SAPIENS DECISION

Partnering for Success

SAPIENS

UServ Product Derby Case Study

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1 Introduction

1.1 The Challenge in Business System Development

IT appears to have resolved many of the major challenges facing business system development today; with tools currently at their disposal they can rapidly build even the most complex and scalable of systems. Advanced technologies, including business rule systems, have been great at helping IT implement business systems faster, saving time and money.

The problem that it has not solved – that it has in fact exposed – is how does the business discover, validate and manage the business policies, regulations, and operational decisions that exist in and across their business systems; these are what we collectively call the BUSINESS LOGIC that underlies our business systems.

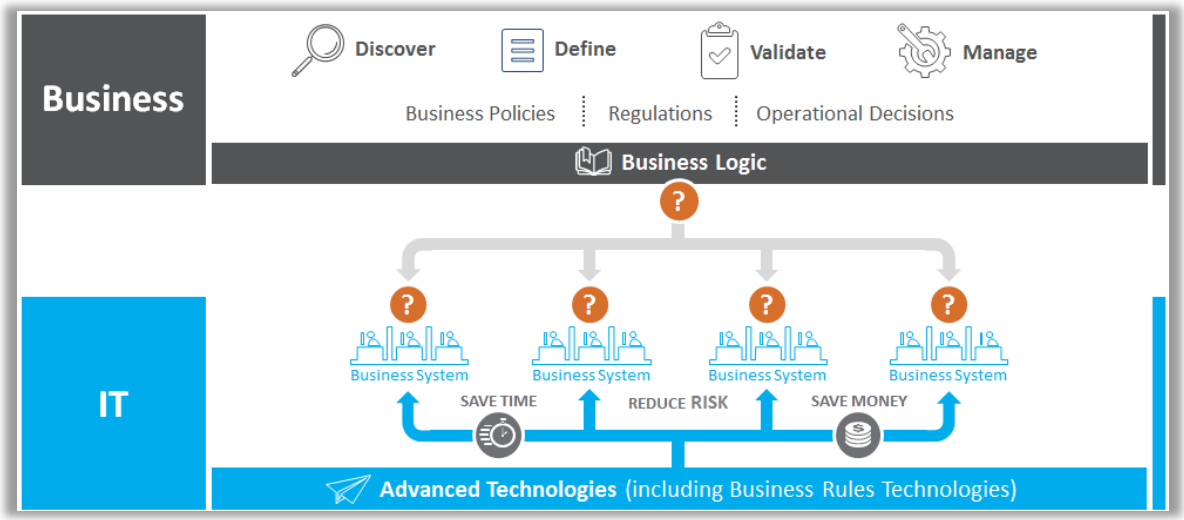


Figure 1. The Challenge in Business System Development

Discovering the business logic, recording it, and expressing it to IT, so that they can effectively implement it into systems; remains a puzzle to this day. Further, it is still the greatest challenge to us in building, implementing and managing, over time, our business systems.

1.2 The Opportunity and Approach

Creating a shared language, one that can allow us to easily and accurately express the business logic in a way that the business can author, but that is rigorous and accurate enough for IT to understand and implement; thus joining business and IT in a common understanding is the role of The Decision Model. Sapiens DECISION implements the

model in a repository so robust that it enables the enterprise to discover, author, manage, and deploy its logic with minimal support from IT.

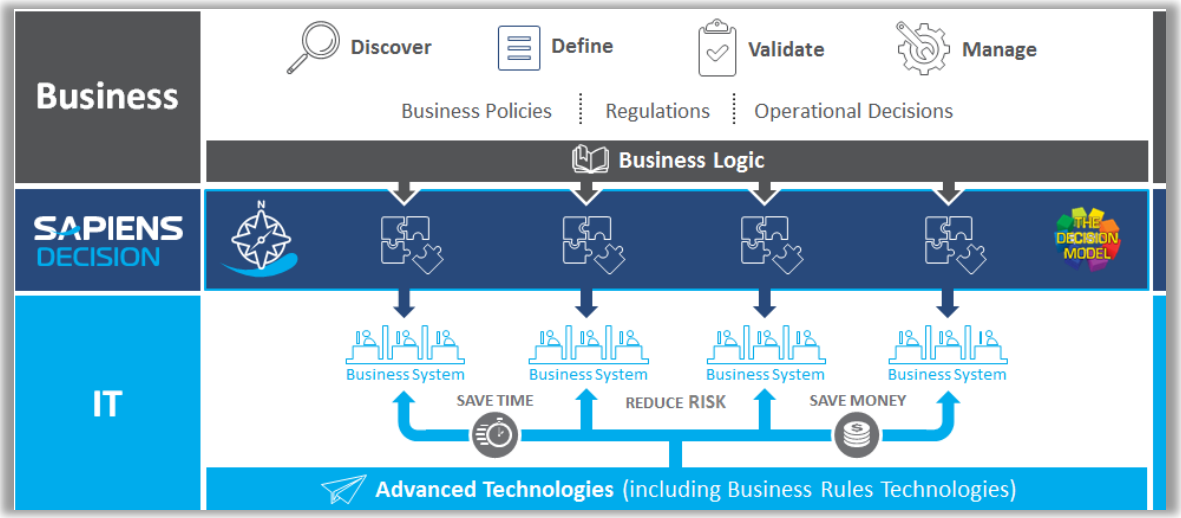


Figure 2. The Value of The Decision Model

We will illustrate this shared understanding, implementing The Decision Model (TDM) methodology with Sapiens DECISION by applying this to the UServ Product Derby Case Study.

2 The Problem Description

2.1 Background: UServ Financial Services

UServ Financial Services provides a full service portfolio of financial products (e.g., Auto Insurance). UServ rewards clients' loyalty as they increase their portfolio. UServ relies on its business rules to manage risk while providing on-going services to customers whose portfolios are profitable, yet violate the eligibility rules of individual products.

This case study details UServ's business rules and scenarios for its Vehicle Insurance Products. The rules address eligibility, pricing and cancellation policies at both the individual product and client portfolio level, differentiating the basic business rules from those that apply to Preferred and Elite clients.

2.2 The Process Model: Vehicle Insurance Application Process

The base business rules are dependent on both the type of vehicle being insured and the characteristics of the persons covered by the policy. The process is instantiated when any one of three triggers occurs: 1) an application sent from a client is received by UServ, 2) an End of Policy (Renewal) event occurs, and 3) after a manual review has been performed by UServ's underwriting team.

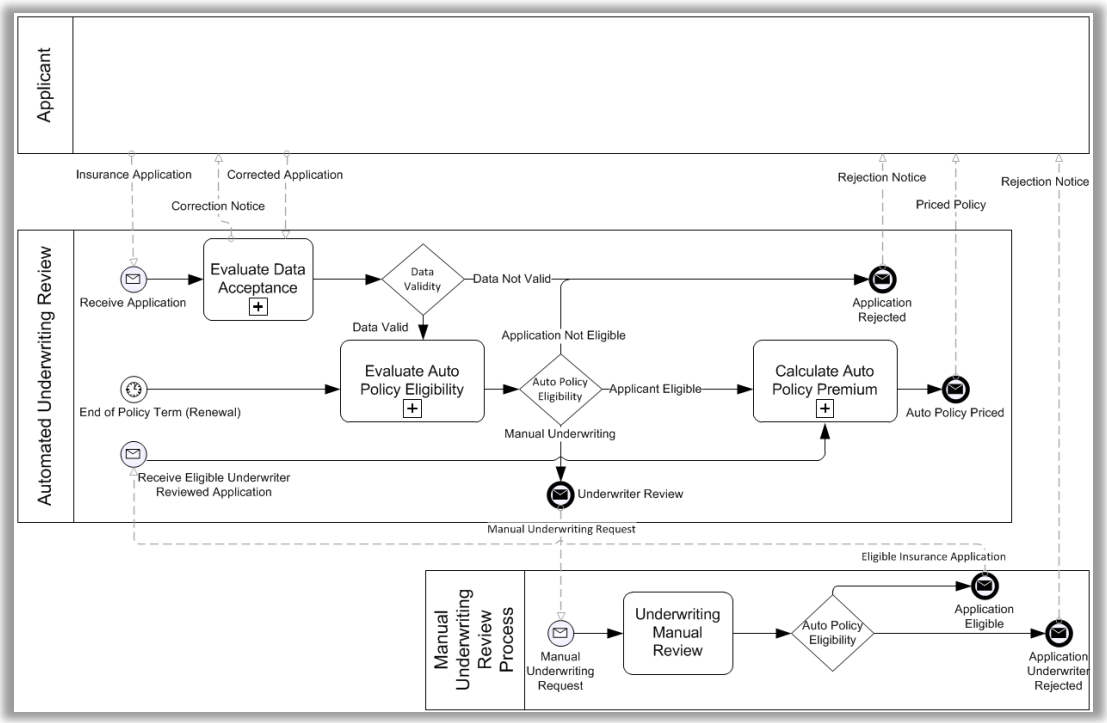
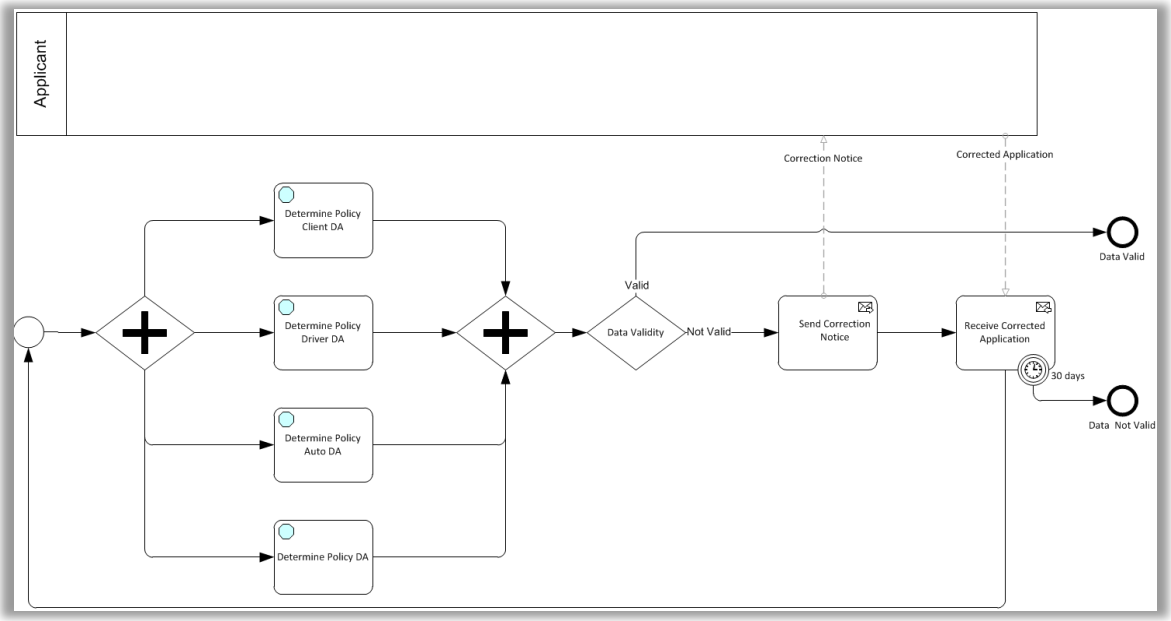


Figure 3. Vehicle Insurance Application Process

2.3 Sub-process 1: Evaluate Data Acceptance

The information in the application is validated based upon UServ's standards prior to processing. Data Acceptance (DA) is assumed to be out of scope for this project, but a sub-process was added for hypothetical purposes.



2.4 Sub-process 2: Evaluate Auto Policy Eligibility

A client's eligibility for auto insurance is determined by a scoring system based on the risk rating for various categories. The lower the client's eligibility score, the better the eligibility rating. The second sub-process, Evaluate Auto Policy Eligibility, includes decisions that receive data inputs from the client application that result in an outcome that determines if the client's application is eligible, not eligible, or requires manual review.

