and link created new users.

### Intended user access levels:

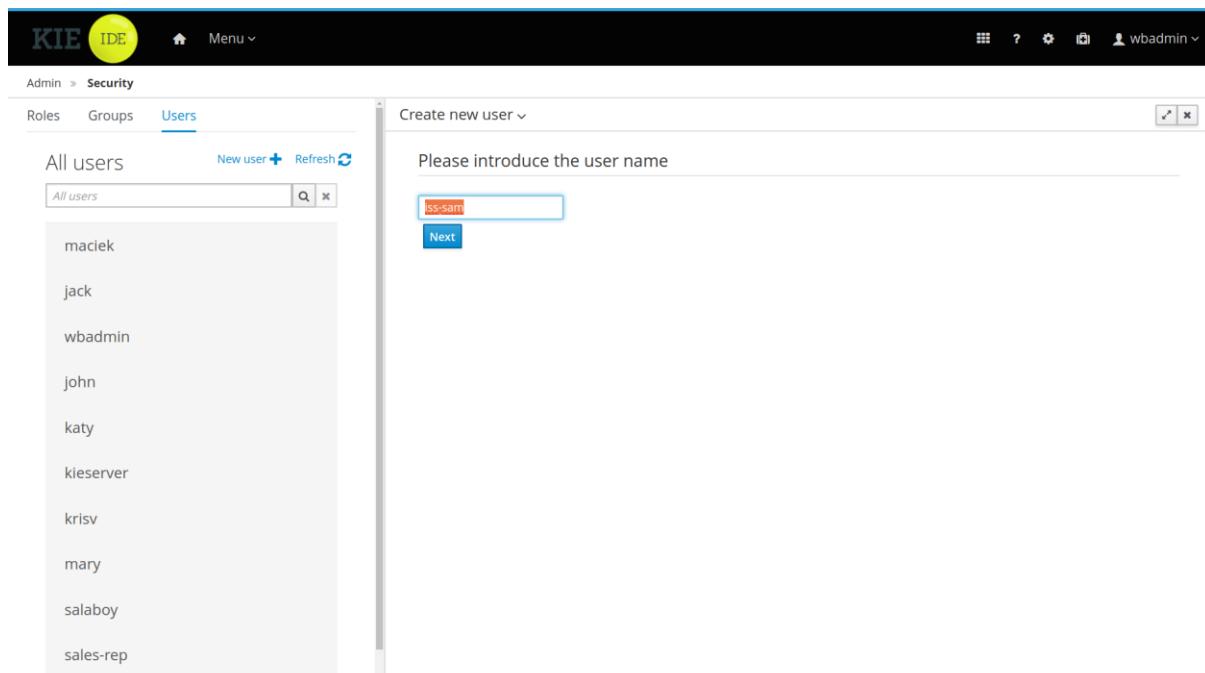
Business system developer	: iss-admin
Business system user (requester)	: iss-sam
Business system user (approver)	: iss-barry
Business system user (manager)	: iss-mk, iss-hy, iss-cm

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's Security management interface. On the left, there is a sidebar with tabs for Roles, Groups, and Users. The Users tab is selected, and a sub-menu shows 'All users'. A list of users is displayed, including maciek, jack, wbadmin, john, katy, kieserver, krisv, mary, salaboy, and sales-rep. At the top of this list, there is a 'New user+' button, which is highlighted with a red box. The main panel on the right is titled 'Security management' and features a large padlock icon. Below it, the text 'Security Management' is centered, followed by the sub-instruction 'Control who can access the different features and resources available'.



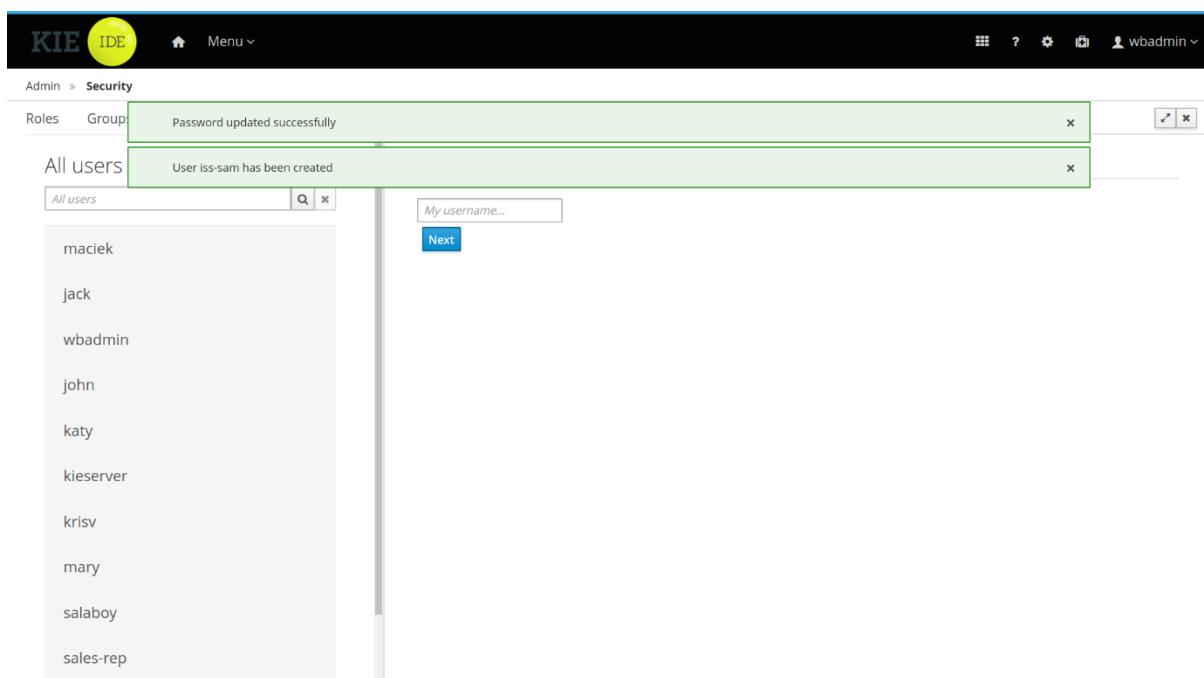
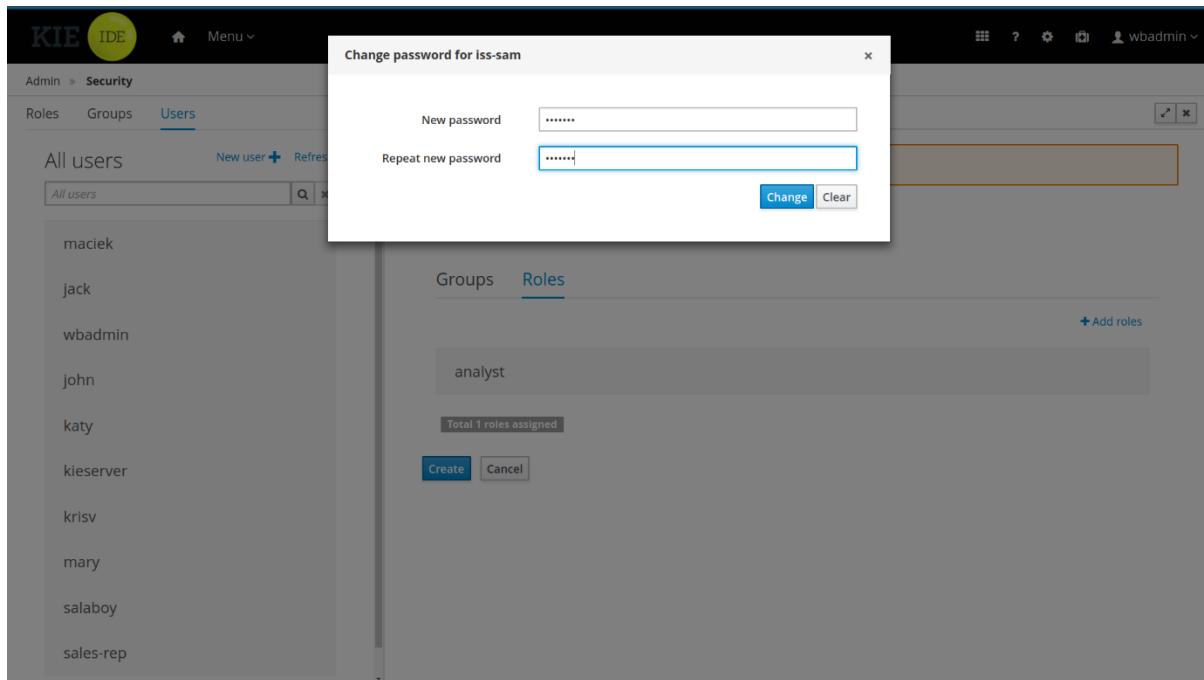
The screenshot shows the 'Create new user' wizard. The first step, 'Please introduce the user name', is displayed. In the input field, the user name 'iss-sam' is typed. Below the input field is a 'Next' button.

