**Cloud Pak for Automation Bootcamp**

**ODM – Hands-on Lab #2: Mortgage prequalification**

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# Introduction

The goal of this hands-on lab is to take you through the full cycle of activities involved in decision management with ODM, including:

* Analyzing the client’s business policy
* Creating a business object model and the rules that apply to it
* Assembling a decision service
* Deploying it to the Rule Execution Server
* Testing the decision service
* Updating the rules and redeploying the decision service

See the Glossary section at the end of the document for some business term definitions.

# Instructions

For this lab, you will go through the following steps in small teams of 2 boot-campers.

Based on a set of business policy statements harvested from a mortgage lender, you will build an ODM loan pre-qualification decision service. You will start from *Rule Designer* to define a standard decision service.

1. **Analyze and design**: Read the policy statements to figure out the object model that should be developed as well as the rules that should connect the attributes of that model. For example, let’s take the following policy statement:

The applicant should be at least 18 years old

This statement tells you that your model should have a concept of Applicant with an age attribute and that a validation rule applies to the value of this attribute.

Once you have designed an object model that supports writing some rules from each of the pre-qualification decision steps (validation, eligibility, etc.), you are ready for the for the Implementation step.

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| sign-info | ***Remember that you do not have to figure-out all the rules or a complete object model before you can start with the implementation step. The decision development process is always agile and iterative.*** |

If you need clarification on the business policy statements or the overall business process, ask your instructors who will play the role of the business SMEs.

1. **Sync-up**: At this point of the lab, we will do a quick sync-up, to make sure that all the teams have figured-out their base object model and a subset of the rules, and that you feel comfortable going into the following implementation step.
2. **Implement**: Start defining your eXecution Object Model (XOM), creating your decision service and write some rules in *Rule Designer*. Once your object model is stable enough, publish your rule projects to Decision Center and start writing rules from Decision Center. Using Decision Center will allow all the members of the team to write rules concurrently.
3. **Validate**: From Decision Center, create a test suite, populate it with a few test scenarios and execute the test suite to make sure your decision service is working as expected.
4. **Deploy and test**: From Decision Center, deploy your decision service to the Rule Execution Server. Log-in to the Rule Execution Server console and verify that your RuleApp and ruleset has been deployed. Then, test that you can execute your decision service. You can either use the Test feature from the Rule Execution Server, or use any REST client (e.g. curl, postman, etc.).
5. **Iterate**: If time permits, go back to *Analyze and design* (step #2) to add more rules to your decision, making it more powerful.
6. **Playback**: At the end of the lab, each team will present the object model they have designed, show their implemented rules in Decision Center, run the test suite to prove the decision service execution, and validate the deployed service in the Rule Execution Server console with a test execution.
7. **Bonus points**: Choose one task from the business scenario (i.e. Validation, Eligibility, etc.) and develop the corresponding *decision model* service in Decision Center.

|  |  |
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| sign-info | ***Be prepared for the instructor to ask you (as would a Business SME) to show what would be the process if the policy changed to require, for example, applicants to be at least 21 years old instead of 18, or other similar updates…*** |

# Useful references

* Documentation for the [decision artifacts](https://www.ibm.com/support/knowledgecenter/SSQP76_8.10.x/com.ibm.odm.dcenter.bu.bconsole/projects/con_bc_project.html) (rule flows, rules, decision tables)
* Documentation for the [BAL rule language constructs](https://www.ibm.com/support/knowledgecenter/SSQP76_8.10.x/com.ibm.odm.dserver.rules.ref.designer/lang_bal_ref_topics/tpc_bal_intro.html)

# Mortgage pre-qualification scenario

You have been meeting with ACME, a national mortgage lender who wants to automate its pre-qualification process. From your previous meetings, you have captured the following notes.

The process is decomposed in the following sequence of tasks:

* **Validation**: checks structure and values of the loan request payload. If the validation step fails, a declined loan response is sent back.
* **Eligibility**: validates that the loan request conforms to the ACME lending policies. If the eligibility step fails, a declined loan response is sent back.
* **Risk assessment**: calculates the risk of lending to the loan applicant. The risk is represented along a risk grade scale, from AA+ to CC.
* **Pricing**: determines the loan interest rate based on ACME’s pricing sheets.

A subset of the rules that go into each task are captured below.

|  |  |
| --- | --- |
| sign-info | ***Some of the rule definitions may be imprecise and the vocabulary used in the definitions may vary from one to another. This is intentional and usually what you would get when talking to different Business SMEs. It is up to you to make some assumptions or ask for clarification.*** |

## Validation

The following structure and value validations should be performed on the loan request:

* The applicant should be at least 18 years old.
* An employee can be Self-employed, Part-time Employed or Full-time Employed.
* An employer name must be specified for an applicant who is not self-employed.
* ACME is not doing business yet in North Dakota or South Dakota.
* There is always one primary borrower in the loan application.
* There can be any number of co-borrowers.
* The purchased property can be either Owner Occupied or Non-Owner Occupied.
* The credit score of an applicant is a number between 200 and 900.

## Eligibility

Eligibility criteria can be divided in two categories: criteria about the loan and criteria about the borrower.