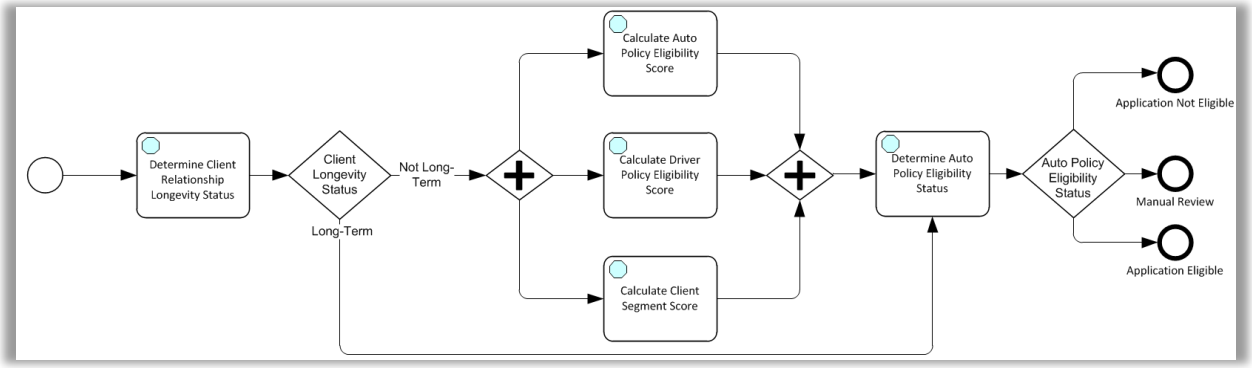


Figure 4. Evaluate Auto Policy Eligibility

2.5 Sub-process 3: Calculate Auto Policy Premium

If the client is eligible for auto insurance, then the annual premium must be calculated. The third sub-process, Calculate Auto Policy Premium, includes decisions that leverage the outputs from the Evaluate Auto Policy Eligibility sub-process to calculate the auto policy premium for each individual or applicant covered by the policy.

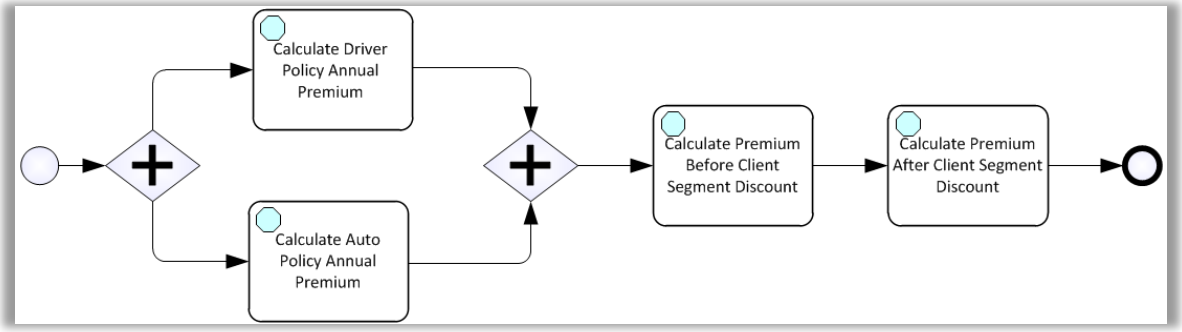


Figure 5. Calculate Auto Policy Premium

In total, the process covers nine Decision Tasks detailed in Table 1.

Decision Task Name	Decision Task Description
Calculate Auto Policy Annual Premium	Calculates the annual premium for each car on the auto policy after the client is found to be eligible for auto insurance. Also accounts for any eligible auto discounts by adding all applicable percentages and discounting the amount from the total Auto Policy Premium.
Calculate Auto Policy Eligibility Score	Calculates the eligibility score for each automobile covered by the policy based upon the vehicle's Potential Theft Category and Potential Occupant Injury Category. Note: the High Theft Probability Auto List is maintained by UServ's Risk Management and provided as input to the eligibility rating process.
Calculate Client Segment Score	Scores a client based upon their status of preferred, elite, or both. A Preferred Client's portfolio includes at least three products from different product families in the UServ financial services offerings. An Elite Client falls within UServ's top 1% of clients based on revenue (there are approximately 25,000 Elite Clients). Note: Elite Client information is provided by UServ to the application.
Calculate Driver Policy Annual Premium	Calculates the annual premium for each driver on the policy after the client is found to be eligible for auto insurance. It considers the driver's location, marital status, Driving Record Category, and Driver Age Category in factoring the appropriate premium amount.
Calculate Driver Policy Eligibility Score	Calculates the eligibility score for each driver covered by the application or policy based upon the Driver Age Category and Driving Record Category. The Driver Age Category can be impacted by whether a driver has taken a certified training course.
Calculate Premium After Client Segment Discount	Applies market segment discounts after all the individual car and driver premiums with auto discounts have been calculated.
Calculate Premium Before Client Segment Discount	Calculates the policy's annual premium which is the sum of the Driver Policy Premium, the Auto Policy Premium, and any eligible Auto Discounts applied to the policy.
Determine Auto Policy Eligibility Status	Determines a client's eligibility for auto insurance using a scoring system based on the risk rating for various categories. The lower the score, the better the eligibility rating.
Determine Client Relationship Longevity Status	Determines whether a client has a long term relationship with UServ. Clients who are determined to be in a long-term relationship (have maintained a portfolio for at least 15 years) with UServ, are always eligible for auto insurance, as is every person and car directly covered by a long term client's auto policy.

Table 1. Decision Task List and Descriptions

3 The Solution: Sapiens DECISION

The Decision Model is a template for perceiving, organizing, and managing the business logic behind a business decision (von Halle & Goldberg, 2010). From the process model we can look at the details of the BPMN decision task Determine Auto Policy Eligibility Status.

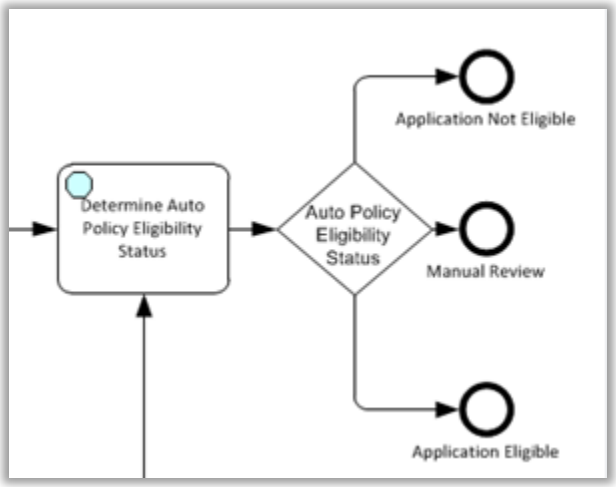


Figure 6. Determine Auto Policy Eligibility Status

This step relates to one Decision View (DV) that encompasses the business logic for the task.

3.1 The Decision Model

The business statement or business rules can be translated into a structural element of a Decision Model (DM). The Decision Model and its principles are fully represented by its Rule Family View table(s) and the Decision Model diagram. Note that the Decision Model diagram only illustrates the Decision Model's structure and not the full content.

The Decision Model diagram begins with an octagonal shape that represents the entire business decision. This octagonal shape relates to tasks within the business process model and to steps within use cases, at the exact place in the model where the business decision is in play.

Further, the business decision shape connects to business requirements, tactics, and objectives (in this project we linked only to business requirements); while the other shapes in the diagram represent Rule Family Views.

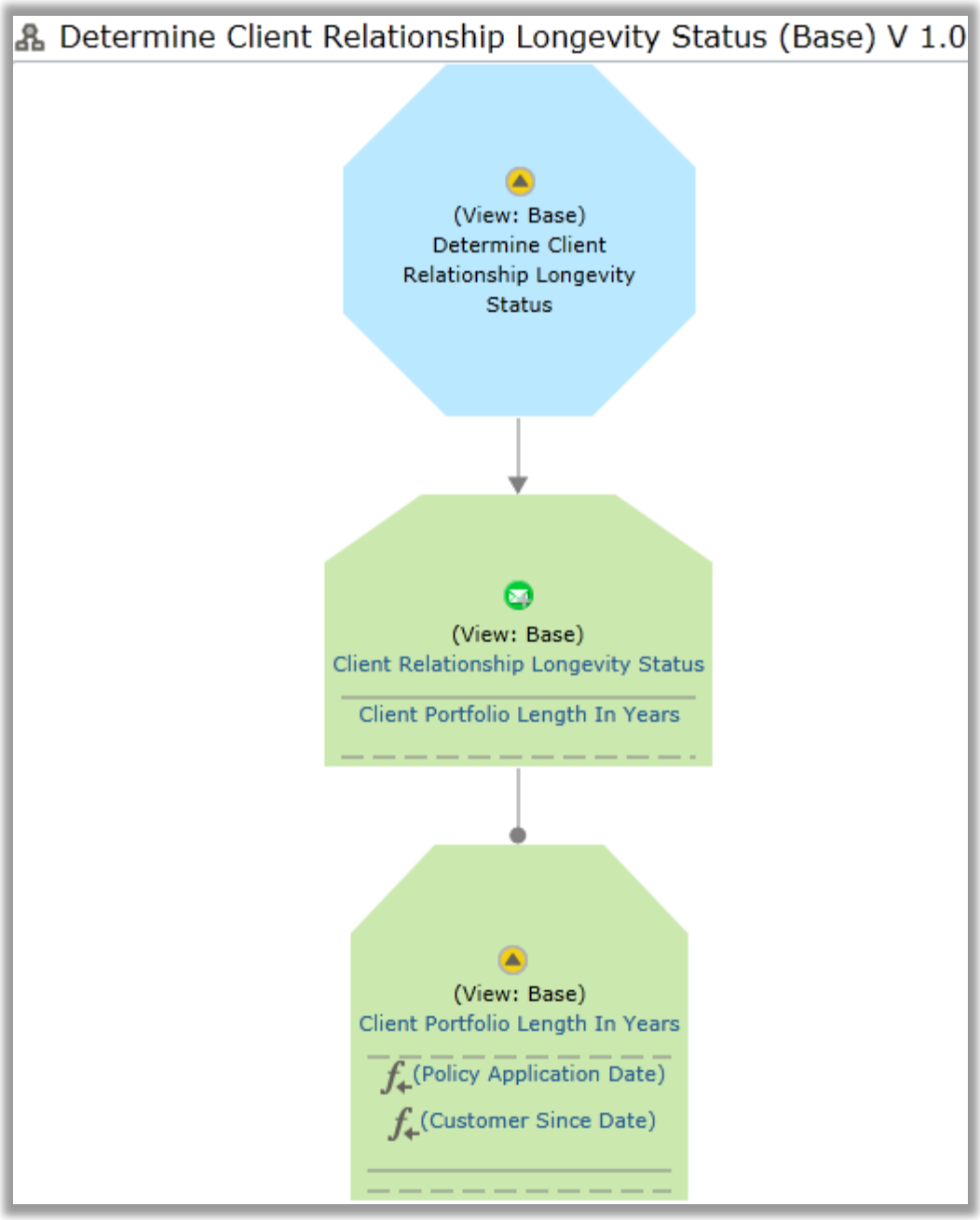


Figure 7. Determine Client Relationship Longevity Status Decision Model

3.2 Rule Family View

The essential structural element of a Decision Model is a two-dimensional table, called a Rule Family View (RFV), relating the conditions to one – and only one – corresponding conclusion.