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 contains a warning message: "No assignments present, the user could be not able to log into the application". A text input field has "iss-sam" typed into it. Below the input field 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 of the panel are "Create" and "Cancel" buttons.

The screenshot shows the KIE IDE Security interface with a modal dialog titled "Role selection for iss-sam". The dialog lists "All roles": process-admin, manager, admin, analyst (which is checked), developer, and user. A message at the bottom 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, wbadmin, 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.

This screenshot is similar to the previous one but includes a modal dialog box titled 'Please confirm the action' with the message 'Do you want to set a password now?'. It has 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-crm, 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, asking for a user name. The input field contains 'My username...' and has a placeholder 'My username...'. Below it is a 'Next' button.

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

The screenshot shows the KIE IDE Security interface. On the left, there's a sidebar with 'Admin' and 'Security' selected. Under 'Groups', there's a list of existing groups: Accounting, rest-all, HR, IT, kie-server, PM, and sales. A 'New group' button is visible. On the right, a modal window titled 'Create new group' is open, with a text input field containing 'My group...' and a 'Next' button below it. Both the 'Groups' tab in the sidebar and the 'My group...' input field are highlighted with orange dashed boxes.

This screenshot is similar to the one above, but the 'My group...' input field now contains the text 'ss-group-requester'. The 'Groups' tab in the sidebar and the input field are highlighted with orange 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 button for 'New group' is visible. On the right, a modal window titled 'Create new group' is open, showing a search results list for 'sa'. It includes three users: salaboy, sales-rep, and iss-sam, each with a checkbox. Below the list is a message 'Total 3 users'. Buttons for 'Add selected users' and 'Cancel' are at the bottom.

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 background. A button for 'New user' is visible. On the right, a modal window titled 'Showing user iss-sam' displays the user's details. It shows the user name 'iss-sam' with an edit icon, and tabs for 'Groups', 'Roles', and 'Permissions'. The 'Groups' tab is selected, showing the group 'iss-group-requester'. A message 'Total 1 groups assigned' is displayed. Buttons for 'Cancel' and 'OK' are at the bottom.

The screenshot shows the KIE IDE Security interface. On the left, a sidebar lists users: iss-barry, iss-mk, iss-hy, iss-cm, iss-admin, and iss-sam. A search bar at the top of the sidebar shows 'iss'. Below the sidebar, it says 'Total 6 users'. On the right, the main panel is titled 'Editing user iss-sam'. It shows the user 'iss-Sam' and has tabs for 'Groups', 'Roles', and 'Permissions'. Under 'Groups', there is one assigned group: 'iss-group-requester'. At the bottom of the main panel are 'Save' and 'Cancel' buttons. To the right of the main panel, there are 'Change password' and 'Delete' buttons. A red dashed box highlights the '+ Add to groups' button.

This screenshot shows the 'Group selection for iss-sam' dialog box. It lists all groups: Accounting, HR, IT, sales, iss-group-requester (which is checked), rest-all, kie-server (which is checked), and PM. The 'All groups' search bar at the top shows 'All groups'. At the bottom of the dialog, it says 'Total 8 groups'. In the bottom right corner of the dialog, there is a red dashed box highlighting the 'Add to selected groups' button. The background shows the same KIE IDE Security interface as the previous screenshot.

The screenshot shows the KIE IDE Security interface. On the left, a sidebar lists users: iss-barry, iss-mk, iss-hy, iss-cm, iss-admin, and iss-sam. A search bar at the top of the sidebar shows 'iss'. A message at the top right says 'User iss-sam has been modified. Please save your changes to apply them'. The main panel is titled 'Editing user iss-sam'. It shows the user 'iss-sam' and tabs for 'Groups', 'Roles', and 'Permissions'. Under 'Groups', two groups are listed: 'iss-group-requester' and 'kie-server'. A message 'Total 2 groups assigned' is displayed. At the bottom are 'Save' and 'Cancel' buttons, with 'Save' highlighted by a red dashed box.

The screenshot shows the KIE IDE Security interface after saving the user. A green success message 'User iss-sam has been saved' is displayed at the top. The main panel shows the user 'iss-sam' and tabs for 'Groups', 'Roles', and 'Permissions'. Under 'Groups', two groups are listed: 'iss-group-requester' and 'kie-server'. A message 'Total 2 groups assigned' is displayed. The 'Save' button from the previous screen is now visible again.