**Borrower**

* The credit score of the primary applicant should be a minimum of 500, otherwise the loan application is rejected.
* The Loan to Value (LTV) should not be greater than 85% for a non-US citizen or for a US-citizen who is self-employed or part-time employed.
* The LTV should not be greater than 90% for a US citizen who is full-time employed.
* The applicant should not be both non-citizen and non-occupant of the purchased property.
* A non-US citizen must be a permanent resident (i.e. have a green card) to apply for a loan.

**Loan**

* The loan amount should not be greater than $600,000.
* The loan amount should not be lower than $50,000.
* The loan purpose should not be Cash-out Refinancing in Texas.
* The loan amount should not be greater than $830,000 in California.

## Risk Assessment

The risk grade is calculated by using a combination of the credit score and the number of times the borrower has been more than 30 days late in paying his mortgage in the past. This is the risk grade determination table, as we understand it:

|  |  |  |
| --- | --- | --- |
| **# Late Payments** | **Credit Score** | **Risk Grade** |
| 0 | at least 700 | AA+ |
| 600 to 699 | AA |
| 500 to 599 | A |
| 1 or more | at least 700 | B |
| 600 to 699 | C |
| 500 to 599 | CC |

## Pricing

The pricing process steps are:

* Get the base rate given the LTV and Risk Grade. The base rate comes from the rate tables below.
* Then, find the rate adjustments if any. One adjustment for example, is a function of the term selected for the loan (e.g. Fixed, 3 years ARM, 5 years ARM). These adjustments can be found on the rate tables.
* Compute the final rate as the sum of the base rate and the adjustments.
* Verify that the final rate is between the Minimum Rate and Maximum Rate. If the final rate is below the minimum rate, then the final rate is taken to be the minimum rate. Same for maximum rate: if the final rate is above the maximum rate, the final rate is taken to be the maximum rate.
* The minimum rates can be found in the rate tables.
* The maximum rate is usually 13.5%, but there can be some exceptions depending on the property state. For example, the maximum in Texas is 15%.

**Base rate**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **LTV** | | | | | |
|  | **65%** | **70%** | **75%** | **80%** | **85%** | **90%** |
| **AA+** | 3.35 | 3.55 | 3.80 | 3.95 | 4.20 | 4.60 |
| **AA** | 3.35 | 3.55 | 3.80 | 4.00 | 4.30 | 4.70 |
| **A** | 3.60 | 3.85 | 4.10 | 4.40 | 4.75 | 5.20 |
| **B** | 4.30 | 4.55 | 4.95 | 5.30 | 5.65 |  |
| **C** | 5.40 | 5.75 | 6.20 | 6.55 |  |  |
| **CC** | 5.80 | 6.25 | 6.70 | 7.10 |  |  |

**Adjustments**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **LTV** | **Adjustment** |  | **Term** | **Adjustment** |
| at most 70% | 0.50 |  | Fixed | 0.75 |
| at most 80% | 0.75 |  | 3 years ARM | 0.25 |
| more than 80% | 1.00 |  | 5 years ARM | 0.35 |

**Minimum rates**

|  |  |
| --- | --- |
| **Term** | **Minimum rate** |
| Fixed | 6.50 |
| 3 years ARM | 5.75 |
| 5 years ARM | 6.10 |

# Glossary

* **Application**: a mortgage application requires borrowers to submit information regarding their income, savings, assets, debts, and more.
* **Adjustable Rate Mortgage (ARM)**: a mortgage in which the interest changes periodically, according to corresponding fluctuations in an index. All ARMs are tied to indexes.
* **Borrower**: a person who has been approved to receive a loan and is then obligated to repay it and any additional fees according to the loan terms.
* **Co-Borrower**: an additional individual who is both obligated on the loan and is on title to the property.
* **Credit Bureau Score**: a number representing the possibility a borrower may default; it is based upon credit history and is used to determine ability to qualify for a mortgage loan.
* **Credit Rating**: borrowers are rated by lenders according to the borrower's creditworthiness or risk profile. Credit ratings are expressed as letter grades such as A-, B, or C+. These ratings are based on various factors such as a borrower's payment history, foreclosures, bankruptcies and charge-offs. There is no exact science to rating a borrower's credit, and different lenders may assign different grades to the same borrower.
* **Credit Report**: a report to a prospective lender on the credit standing of a prospective borrower. Used to help determine creditworthiness. Information regarding late payments, defaults, or bankruptcies will appear here
* **Fixed rate mortgage**: a mortgage interest rate which is fixed for the term of the loan. Payments as well are fixed at one amount.
* **Loan Amount**: the amount of money that you intend on borrowing from a financial institution for the purchase of your home. Subtracting the down payment from the purchase price of the home will provide you with the loan amount.
* **Loan-To-Value (LTV)**: the percentage relationship between the amount of the loan and the appraised value or sales price (whichever is lower).

For example:

* + Home sales price = appraised value = $100,000
  + Down payment = $20,000
  + Loan amount = $80,000

Then, the LVT is 80,000 / 100,000 = 80%

* **Mortgage**: a legal document that pledges property to a creditor for the repayment of the loan, and is the term used to describe the loan itself. Some states use the term First Trust Deeds to refer to mortgage loans.
* **Underwriting**: the process of analyzing a loan application to determine the amount of risk involved in making the loan; it includes a review of the potential borrower's credit history and a judgment of the property value