Pattern	Client Relationship Longevity Status	Policy Eligibility Score	Auto Policy Eligibility Status	Informational
1	**Is** ‖ v Long Term		**Is** ‖ v Eligible	"The client is Eligible for the policy because they are a Long Term Client."
2	**Is** ‖ v Not Long Term	**Is Less Than** ‖ v 100	**Is** ‖ v Eligible	"The Auto Policy Eligibility Status is "+%Auto Policy Eligibility Status%+" because the Policy Eligibility Score is "+%Policy Eligibility Score%
2	**Is** ‖ v Not Long Term	**Is Between** ‖ v {100,250}	**Is** ‖ v Manual Review	"The Auto Policy Eligibility Status is "+%Auto Policy Eligibility Status%+" because the Policy Eligibility Score is "+%Policy Eligibility Score%
2	**Is** ‖ v Not Long Term	**Is Greater Than** ‖ v 250	**Is** ‖ v Not Eligible	"The Auto Policy Eligibility Status is "+%Auto Policy Eligibility Status%+" because the Policy Eligibility Score is "+%Policy Eligibility Score%

Figure 8. Determine Auto Policy Eligibility Status Rule Family View

The above Rule Family View has two condition columns that are tested to arrive at the conclusion column. There is also a column for an Informational Message to provide insights on the conclusion(s) derived from the tests of the Rule Family View.

The condition column headings contain the names of the facts being tested (Client Relationship Longevity Status and Policy Eligibility Score). The conclusion column (shaded in light blue) heading contains the name of the conclusion being reached (Auto Policy Eligibility Status).

The rows in the Rule Family View table are the set of business logic belonging to the Rule Family View. The populated conditions in each row of the Rule Family View are ANDed together to reach the conclusion (no ORs are permitted among populated conditions). Each Rule Family View adheres to a full set of principles (e.g., a Rule Family View can have only one conclusion column). In addition, each Rule Family View can be related to other Rule Family Views and these relationships are carefully managed.

Rule Family Views can be – and this is highly encouraged – reused in multiple Decision Views. In the following example, the Auto Potential Occupant Injury Rating and Auto Potential Theft Rating Rule Family Views are being reused in the two Decision Views shown.

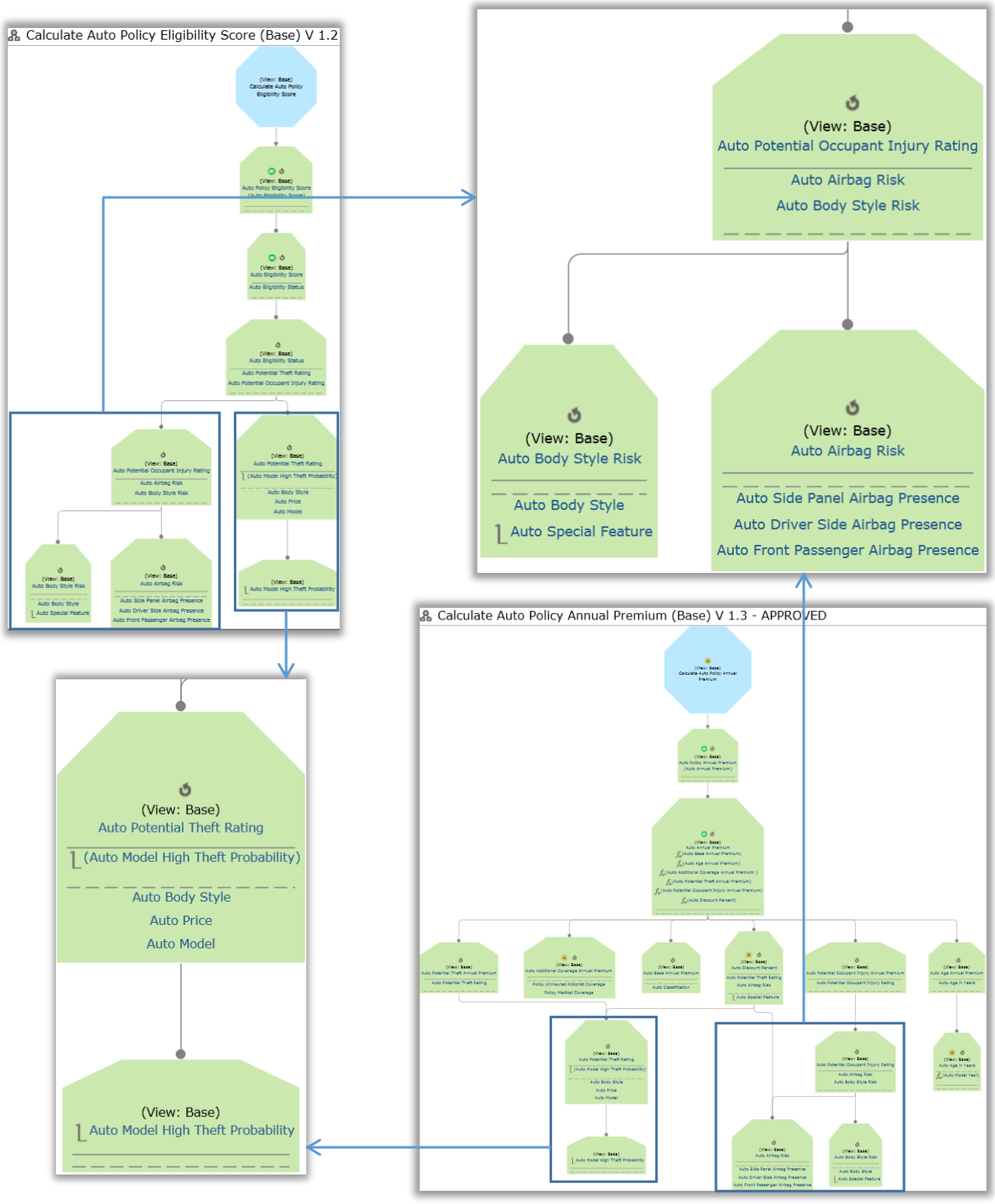


Figure 9. Re-use of Rule Family Views from Calculate Auto Policy Eligibility Score in Decision View Determine Auto Policy Eligibility Status

3.3 Glossary

Sapiens DECISION provides enterprise capability with both centralized and federated glossary management. The glossary maintains all of the approved Fact Type (FT) names and descriptions so that there is no redundancy in the system, and enables reusability of common Fact Types.

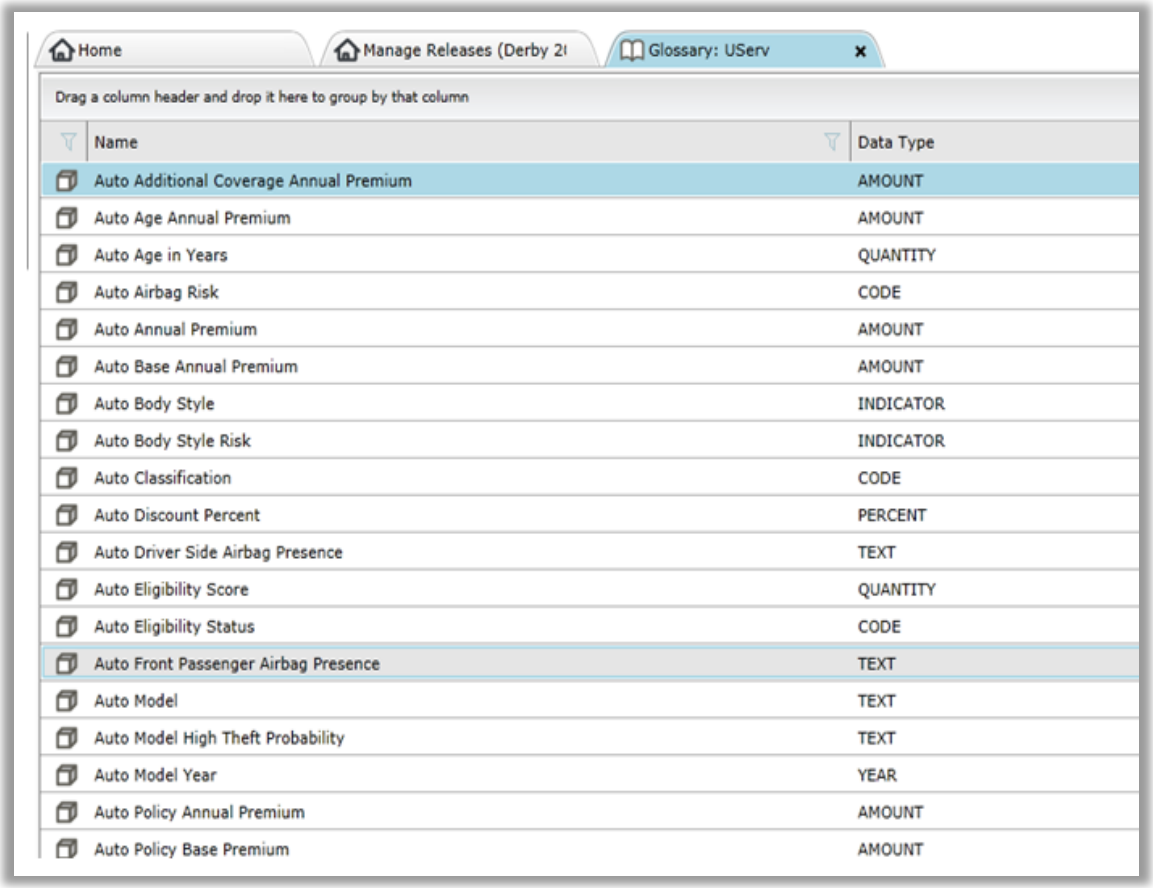


Figure 10. Example Glossary of Fact Types

3.4 Meta Level Data

The Additional Info Tab in Sapiens DECISION provides additional insights into the Decision View and Rule Family View concerning other objects (e.g., Decision Views, Rule Family Views, Fact Types) the current object is associated with. Further, the Additional Info Tab provides information concerning sizing, related items, impact analysis, statistics, audit trail, notes, and links.