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

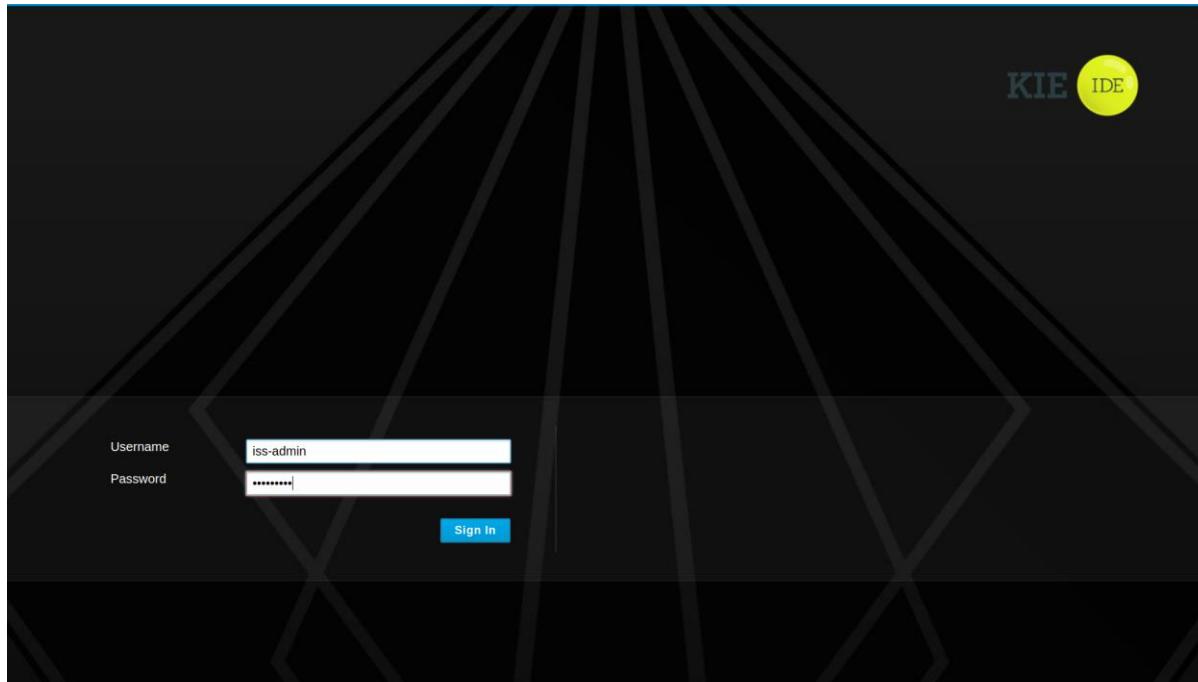
The screenshot shows the KIE IDE Security interface. On the left, under 'Groups', a search bar shows 'iss' and a list of three groups: 'iss-group-manager', 'iss-group-requester', and 'iss-group-approver'. A red dotted box highlights this list. On the right, a 'Create new group' form is open, with a text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

The screenshot shows the KIE IDE Security interface. On the left, under 'Users', a search bar shows '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, the details for user 'iss-admin' are shown, including their assigned groups: 'iss-group-manager' and 'kie-server'. A message at the bottom states 'Total 2 groups assigned'.

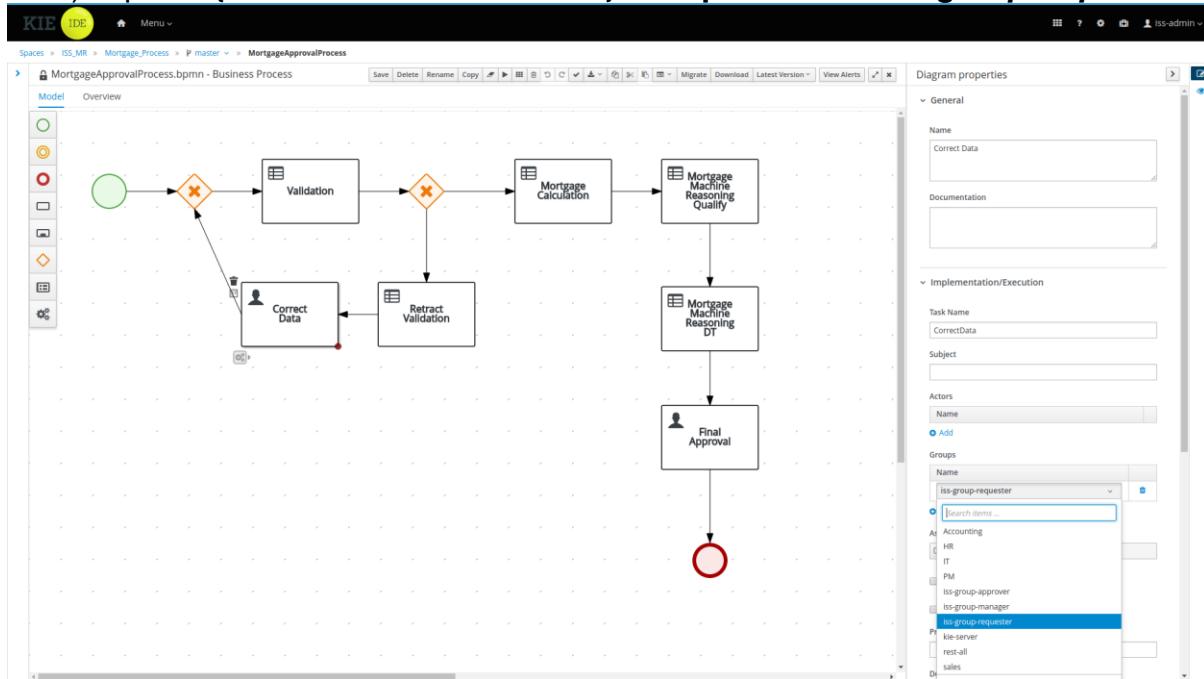
## 4.1.2. Business system enhancement [ Group ]

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

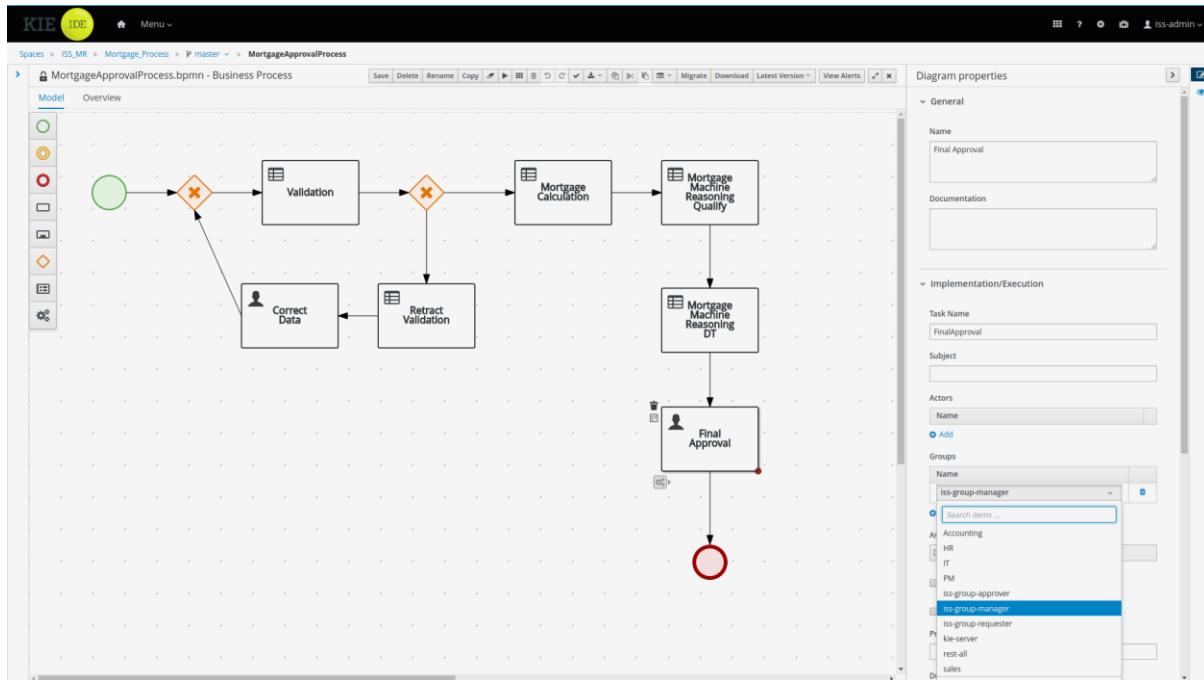
- 1) Re-login as Username : **iss-admin**  
Password : **iss-admin**



