**Lab Guide**

IBM Decision Manger Open Edition

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Hands-on Lab

DMN Design Patterns for Big Decisions



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# Introduction

In this Lab we will implement common DMN patterns using **IBM Decision Manager Open Edition**. This lab assumes you have mastered the basics of **DMN** and **KIE Sandbox**.

The Lab will start by building a simple decision service that is an antipattern. We will improve the design by applying the following patterns:

* The **Structured Data Pattern** to simplify DMN Diagrams
* The **Divide and Conquer Pattern** to split a complex table into smaller tables
* The **Tiered Service Pattern** to divide a single DMN file into several smaller DMN Files.

By the end of the lab, you will have built an executable decision service that should be maintainable for future changes.

It is worth noting that not all the patterns may be appropriate for your project. The patterns presented are appropriate for large projects, and for smaller projects you may not need them.

**Pre-requisites**

To perform this Lab, you need either:

A remote Virtual Machine from IBM TechZone with a pre-deployed PAM-DM Open Edition tooling to use in this Lab. Please follow instructions in Appendix A to provision and access to an instance of this Virtual Machine.

OR

Your own PC with Chrome or Safari pointing at URL <https://sandbox.kie.org/>

# Labs – Applying design patterns to complex DMN projects

In these labs, you will start with a simple decision service that will not scale. It shows how easy it is to fall into the trap of poor design. Once a poor design is approved, it quickly takes hold. At this point the decision service may require a total re write which can be expensive. Therefore, it is important to start with a good design at the beginning.

## Lab 0 - The Anti-pattern

In this task, you will create a decision service that takes planetary data and decides habitability.

This example will be improved in subsequent labs until we reach a good design.

1. In your Chrome or Safari 16 (or later) browser, open the web site <https://sandbox.kie.org/> :  
     
   Graphical user interface, application, website

   Description automatically generated

Figure 1: Kie Sandbox Start Page

1. Click on the **New Decision** button on the home screen. In the top left corner rename the decision service from Untitled to **Habitability**. Hit the **Enter** button so that the DMN Model Name property is set.
2. Create the following inputs of type **number**: *SurfacePressure, carbonDioxide, methane, oxygen, temperature* and *gravity*:

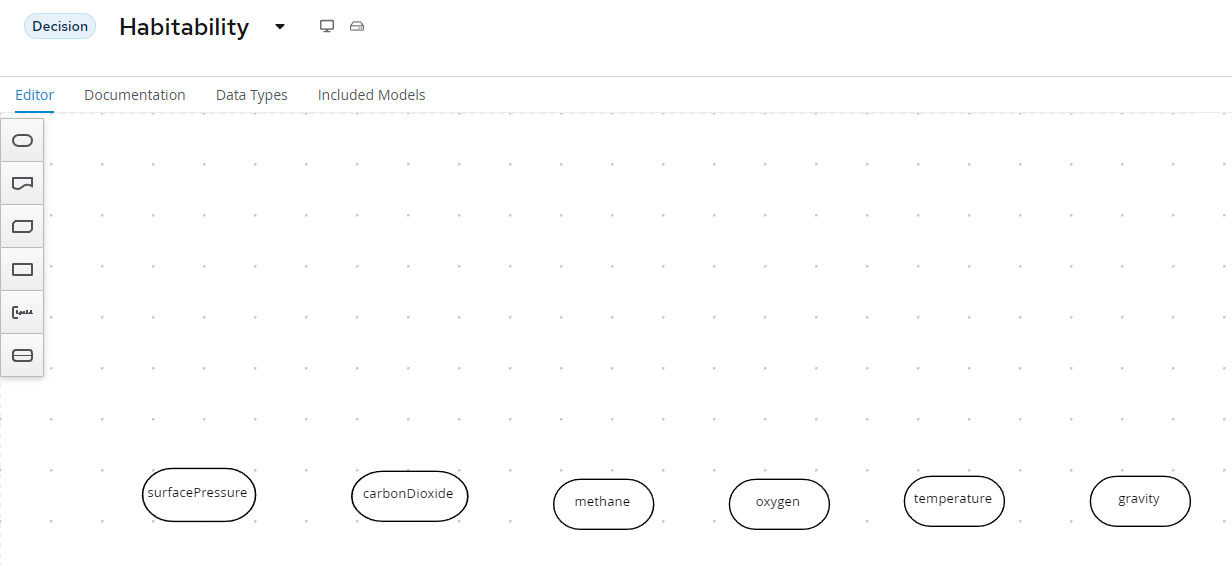


Figure 2: Habitability Decision Inputs

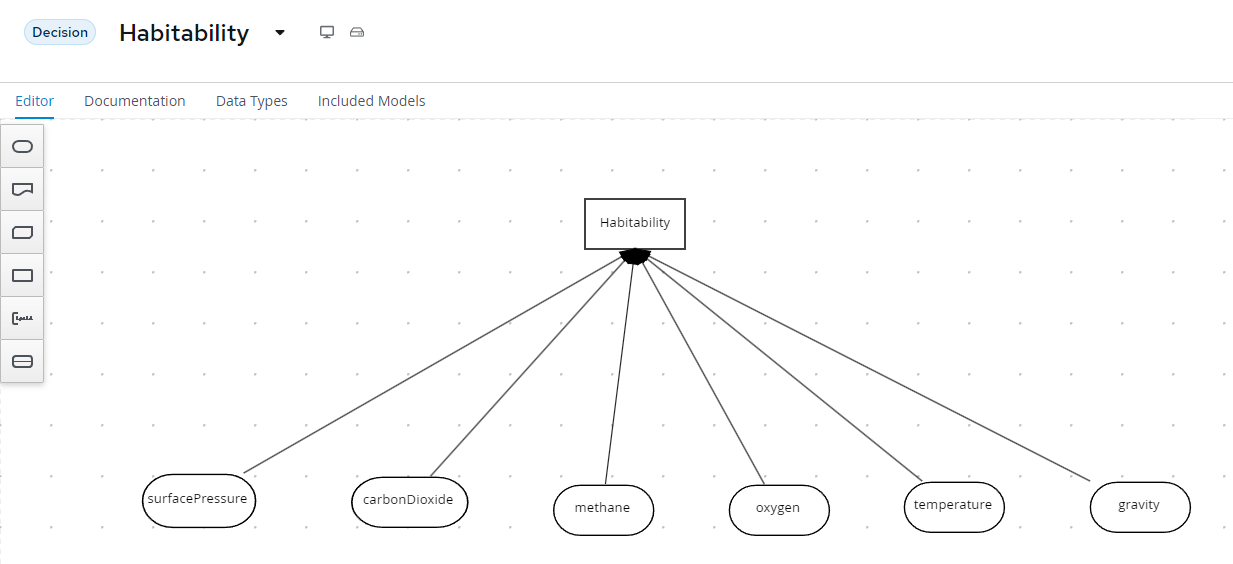
Create Decision *Habitability* and join the inputs to this node:

Figure 3: Initial Habitability DMN Design

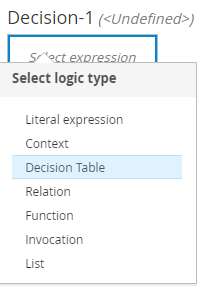
1. Edit **Habitability**. Click on **Select expression** to see a list of available logic types.  
   