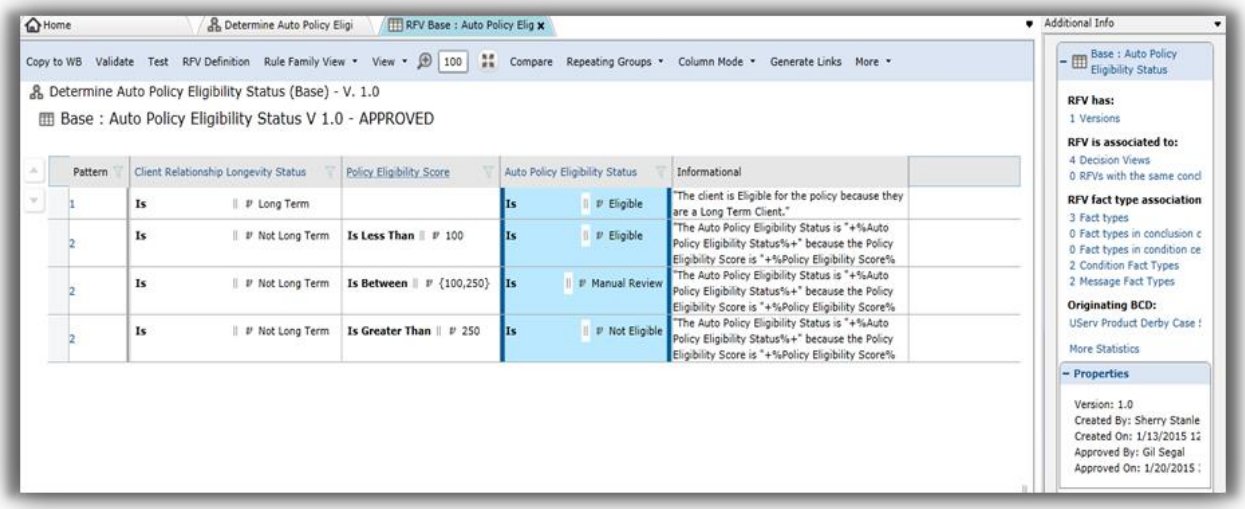


Figure 11. Auto Policy Eligibility Status Additional Info Tab Rule Family View

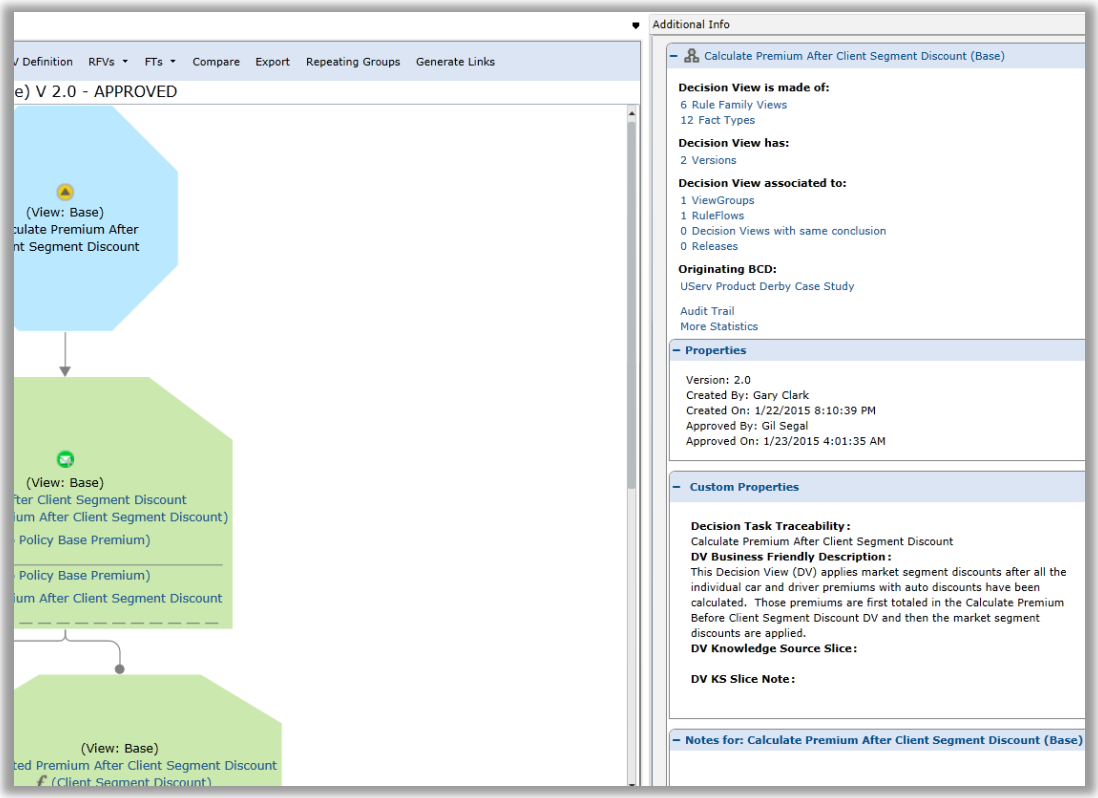


Figure 12. Calculate Premium After Client Segment Discount Additional Info Tab Decision View

3.5 Decision Flow

Finally, to execute the end-to-end process within the Sapiens DECISION tool, a feature called Decision Flows (DF) allows the modelers to input the data and execute a sequence of Decision Views to generate the results, without any manual steps. An example of a Decision Flow will be detailed in the scenario exercises below.

3.6 Knowledge Source Traceability

To determine that the requirements in their totality have been modeled and to be able to show which requirements mandate a particular model, traceability has to be maintained. The actual linking is accomplished via hyperlinks both from the tool to external sources and from external sources into particular models at a granular level.

The table below shows traceability between the Decision Tasks in the BPMN process model and the Decision Models, between the Decision Models and the Rule Family Views, and between the Rule Family Views and the business requirements (DMN Knowledge Source).

Decision View	V	Decision Task Traceability	Rule Family View	V	RFV Knowledge Source Slice
Calculate Client Segment Score (Base)	1.1	Calculate Client Segment Score	Base : Client Segment Score	1	2.2.3.1.3 Client Segment Scoring
Calculate Client Segment Score (Base)	1.1	Calculate Client Segment Score	Base : Preferred Client Indicator	1	2.1 Client Segmentation Business Rules
Calculate Client Segment Score (Base)	2	Calculate Client Segment Score	Base : Client Segment Score	1	2.2.3.1.3 Client Segment Scoring
Calculate Client Segment Score (Base)	2	Calculate Client Segment Score	Base : Preferred Client Indicator	2	3.1 Grandfathered Rule Sets

Table 2. Traceability across versions, Grandfathered Scenario

As can be seen, traceability is also maintained across versions. The table shows the transitions of the Grandfathered Scenario. Specifically, the Preferred Client Indicator Rule Family View Version 2 is associated with Version 2 of the Calculate Client Segment Score Decision. Similar traceability is maintained for Preferred Client Indicator with the Decision Calculate Premium After Client Segment Discount.

Below is another example showing a section of the requirements that corresponds to a particular Rule Family View version, Decision Model and BPMN Decision Task (in this case, a one-to-one relationship but many-to-many relationships are also supported).

Decision View	V	Decision Task Traceability	Rule Family View	V	RFV Knowledge Source Slice
Calculate Auto Policy Eligibility Score (Base)	1.1	Calculate Auto Policy Eligibility Score	Base : Auto Potential Theft Rating	1.0	2.2.1.1 Potential Theft Category

2.2.1.1 Potential Theft Category

If the car is a convertible, then the car's potential theft rating is high.
If the car's price is greater than $45,000, then the car's potential theft rating is high.
If the car model is on the list of "High Theft Probability Auto", then the car's potential theft rating is high.
If all of the following are true, then the car's potential theft rating is moderate. o car's price is between $20,000 and $45,000, o car model is not on the list of "High Theft Probability Auto"
If all of the following are true, then the car's potential theft rating is low: o car's price is less that $20,000 o car model is not on the list of "High Theft Probability Auto"

Table 3. Traceability from Requirements to a Rule Family View Version, Decision Model and BPMN Decision Task

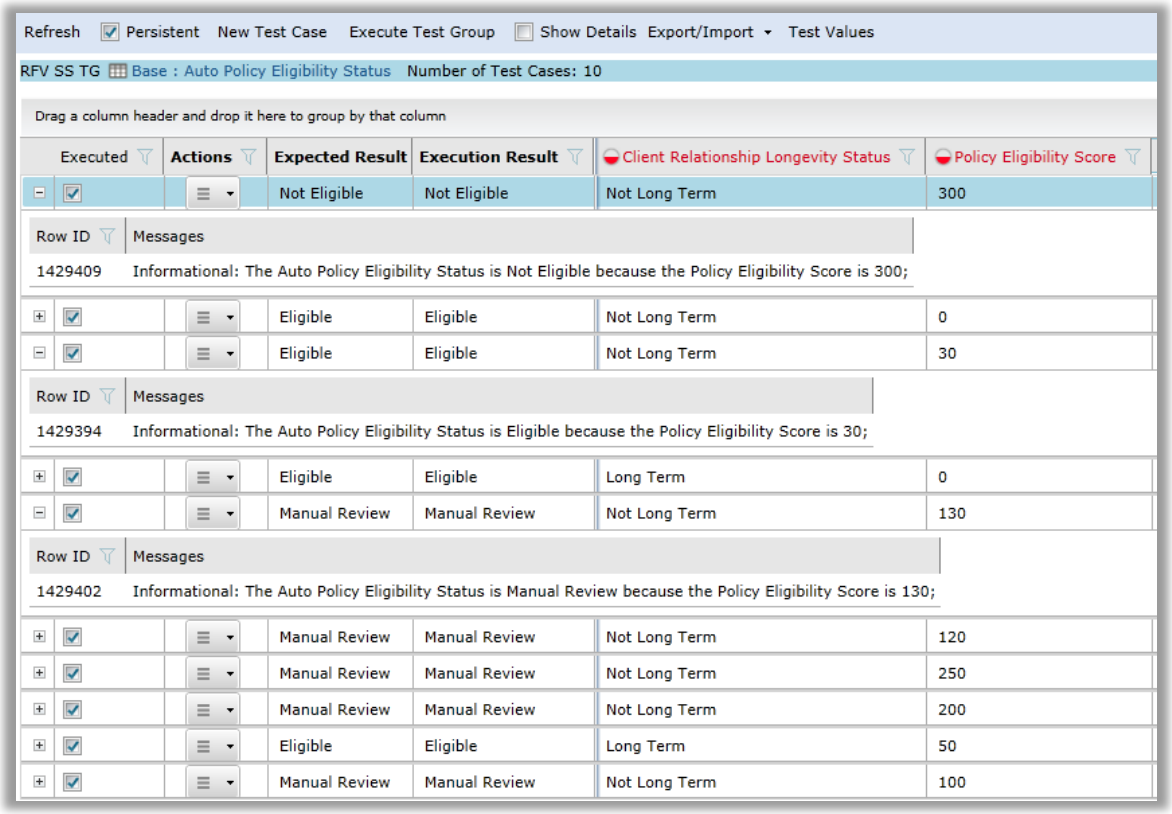
A workflow to incorporate requirement changes can further utilize Sapiens DECISION's capability to analyze the text of a Knowledge Source using the Text Analyzer in order to identify specific terms in the glossary that are present in the Knowledge Source.

3.7 Governance

Sapiens DECISION has extensive enterprise-scale governance capabilities. A discussion of these features is outside the scope of this document. Please contact Sapiens for additional details.

3.8 Testing Rule Family Views

The rigor of The Decision Model allows for exhaustive testing and validation of the business logic in the Decision Model to the granularity of each row within each Rule Family View.



Refresh | Persistent | New Test Case | Execute Test Group | Show Details | Export/Import | Test Values

RFV SS TG | Base : Auto Policy Eligibility Status | Number of Test Cases: 10

Drag a column header and drop it here to group by that column

Executed	Actions	Expected Result	Execution Result	Client Relationship Longevity Status	Policy Eligibility Score
☑		Not Eligible	Not Eligible	Not Long Term	300
Row ID	Messages				
1429409	Informational: The Auto Policy Eligibility Status is Not Eligible because the Policy Eligibility Score is 300;				
☑		Eligible	Eligible	Not Long Term	0
☑		Eligible	Eligible	Not Long Term	30
Row ID	Messages				
1429394	Informational: The Auto Policy Eligibility Status is Eligible because the Policy Eligibility Score is 30;				
☑		Eligible	Eligible	Long Term	0
☑		Manual Review	Manual Review	Not Long Term	130
Row ID	Messages				
1429402	Informational: The Auto Policy Eligibility Status is Manual Review because the Policy Eligibility Score is 130;				
☑		Manual Review	Manual Review	Not Long Term	120
☑		Manual Review	Manual Review	Not Long Term	250
☑		Manual Review	Manual Review	Not Long Term	200
☑		Eligible	Eligible	Long Term	50
☑		Manual Review	Manual Review	Not Long Term	100

Figure 13. Executed Test Results for Determine Auto Policy Eligibility Status Rule Family

Within Sapiens DECISION, test cases can be generated or created at the Rule Family View level or at the Decision View level to test and validate the business logic content in the Rule Family View and in the Decision View. Since Decision Models are designed for reuse, associated test cases are also available for reuse when the corresponding Decision Model is reused in other systems, Decision Models, or updated.

3.9 UServ Project Methodology

The project team employed the QuickSTEP™ methodology which integrates Agile methods of business process modeling, decision modeling and business rule mining into a comprehensive business requirements management approach.

4 Scenario 1: The Grandfathered Rule Sets, Versioning, and Model Re-Use

The purpose of this scenario, besides exercising the auto insurance eligibility and pricing business rules, is to establish business rules for determining preferred clients, apply them, and then change the business rules to be more stringent. The original set of rules continues to apply to clients who qualified as premium clients under those rules. The new rule set applies to new clients.