- 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

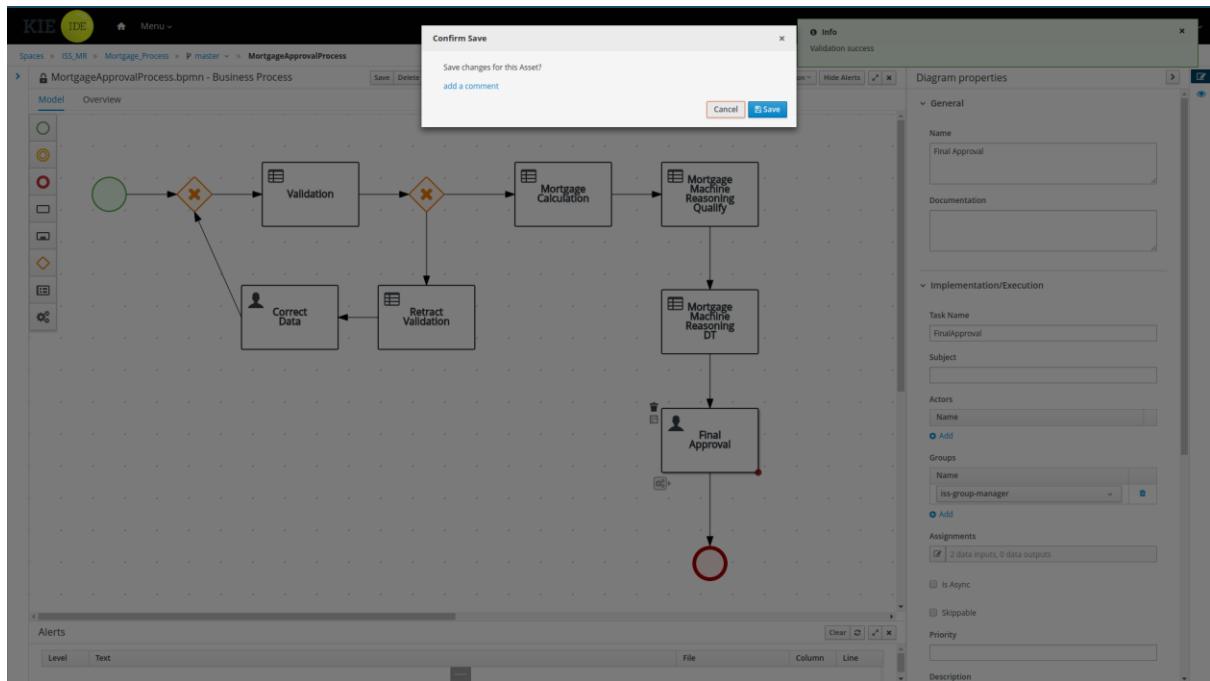


Chief, MTech Knowledge  
Engineering Programme /  
Chief, MTech Intelligent  
Systems Programme

✉ 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;