Figure 4: Logic Type

1. Select **Decision Table** and enter the following data:

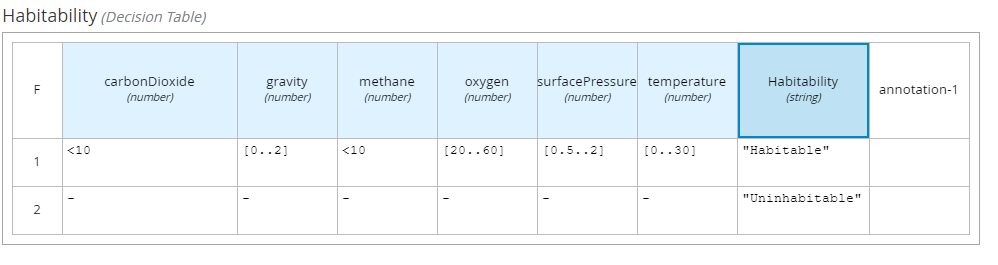


Figure 5: Habitability Decision

1. Test the model with Earth data and the expected result is *Habitable :*

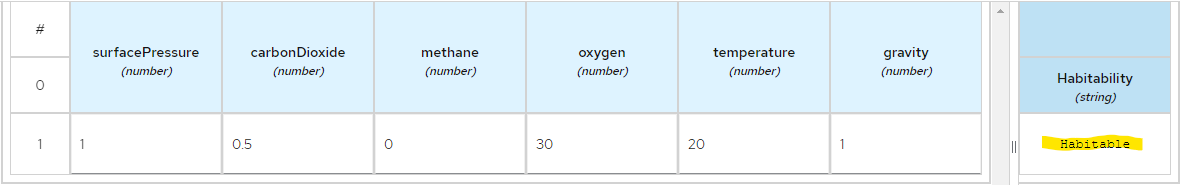


Figure 6: Test Result - Habitable

1. Test the model with Venus data and the expected result is *Uninhabitable :*

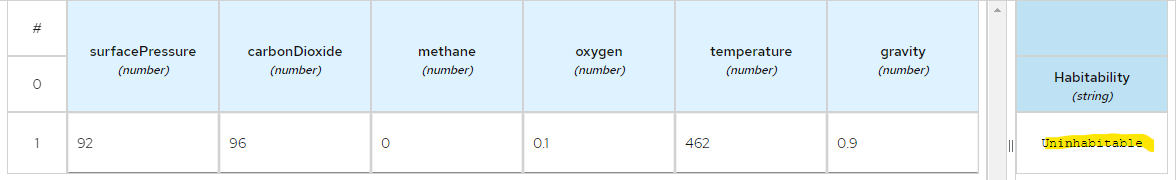


Figure 7: Test Result - Uninhabitable

### What is Wrong with this Design?

There is a problem with this design. Further changes will quickly make the DMN unmaintainable. If additional properties were added the table will become too wide. If more rules were added, the table would become too tall. In other words, the decision table will become unmaintainable in both directions! This falls into the ‘Swiss Army Knife’ anti pattern. This antipattern is so named because the entire decision is made in one table. The next three labs will show how we can refine the design to help scale the decision service to handle thousands of decision rows and dozens of attributes.

## Lab 1 –Structured Data Pattern

It is good practice to structure input and output to reduce the number of inputs in the DMN diagram. In our example, planetary data can be classified into *atmospheric* and *surface* data:

**Atmosphere**

* Carbon Dioxide
* Methane
* Oxygen

**Surface**

* Pressure
* Gravity
* Temperature

This can be modelled in **Kie Sandbox** data types:

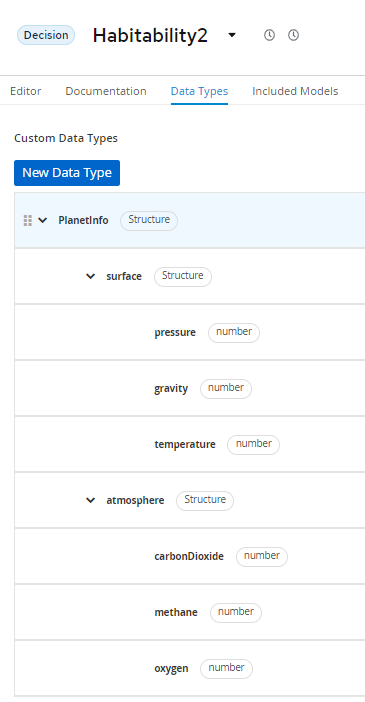


Figure 8: PlanetInfo Data Type

Now we can define just one DMN input called *planet* of type *PlanetInfo*:

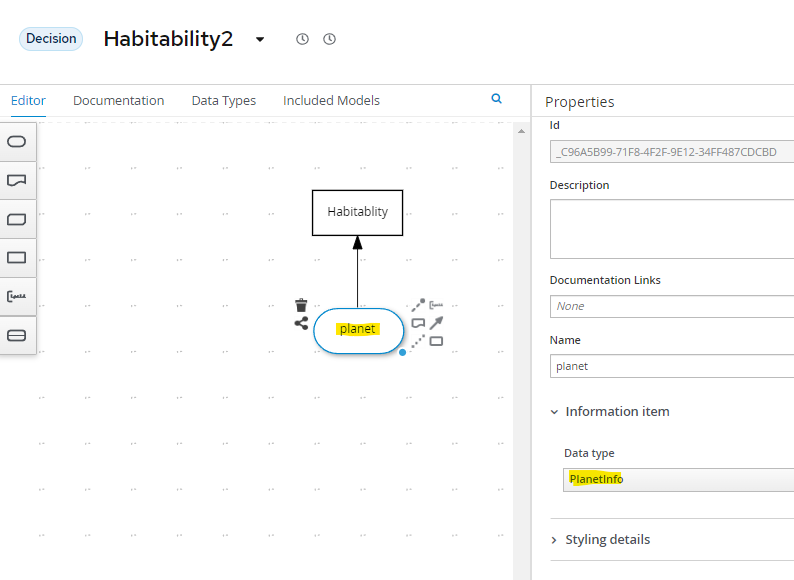


Figure 9: Planet DMN Input defined as a PlanetInfo Data Type

The decision table is the same as the previous lab, but it now references the new data structure:

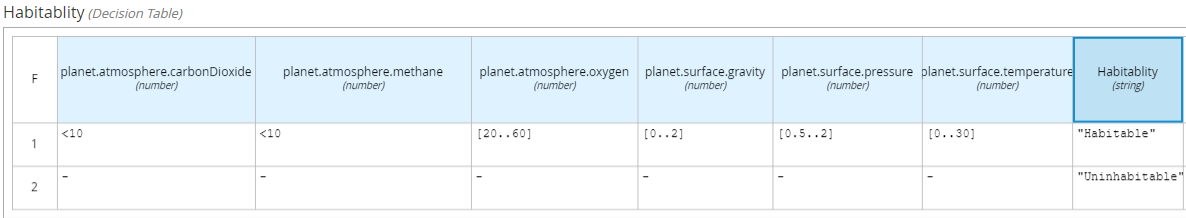


Figure 10: Decision referencing PlanetInfo data type

Although we have simplified the DMN model, the decision table will grow in width and length once more rules and attributes are added. This will be fixed in the next lab.

## Lab 2 – The Divide and Conquer Pattern

To reduce the size of a decision table with many attributes, you can divide and conquer it into smaller parts.

To do this, create a new decision table for each planet attribute. The purpose of these single attribute tables is to reduce the many values of each attribute into a restricted range of enumerated string types. These enumerated types are then applied in aggregated decisions further up in the DMN model. In our example we are reducing all numeric ranges into three enumerated types: *Optimal, Bearable and Deadly.*



Figure 11: Pressure Table

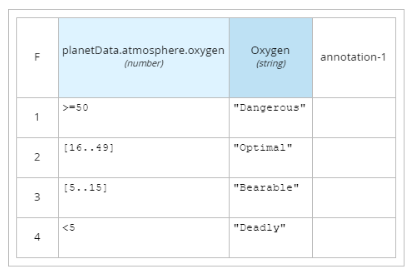


Figure 12: Oxygen Table

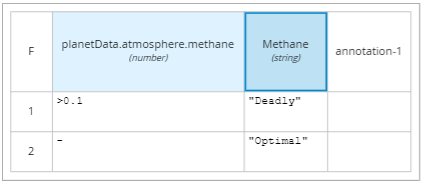


Figure 13: Methane Table

We now combine the decision results of these three tables to define the *atmosphere* decision:

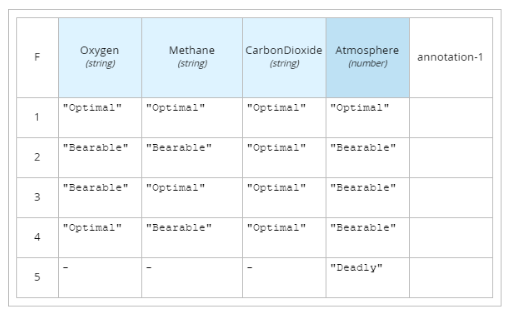


Figure 14: Atmosphere Table

We can apply the same summary pattern to *Pressure, Temperature* and *Gravity* to create the *Surface* Decision:

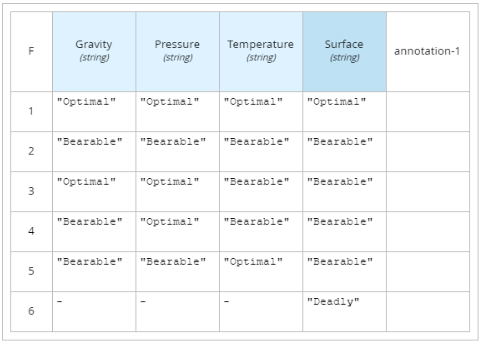


Figure 15: Surface Table

We now join both *Atmosphere* and *Surface* tables to *habitability* which produces the overall decision:

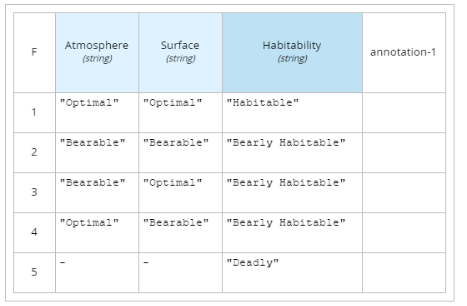


Figure 16: Habitability

All the tables are linked in the DMN diagram as follows:



Figure 17: Divide and Conquer Pattern for Habitability

The **habitability** table has the same behavior as the original DMN design, except now it is easier to maintain. Each planet attribute has its own table making it easier to add attributes and change behavior as there is no dependency on a single table. The last problem we must address is that all this logic is still inside a single DMN file which means the decision tables cannot be edited by separate people and reused in other decisions.

## Lab 3 – The Tiered Service Pattern

Although the DMN defined in the previous section is more maintainable, there is still a design problem. All decision tables are defined within a single DMN file. If additional decision tables and branches were added it would quickly become difficult to maintain. A single DMN file also prevents multiple users from making changes at the same time. To improve on this, we move the second-tier decisions into their own decision service file and then invoke these decisions from the top tier decision service. See figure below, where the second-tier decision services are *AtmosphereDS* and *SurfaceDS* respectively, and the first-tier decision is *Habitability*:

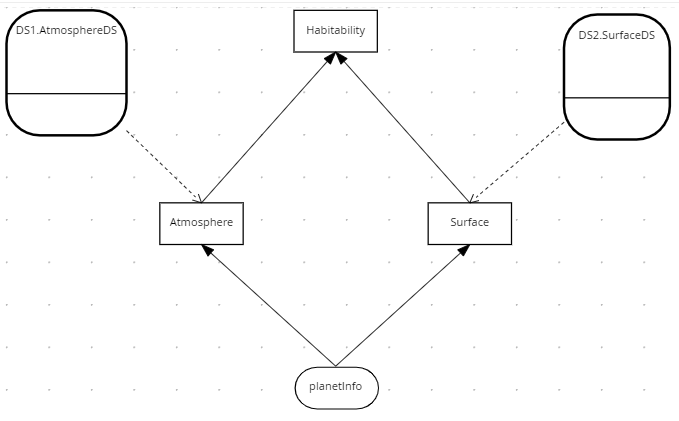


Figure 18: Tiered Service Pattern

The two second tier decision services are *AtmosphereDS* and *SurfaceDS*:

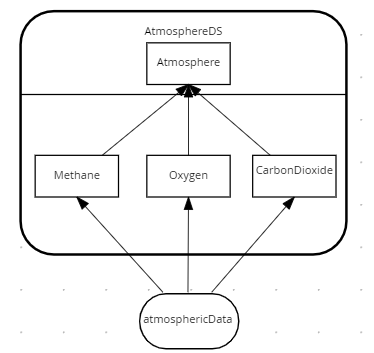


Figure 19: Atmosphere Decision Service

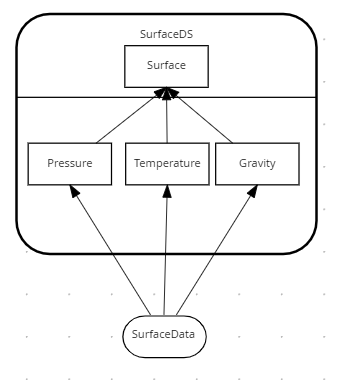


Figure 20: Surface Decision Service

In the Habitability example we have only two tiers – but in practice the pattern could be applied to multiple tiers, with second tier decision services calling third tier services, and so on. It really depends on your project complexity.

## Conclusion

In this lab we presented three design patterns to aid maintainability of large DMN projects. These were:

* The **Structured Data Pattern** to reduce the amount of DMN Input Data
* The **Divide and Conquer Pattern** to divide a single table into smaller tables
* The **Tiered Service Pattern** to divide a single DMN file into several smaller DMN Files.

Consider applying these patterns in your projects and reap the benefits of more maintainable decision logic!