Below are the models that show the implementation of the Preferred Client business logic change. Each version of the business logic is implemented in different versions of the model. Business logic for each is implemented by a Rule Family View. Each version of the model can be invoked as necessary (Rule Family View Version 1.0 and Version 2.0).

4.1 Requirement Version 1: Sara & Spencer

Requirement Version 1 for determining a Preferred Client

> A Preferred Client has a portfolio that includes at least three products families. For example, a Preferred Client may have a portfolio that includes vehicle and life insurance policies and an Individual Retirement Account (IRA). A client is not a Preferred Client if their portfolio includes only three vehicle insurance policies or four IRAs.

The execution of the data inputs for the Grandfathered Rule Set Version 1 is below. In Version 1 Sara is deemed a Preferred Client because she obtains at least 3 product families from UServ.

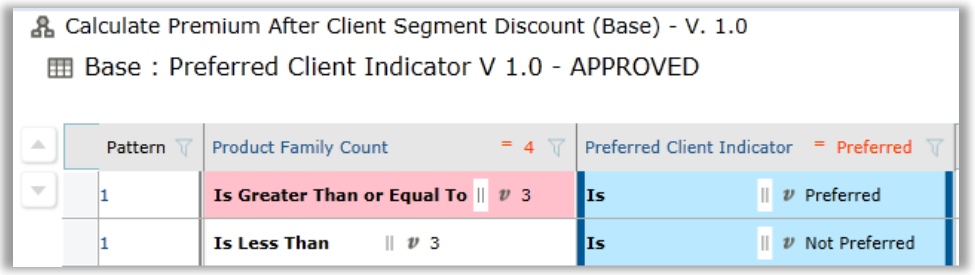


Figure 14. Preferred Client Indicator Version 1.0

As shown below, Sara's Premium After Client Segment Discount was calculated as $2,380.50.

Interim

Fact Type Name	Value
Auto Policy Annual Premium	$2,330.50
Auto Policy Base Premium	$750.00
Auto Policy Eligibility Score	0
Auto Policy Eligibility Status	Eligible
Client Portfolio Length In Years	0
Client Relationship Longevity Status	Not Long Term
Client Segment Discount	-$250.00
Client Segment Score	-50
Driver Policy Annual Premium	$300.00
Driver Policy Eligibility Score	0
Policy Eligibility Score	-50
Preferred Client Indicator	Preferred
Premium After Client Segment Discount	$2,380.50
Premium Before Client Segment Discou	$2,630.50
Unadjusted Premium After Client Segm	$2,380.50

Figure 15. Results of Sara's Premium After Client Segment Discount

4.2 Requirement Version 2: Mark Houston & Angie

Requirement Version 2 for determining a Preferred Client

> A Preferred Client has a portfolio that includes an average of three products families over the prior rolling 12 month period. The configuration of the portfolio families can change over the period, so long as the average is three product families. New clients must maintain this average for a year before they are eligible.

In Version 2 another client, Angie, has the exact same profile as Sara, but applies after the Preferred Client logic change. Note that both sets of logic are available and they are invoked based on transaction date provided as input.

Figure 16. Preferred Client Indicator Version 2.0

In the second version of the Preferred Client business logic, 2 Fact Types (Existing Preferred Client and Rolling 12 Month Average Product Count) were added to the Rule Family View. With these two Fact Types and the structure of the logic, UServ is able to distinguish between clients who are Preferred when they apply from those who are not.

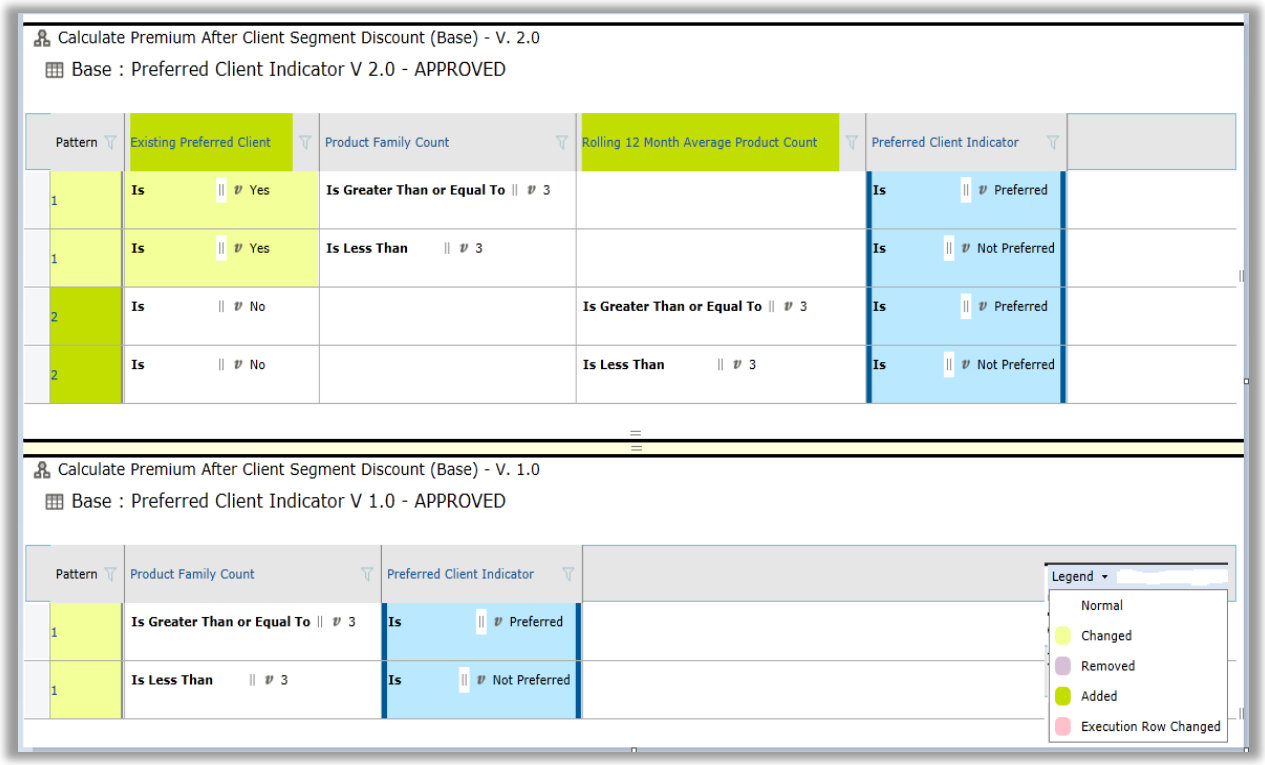


Figure 17. Rule Family View Comparison of Version 1.0 and Version 2.0 for Preferred Client

Rule Family Views exist in the context of Decision Views. In this case the determination of Preferred Client status is part of the calculation of the annual insurance premium.

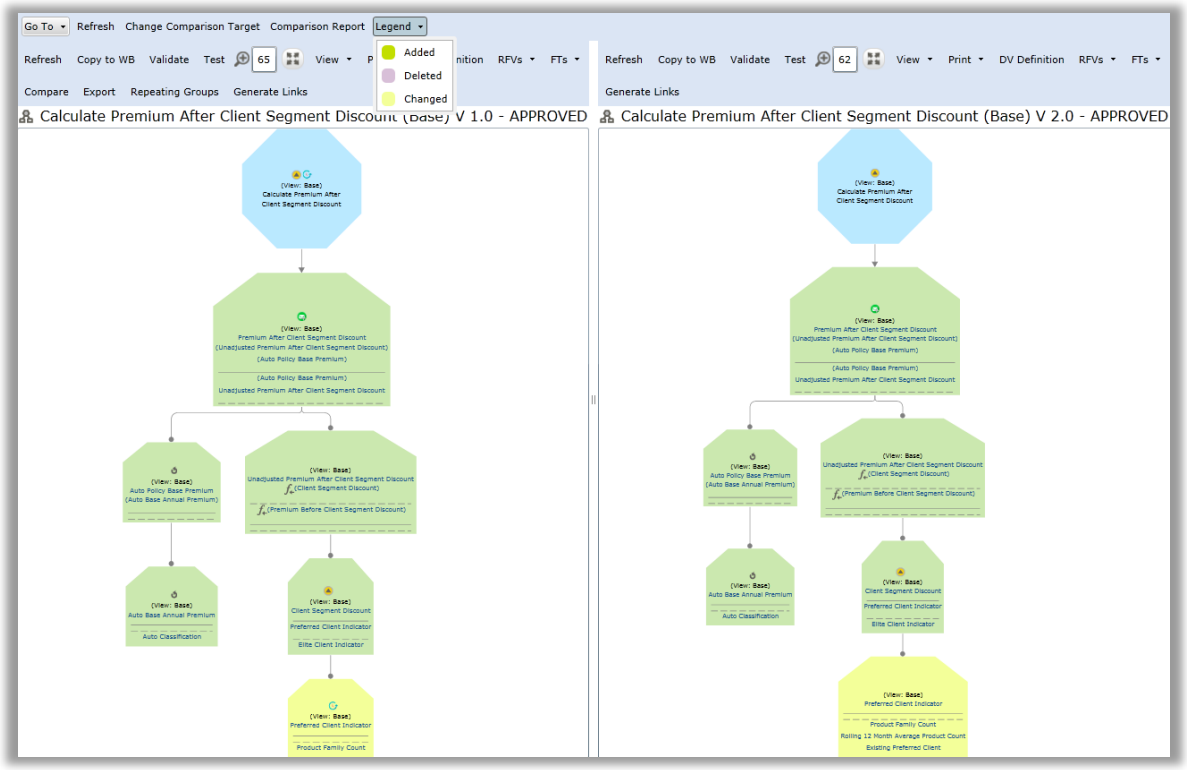


Figure 18. Calculate Premium After Client Segment Discount Decision View Comparison

Below are the execution results for the two versions of the Decision View, each utilizing a different version of the Rule Family View. The premium in Version 1 is $2380.50 and the premium in Version 2 is $2630.50.