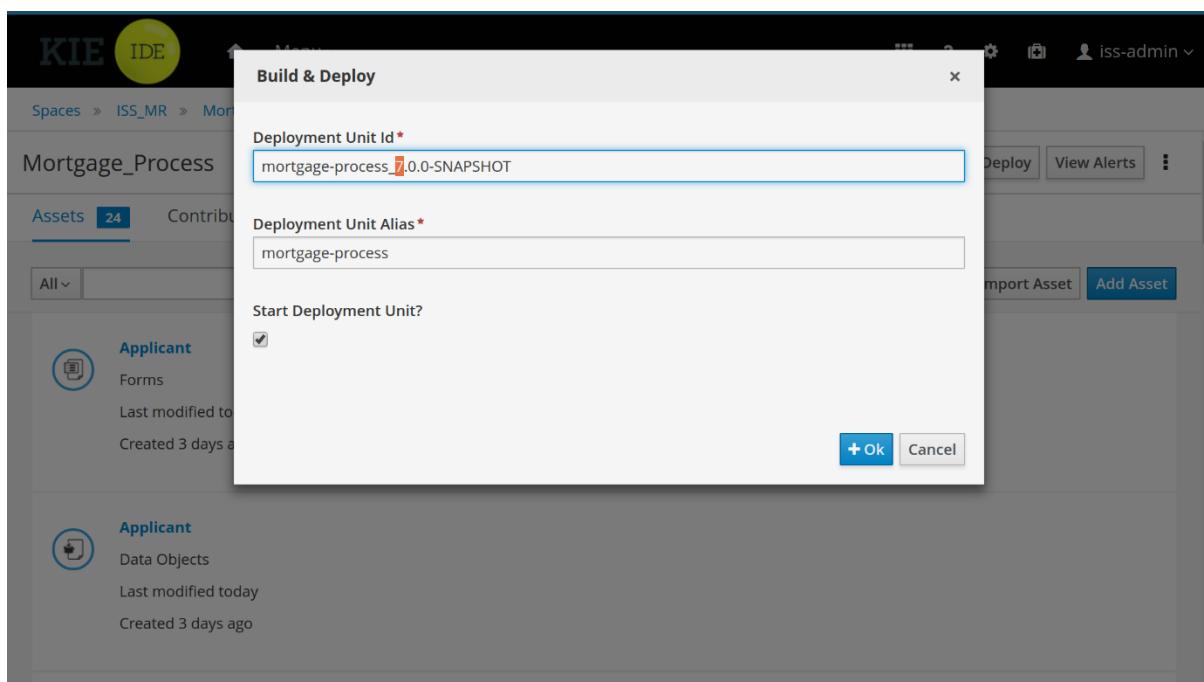


### 4.1.3. Business system enhancement [ Deploy ] v7.0.0

{ 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

MortgageApprovalProcess

Correlation key

Form

Application

Down Payment: 50000 | Years of amortization: 20

Applicant

Name: Sam GU 7.0 case 1

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

Annual Income: 123456

SSN: SSN

Property

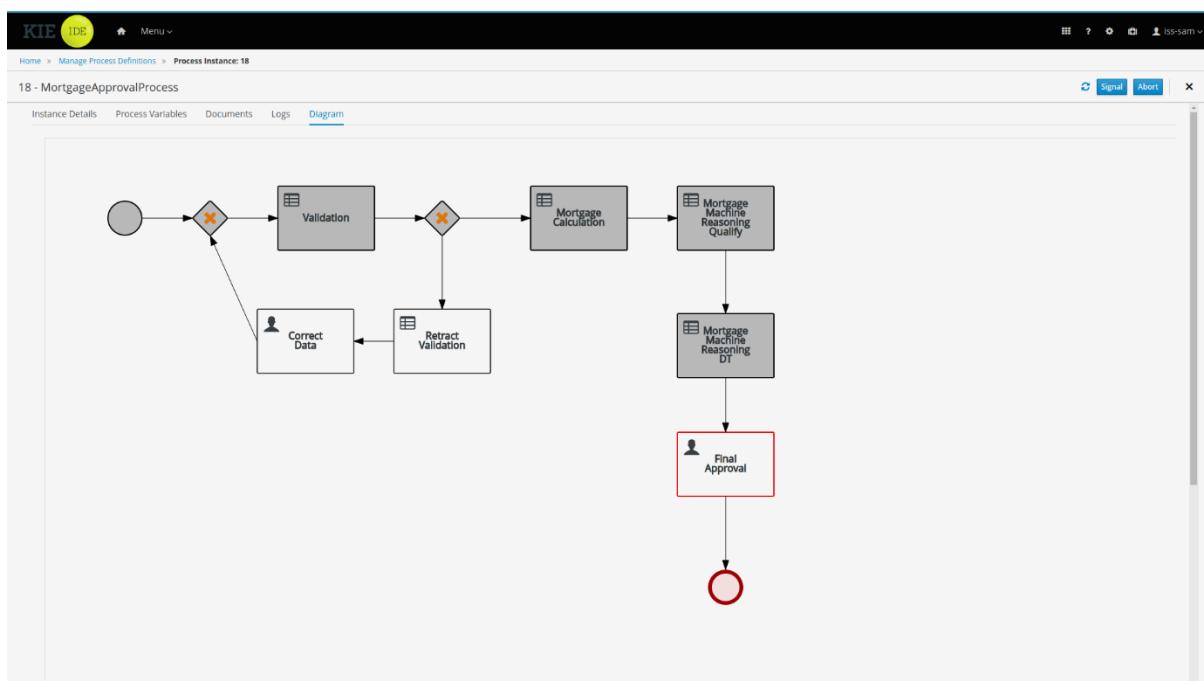
Age of property: 3

Address of property: 25 HMKT

Locale: Urban

Sale Price: 250000

Submit



The screenshot shows the KIE JBoss 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, Obsolete, Ready, Reserved, and Suspended. The 'Ready' status is selected. 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 columns: Task, Process Definition Id, Status, Created On, and Actions. A message at the top right says 'No tasks found'. At the bottom right, there are navigation icons and a page number '0 of 0'.

{ 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!**

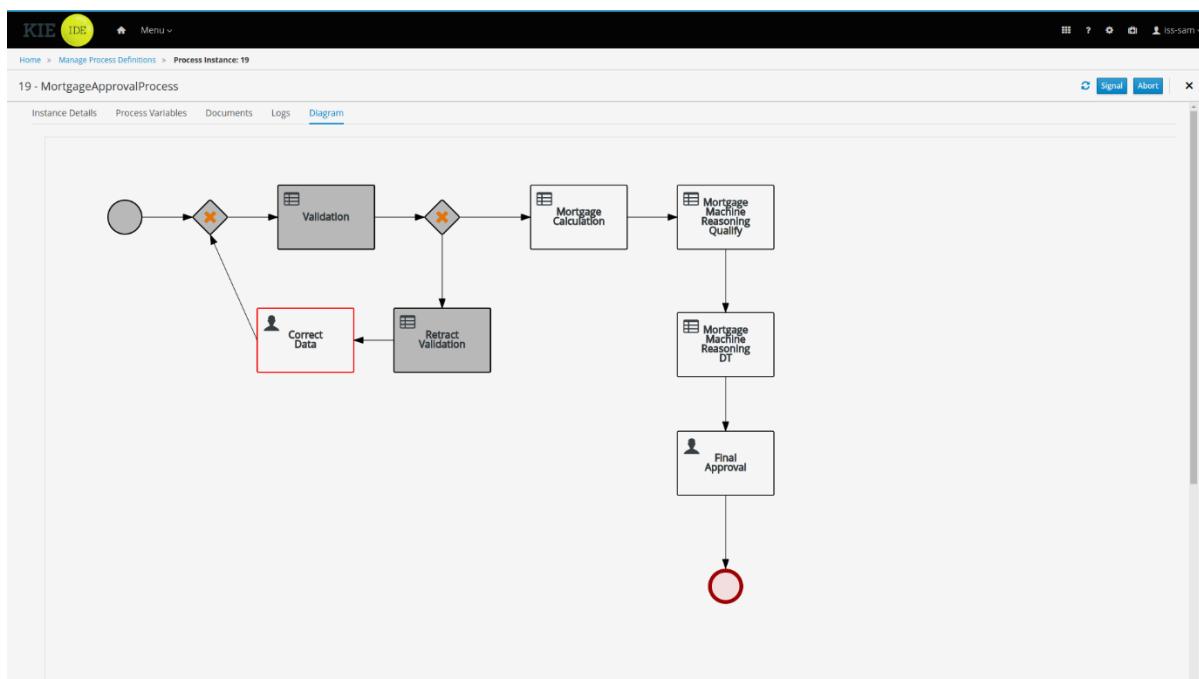
The user is:

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

The screenshot shows the KIE IDE Task Inbox interface. 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 a dropdown for 'Id' and a text input field 'Filter By Id...'. Below that is a dropdown for 'Process Definition Id' with 'Select' option. The main area is titled 'Task Inbox' with the subtitle 'Task'. It displays a table with one row for the task 'Final Approval'. The columns are 'Task', 'Process Definition Id', 'Status', 'Created On', and 'Actions'. The task details are: Process Definition Id is 'Mortgage\_Process.M...', Status is 'Ready', and Created On is '22-Feb-2019 19:11:08'. At the bottom, 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 shows 'Home > Task Inbox > Task: 19'. The main content area is titled '19 - Final Approval'. It is divided into sections: 'Application' (Mortgage amount: 200000, Down Payment: 50000), 'Applicant' (Name: Sam GU 7.0.0 case 1, Age: 31, Credit Rating: 0, Has Job: Yes, Own House: Yes), 'Annual Income' (123456), 'SSN' (0), and 'Property' (Age of property: 3, Address of property: 25 HNKRT, Locale: Urban, Sale Price: 250000). At the bottom, there are buttons for 'Inlimit', 'Save', 'Release', and 'Complete'.

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



{ 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, etc., with some checkboxes checked. Below the filters are sections for "Filter By" (Id, Filter By Id...) and "Process Definition Id" (Select). The main area is titled "Task Inbox" and shows 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", "Task: 20", and tabs for "Work", "Details", "Assignments", "Comments", "Admin", and "Logs".

The "Work" tab is active. The page displays the following fields:

- Outputs:** Application
- Error details**
- Error and cause:** Down payment cannot be 0, greater than, or equal to the property sale price.
- Down Payment**: Value 0
- Years of amortization**: Value 20
- Applicant**
- Name**: Sam GU 7.0.0 case 2
- Age**: Value 21
- Credit Rating**: Value 0
- Has Job\***: Checked
- Own House\***: Unchecked
- Annual Income**: Value 123456

KIE IDE

Home > 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	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Annual Income

123456

KIE IDE

Home > Task Inbox

Task Inbox

Active filters: Status: Ready, InProgress, Reserved Save Filters | Clear All

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 IDE Task Inbox interface. 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 'Status', 'InProgress' and 'Ready' are checked. Below the filters are sections for 'Filter By' (Id and Filter By Id...) and 'Process Definition Id' (Select). The main area is titled 'Task Inbox' and shows a table with one item:

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

At the bottom, it says '10 Items' and has navigation buttons («, <, >, ») and a page indicator '1 of 1'.