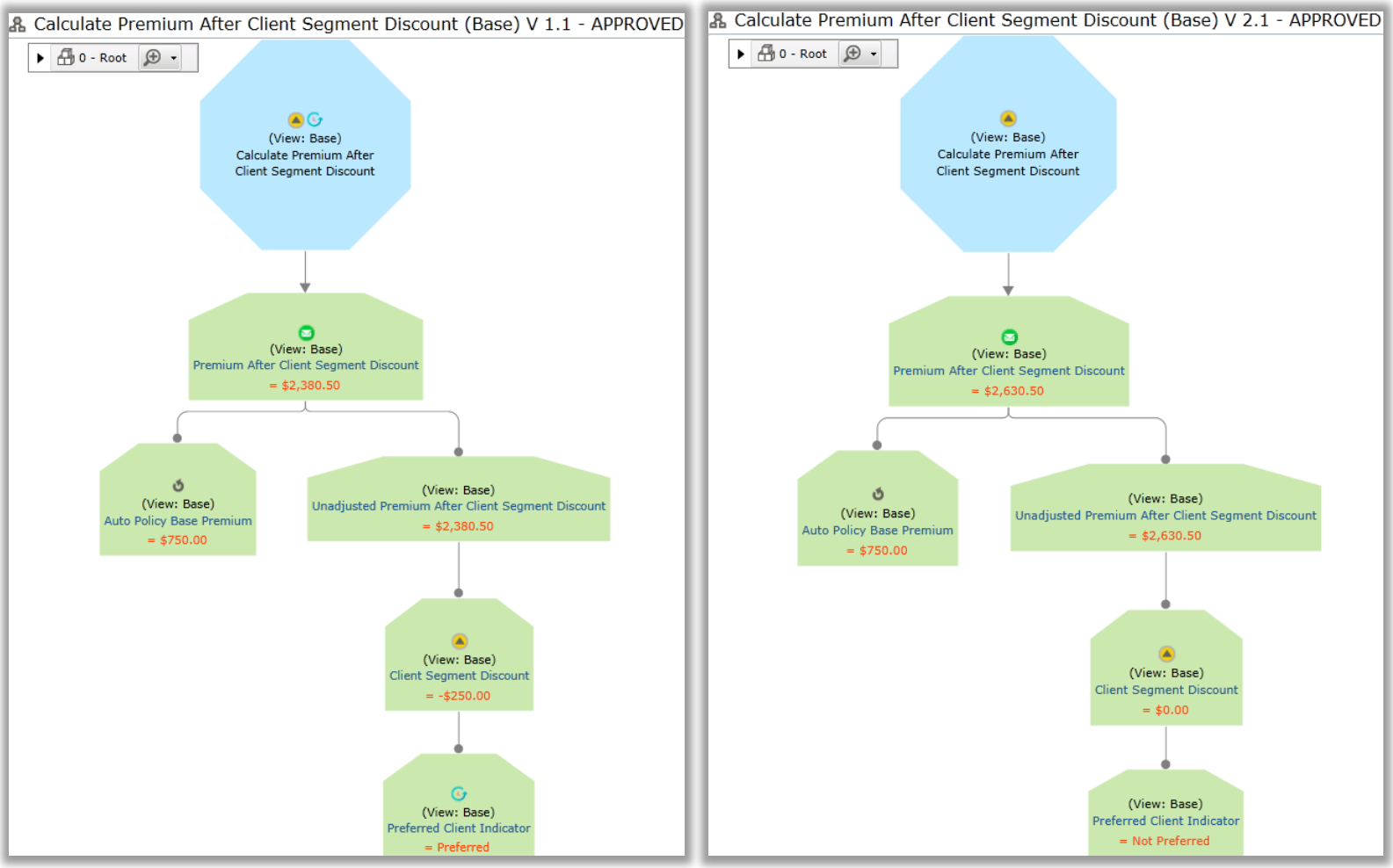


Figure 19. Decision View Comparison between Version 1 and Version 2

4.3 Re-rate of Sara & Spencer (Cars 1 Year Older)

The Honda Odyssey was initially rated at 10 years old with a calculated Auto Age Annual Premium of $250. The logic pertaining to the age of the automobile at 11 years old yields a calculated Auto Age Annual Premium of $0. The diagrams below illustrate the re-rate for Sara with her cars being a year older.

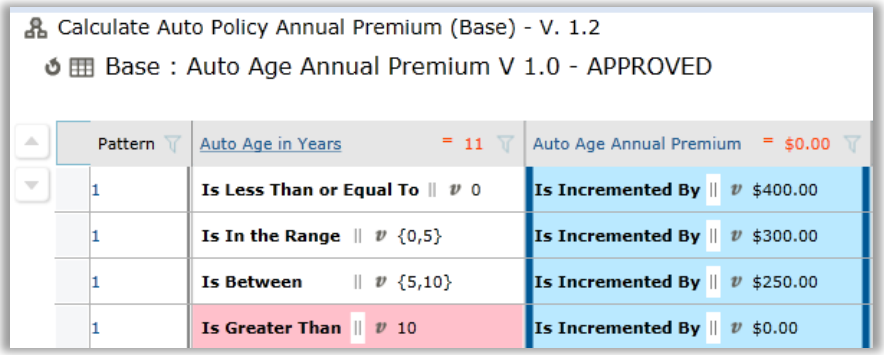


Figure 20. Rule Family View of Auto Age Annual Premium

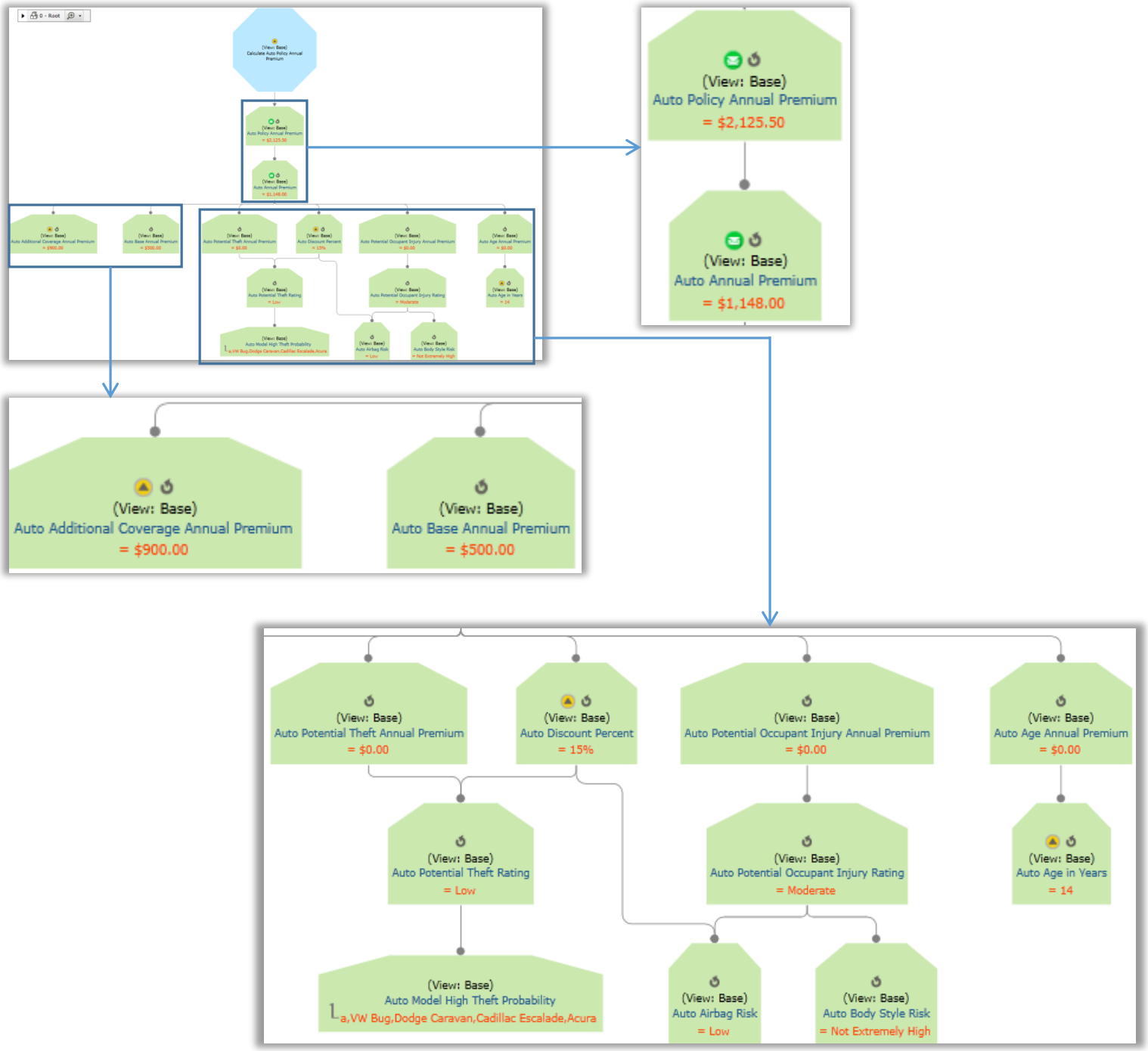
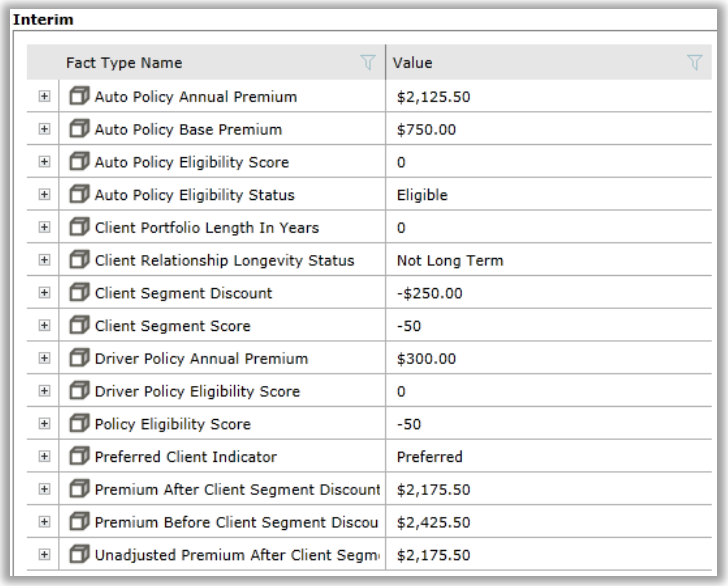


Figure 21. Calculate Auto Policy Annual Premium Decision View
The test results below show the updated premium after Sara was re-rated.



Interim

Fact Type Name	Value
Auto Policy Annual Premium	$2,125.50
Auto Policy Base Premium	$750.00
Auto Policy Eligibility Score	0
Auto Policy Eligibility Status	Eligible
Client Portfolio Length In Years	0
Client Relationship Longevity Status	Not Long Term
Client Segment Discount	-$250.00
Client Segment Score	-50
Driver Policy Annual Premium	$300.00
Driver Policy Eligibility Score	0
Policy Eligibility Score	-50
Preferred Client Indicator	Preferred
Premium After Client Segment Discount	$2,175.50
Premium Before Client Segment Discou	$2,425.50
Unadjusted Premium After Client Segm	$2,175.50

Figure 22. Results of the Re-rate for the Cars (Annual Premium Amount is $2,175.50)

5 Scenario 2: Eligibility Within and Outside an Elite Client Relationship Scenario

This scenario exercises the business rules related to cars and drivers that are not eligible on their own, but are eligible when they are part of the portfolio owned by an Elite Client. When that person tries to establish their own portfolio, they are scored based on their own merit.

5.1 Within Elite Client Scenario

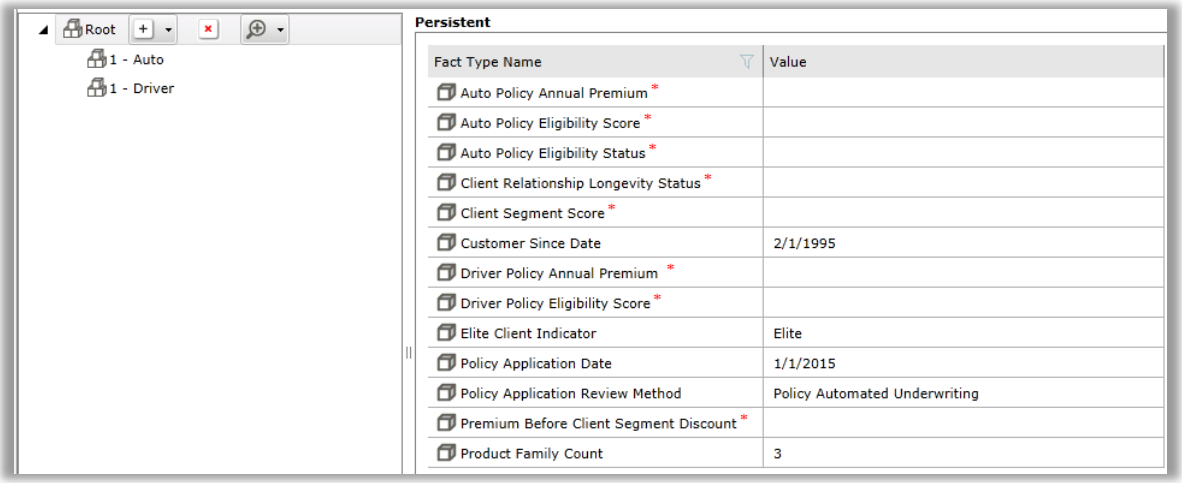


Figure 23. Application Form (Root) Level Data Inputs

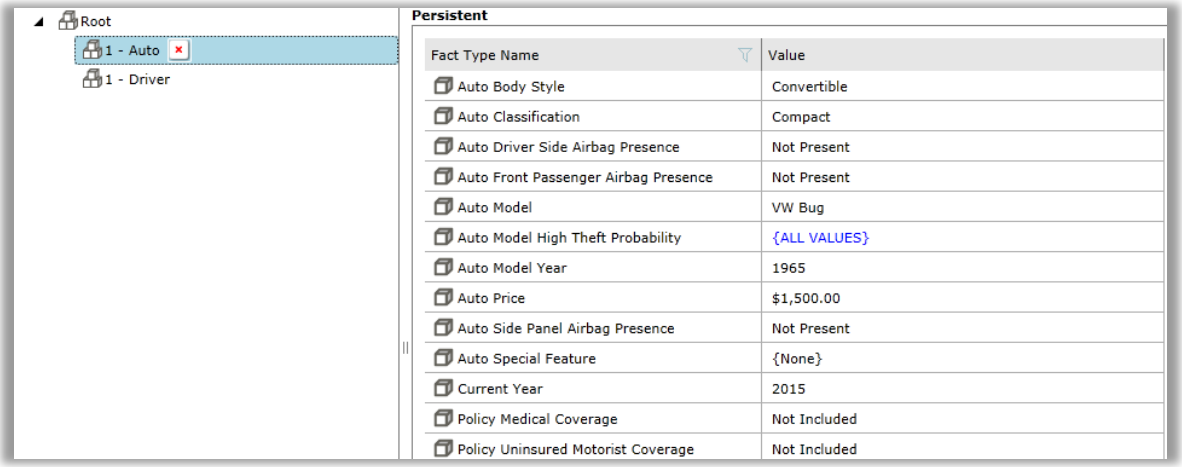


Figure 24. Auto Data Inputs

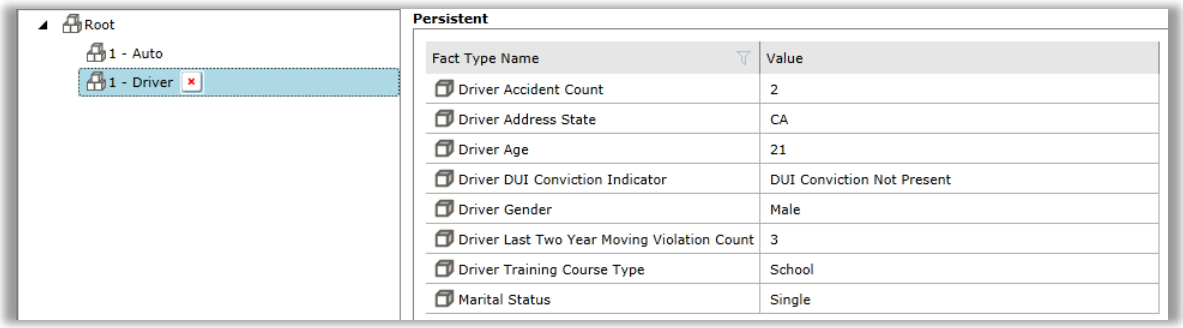


Figure 25. Driver Data Inputs

Interim data is generated from the inputs of the Root, Auto, and Driver Data to come to a conclusion.

Interim

Fact Type Name	Value
Auto Policy Annual Premium	$1,750.00
Auto Policy Base Premium	$250.00
Auto Policy Eligibility Score	NULL
Auto Policy Eligibility Status	Eligible
Client Portfolio Length In Years	19
Client Relationship Longevity Status	Long Term
Client Segment Discount	-$750.00
Client Segment Score	NULL
Driver Policy Annual Premium	$1,020.00
Driver Policy Eligibility Score	NULL
Policy Eligibility Score	0
Preferred Client Indicator	Preferred
Premium After Client Segment Discount	$2,020.00
Premium Before Client Segment Discou	$2,770.00
Unadjusted Premium After Client Segm	$2,020.00

Figure 26. The Results of Within Elite Client Scenario

Below are the results from the Within Elite Client Scenario from the Decision Flow.

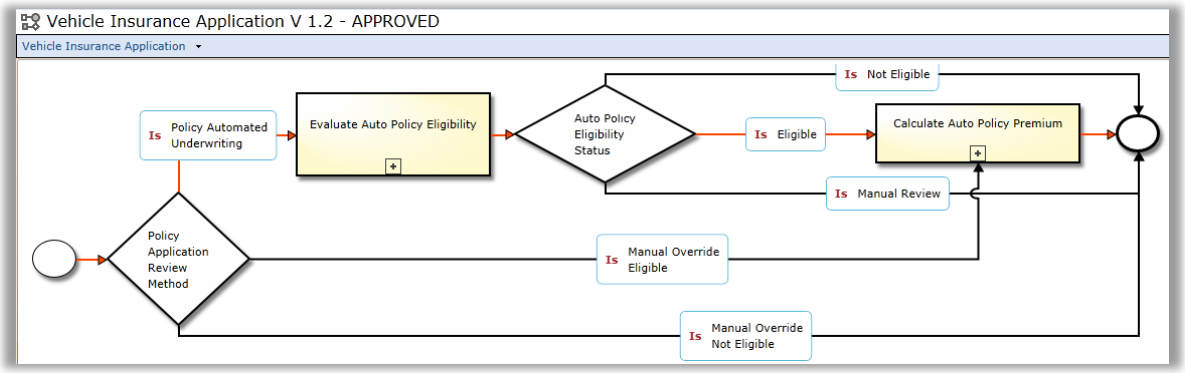


Figure 27. Vehicle Insurance Application Decision Flow Within Elite Client (Client is Eligible due to Long Term Relationship with UServ)

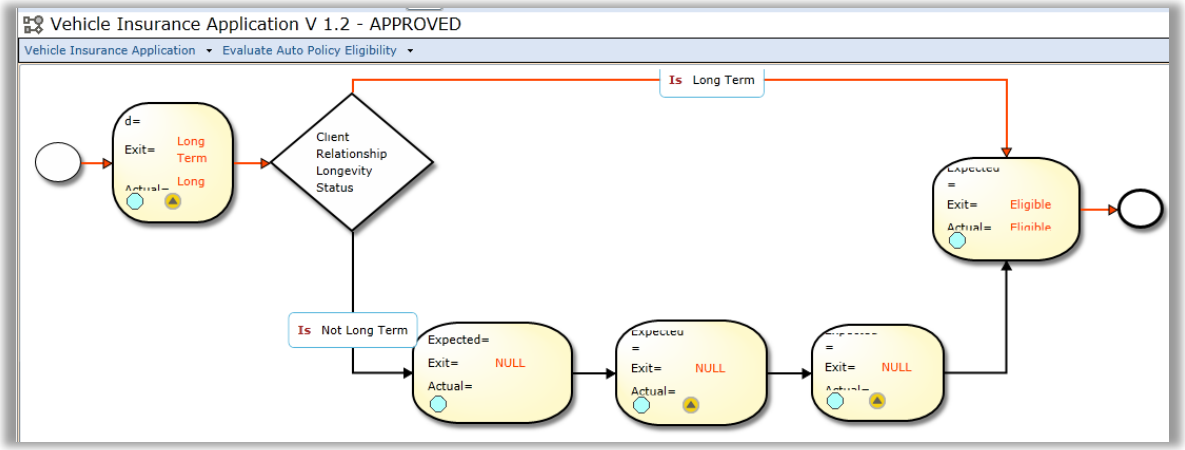


Figure 28. Evaluate Auto Policy Eligibility Decision Sub Flow Within Elite Client (Client is Eligible due to Long Term Relationship with UServ)

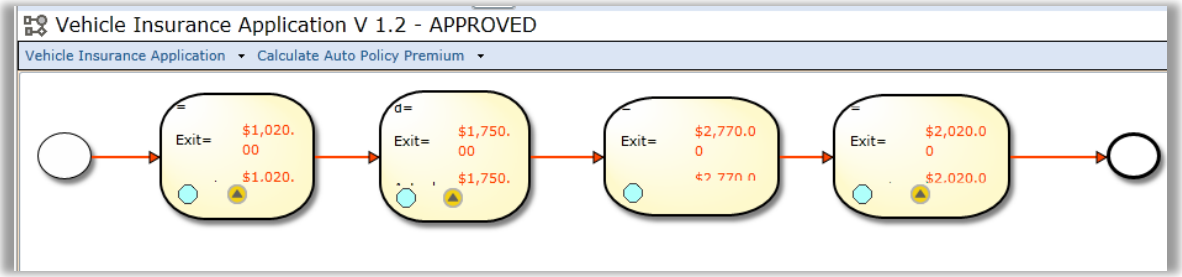


Figure 29. Calculate Auto Policy Premium Decision Sub Flow Within Elite Client (Client's Premium is $2,020.00)