The screenshot shows the KIE IDE Task details interface for 'Task: 21 - Final Approval'. It has three main sections: Application, Applicant, and Property.

- Application:**
  - Mortgage amount: 200000
  - Down Payment: 56719
  - Years of amortization: 20
  - Inlimit Machine Reasoning checkbox is checked
- Applicant:**
  - Name: Sam GU 7.0.0 case 2
  - Age: 31
  - Credit Rating: 0
  - Has job: Yes
  - Own House: Yes
  - Annual Income: 123456
  - SSN: 0
- Property:**
  - Age of property: 3
  - Address of property: 25 HNK
  - Locale: Urban
  - Sale Price: 250000
  - Inlimit checkbox is checked
  - Claim button is visible

#### 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](mailto: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]**

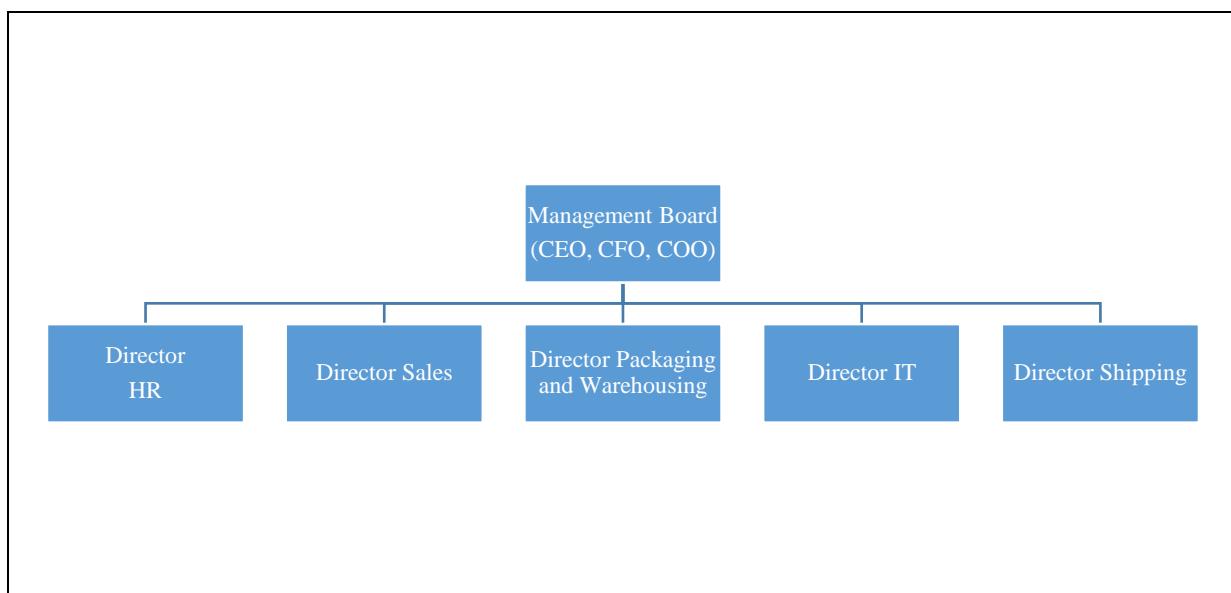
### 5.1.2. Workshop Project Candidate Two

#### 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:

<b>HR Director:</b>	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.
<b>Director Sales:</b>	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.
<b>Director Packaging and Warehousing:</b>	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.
<b>Director IT:</b>	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.
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## 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**

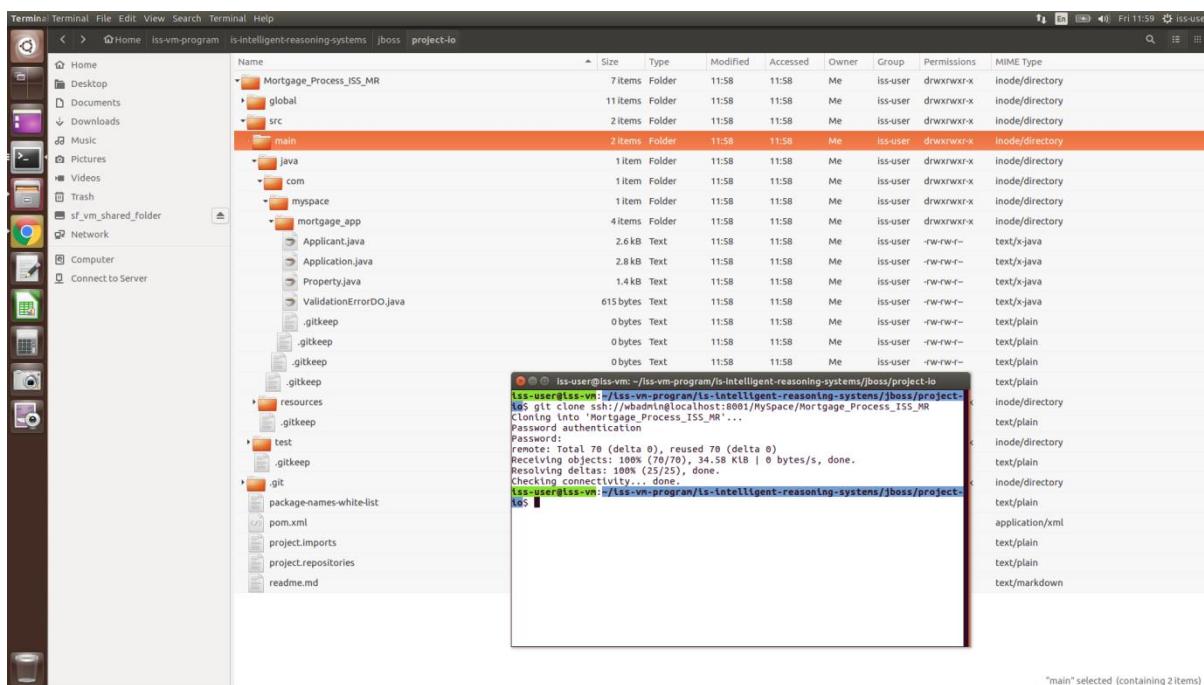
Review project settings to obtain project URL link

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

- Project Path:** Spaces > MySpace > Mortgage\_Process\_ISS\_MR > master
- Project Name:** Mortgage\_Process\_ISS\_MR
- Description:** Getting started loan approval process in BPMN2, decision table, business rules, and forms.
- URL:** ssh <input value="ssh://localhost:8001/MySpace/Mortgage\_Process\_ISS\_MR" type="text">
- General Settings:** Disable GAV conflict check (unchecked), Allow child GAV edition (unchecked).
- Group ID:** mortgage-process
- Artifact ID:** Mortgage\_Process\_ISS\_MR
- Version:** 1.0.0-SNAPSHOT

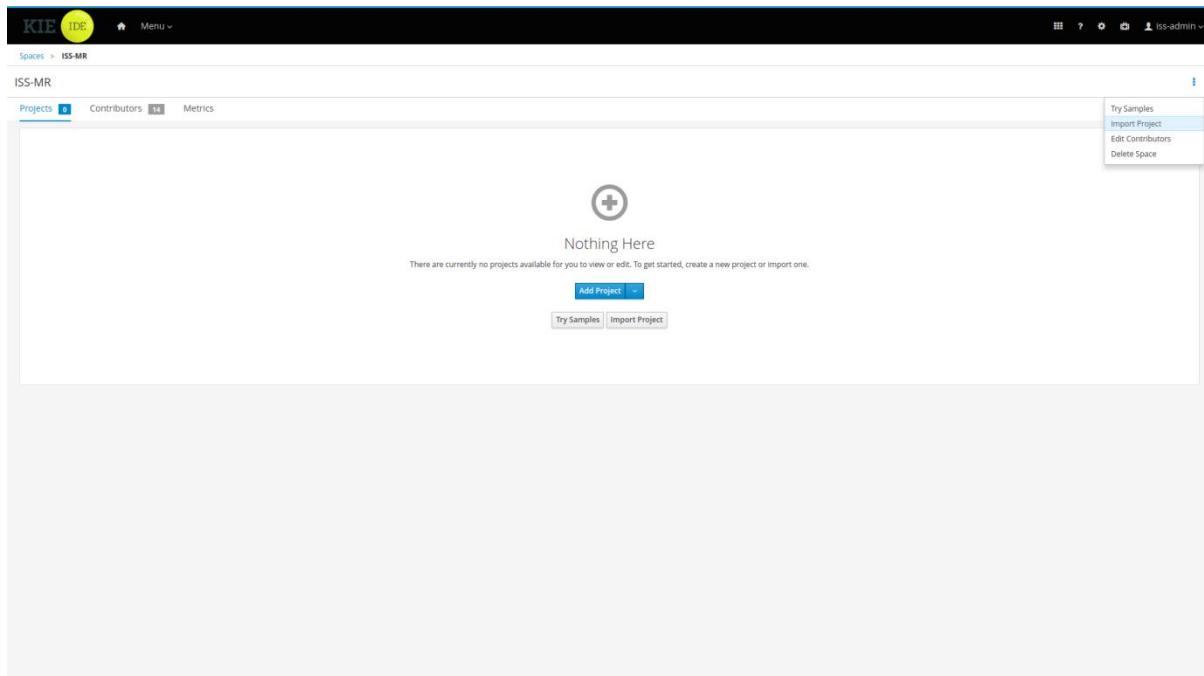
## 5.2.1. Export project from KIE Workbench

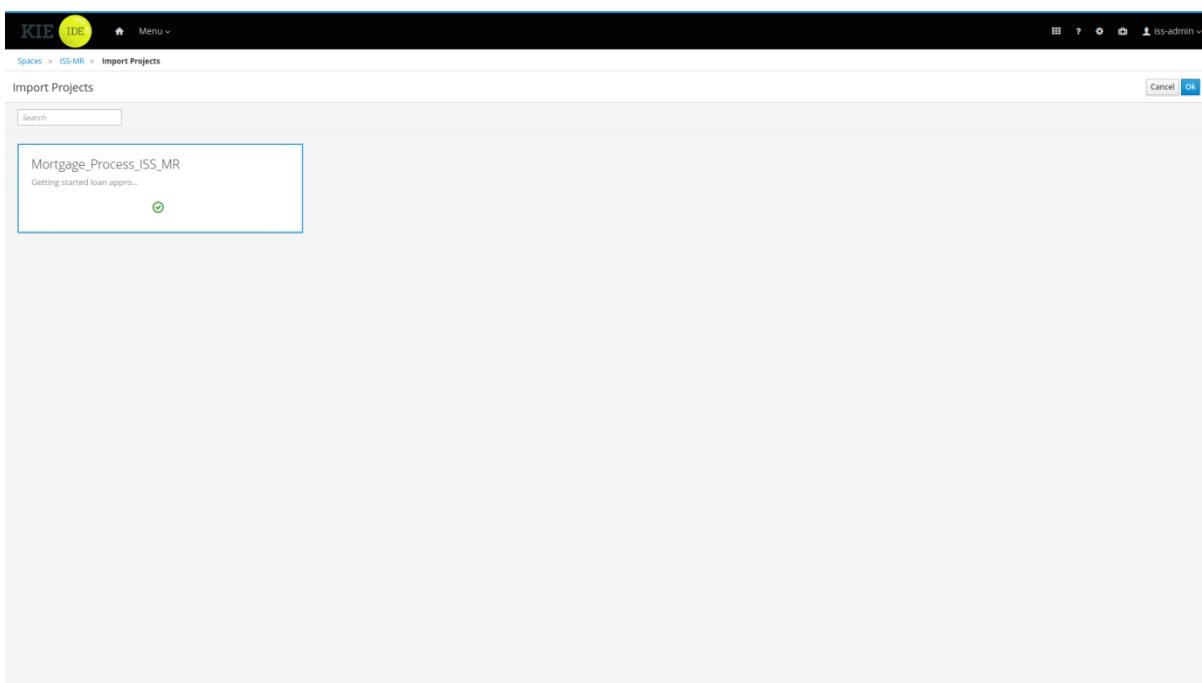
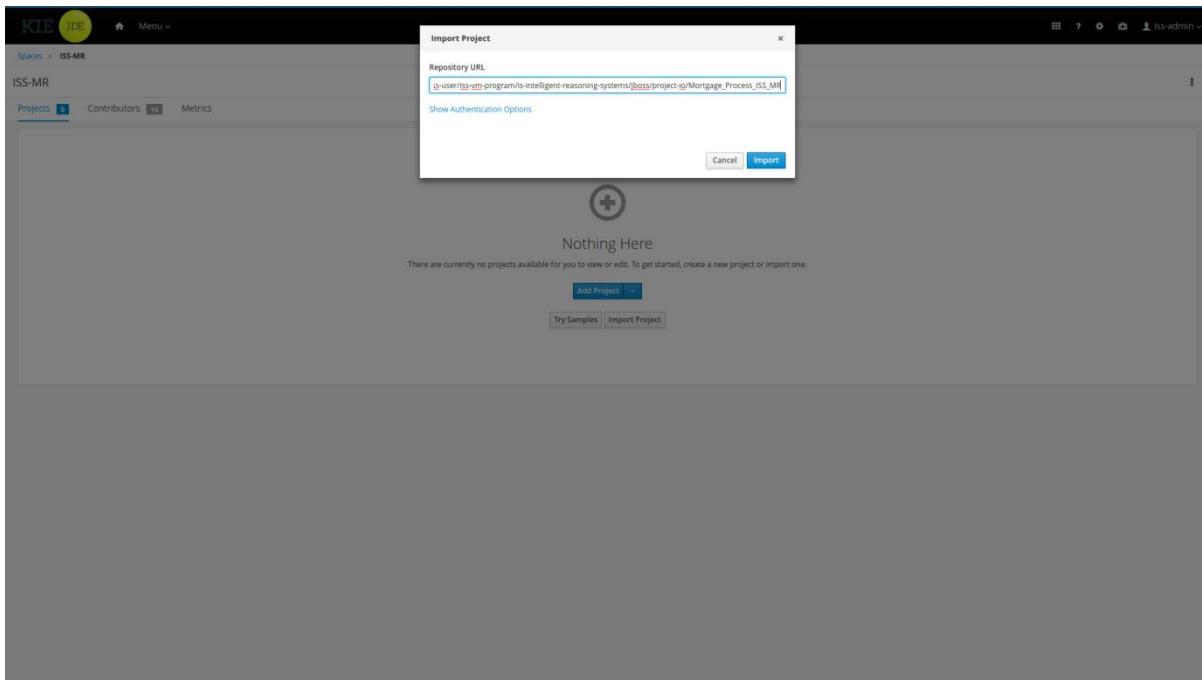
- 1) Select a folder for exporting, example here uses **/home/iss-user/iss-vm-program/is-intelligent-reasoning-systems/jboss/project-io**
- 2) Start a **Terminal or Command line tool** there, key in: **git clone ssh://wbadmin@localhost:8001/MySpace/Mortgage\_Process\_ISS\_MR**  
 { Tips } Note the modified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

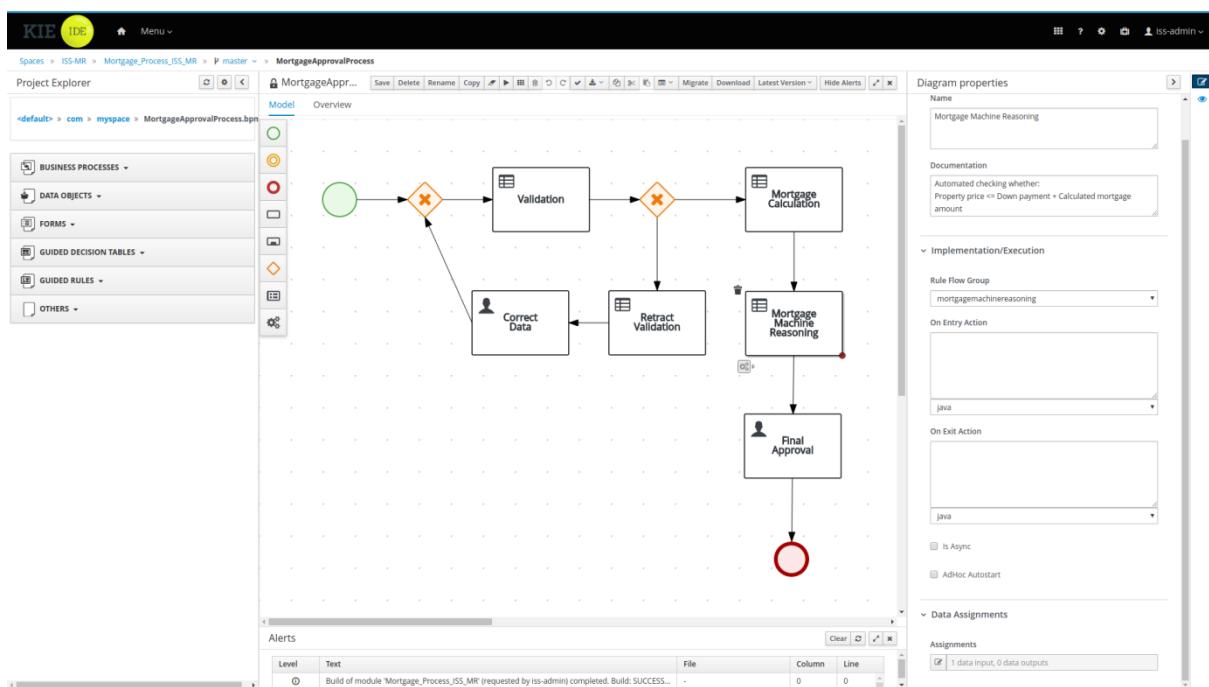
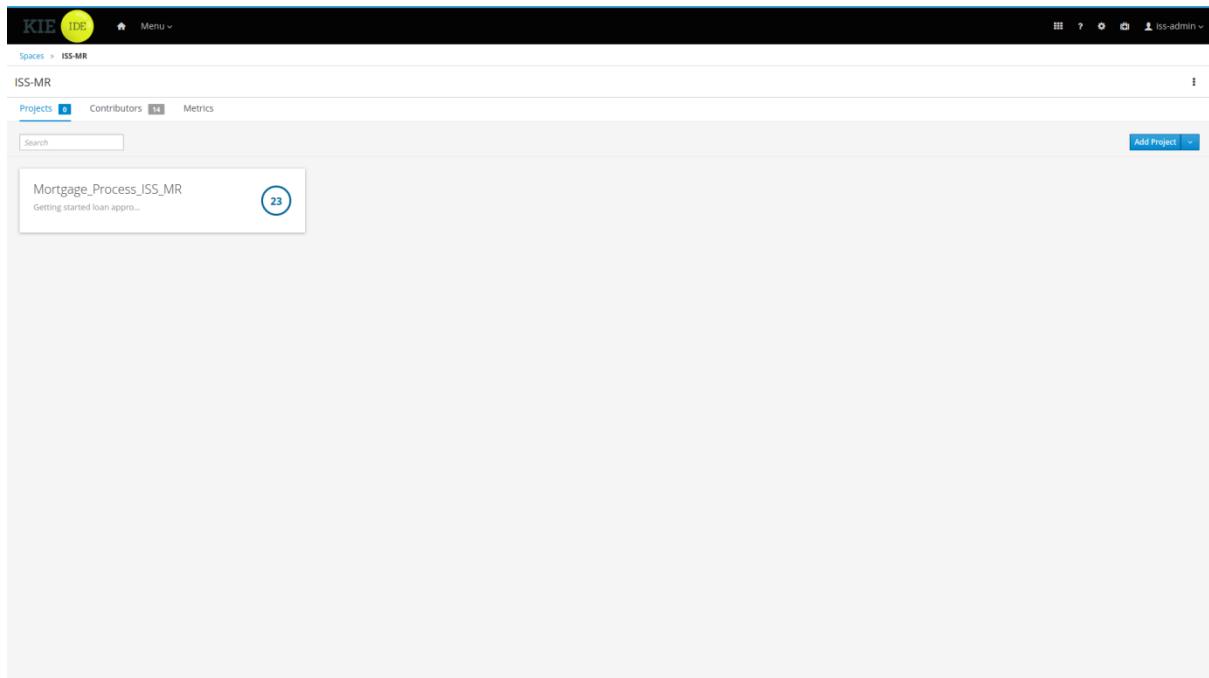


## 5.2.2. Import project into KIE Workbench

- 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	<a href="http://www.clipsrules.net/">http://www.clipsrules.net/</a>
Node.js, Python, Ruby	<a href="https://github.com/jruizgit/rules">https://github.com/jruizgit/rules</a>
Python	<a href="https://github.com/buguroo/pyknow">https://github.com/buguroo/pyknow</a>
Node.js	<a href="https://github.com/primaryobjects/knowledgebase">https://github.com/primaryobjects/knowledgebase</a>

## The End of Workshop Project Guide