5.2 Outside Elite Client Scenario

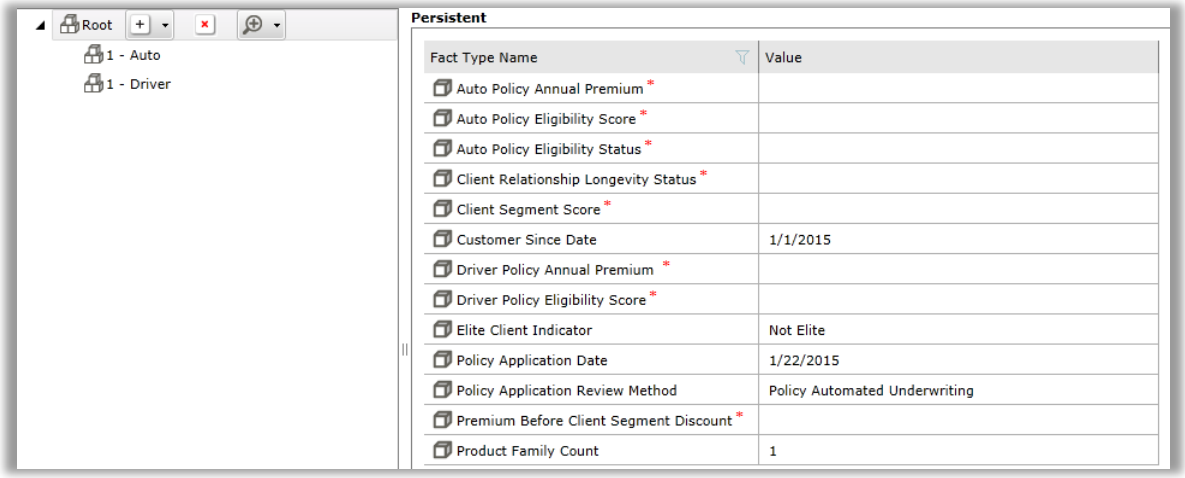


Figure 30. Application Form (Root) Level Data Inputs

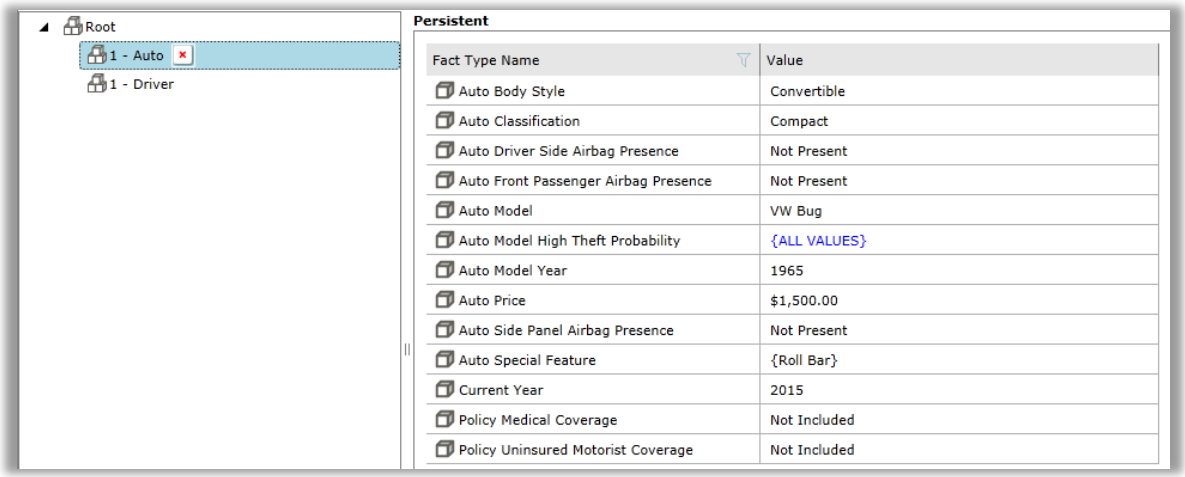


Figure 31. Auto Data Inputs

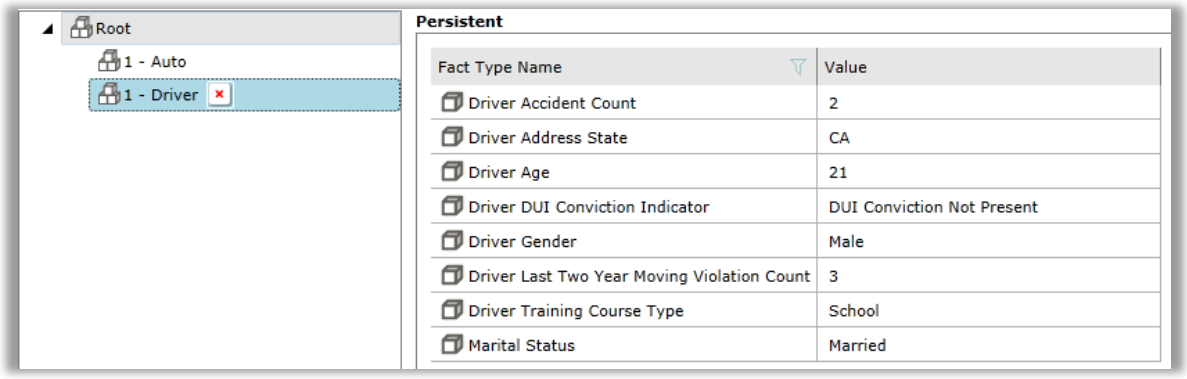


Figure 32. Driver Data Inputs

Below are the results from the Outside Elite Client Scenario from the Decision Flow.

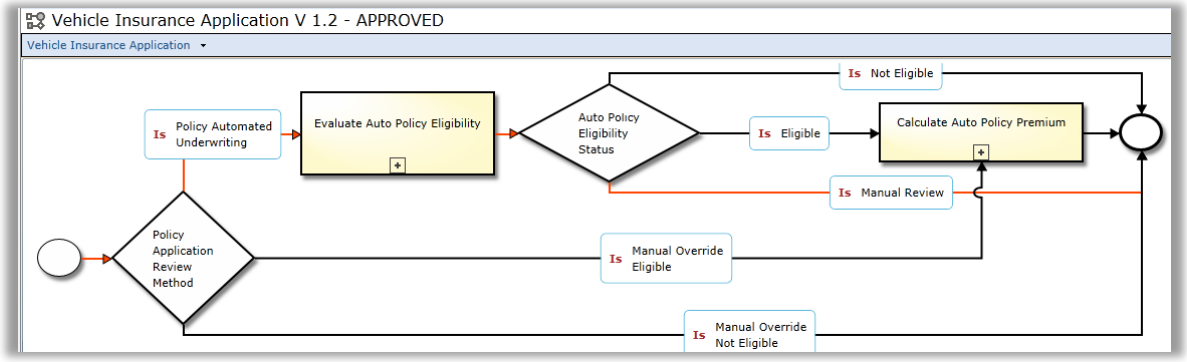


Figure 33. Vehicle Insurance Application Decision Flow Outside Elite Client (Client's application requires Manual Review)

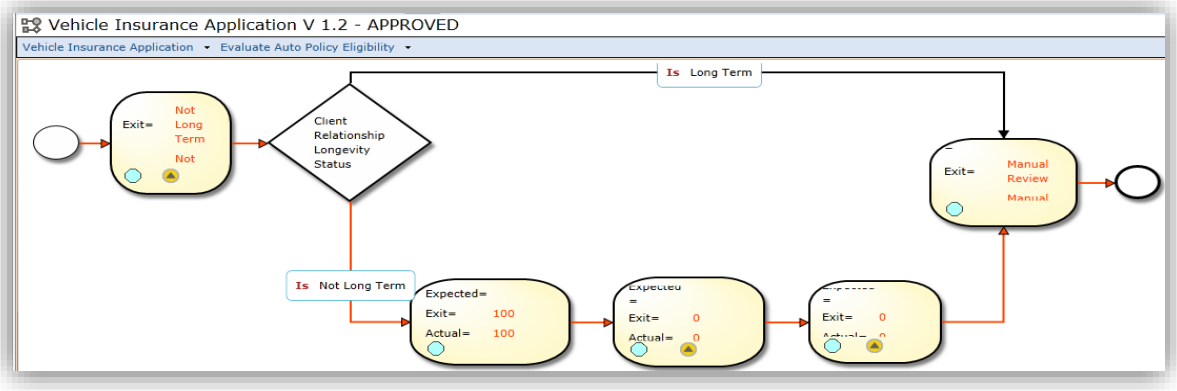


Figure 34. Evaluate Auto Policy Eligibility Decision Sub Flow Outside Elite Client (Client's application is in Underwriting Manual Review)

5.3 Deployment into Execution Environments

Sapiens DECISION provides a unique ability to generate and deploy code from the Decision Flows and Decision Views seamlessly to any rules engine, or other technology environment whether procedural or object-oriented code. The tool uses a release management mechanism and adapters that transform the Decision Models into appropriate code.

Sapiens DECISION is delivered with the option of using different adapters to generate code for rules engines such as Drools or IBM ODM, and for the Sapiens DECISION Execution Server (DES). In addition, the ability to generate code can include any programming environment (e.g., Java, SQL) or other text-based formats (e.g., XML) through the use of adapter kits.

This powerful deployment functionality assures consistency between the business logic as expressed in the designed decision models, and their execution in run-time. It also saves time and effort and greatly reduces risks at the deployment stage.

To illustrate the deployment of the UServ case study, the Decision Flows and Decision Models have been exported into Drools and executed via a SOAP service as shown below using the SoapUI tool.

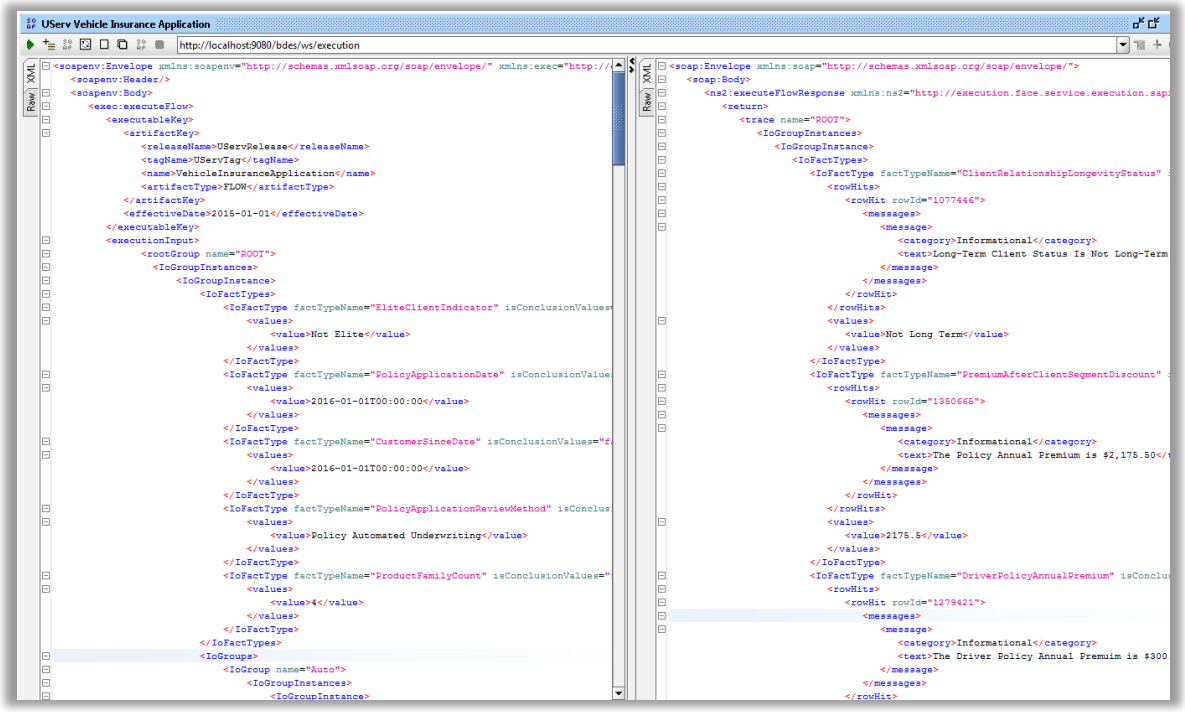


Figure 35. Executed Decision Flow using SoapUI tool

6 Modeling Assumptions

- Preferred and Elite Statuses are not mutually exclusive.
- The data concerning the training course for the Young Driver or the Senior Driver will come over on the application at the time of submission.
- Only Automobiles and Drivers found Eligible will be priced for a policy premium.
- All car classifications are exclusive. For example, you cannot have a compact luxury car.
- We cannot get an accurate total policy premium without all of the data for each of Ray Meno's 137 cars, only premium amounts for Shane Meno.
- Data Acceptance modeling was not done because the knowledge source explicitly states that the data validation rules are not provided. However we did include the Data Validation step in our process model because it was noted in the knowledge source.
- In the testing of the scenarios, if information is not given, the assumption is that the information is not applicable. For example, if the scenario in the knowledge source does not state whether a driver is married or not, it is assumed that they are single.

7 About Sapiens DECISION

Sapiens DECISION is an enterprise-grade platform that empowers business users to independently author business logic in a manner that can be understood by business, as well as by IT. The resulting logic can be deployed to existing rules engines, the Sapiens DECISION Execution Server (DES), and other execution technologies.

For the business users, Sapiens DECISION provides a fully governed, business-friendly decision modeling environment that allows logic reusability, validation and testing, and assures consistency between business requirements and their deployment and execution.

Sapiens DECISION implements The Decision Model (TDM), providing a strong framework and governance for authoring and deploying easy-to-understand, unambiguous, sharable, and maintainable, decision models.

While TDM notation predated DMN, Sapiens DECISION provides an alternate DMN view of any TDM model. The DMN views of the UServ Derby Decision Models are displayed in the appendix.

Sapiens DECISION is comprised of multiple components including:

- **Glossary**: represents the business Fact Types (or business-friendly terms) and their underlying models.
- **Decision Repository**: a repository of Decision Models comprised of conditions, conclusions, and their inferential relationships.
- **Testing Facility**: used to generate and execute test cases for Decision Models and Decision Flows. Test scripts may also be exported for integration and UAT testing, and test scripts may be imported from data sets for regression and what-if analysis.
- **Governance and Control**: a comprehensive framework of governance tools including workflow, access control, versioning, and approval management for all assets in the repository.
- **Release Management**: a set of management tools to manage the deployment of the decision logic into the execution environment.

8 About Sapiens

Sapiens International Corporation (NASDAQ and TASE: SPNS) is a leading global provider of software solutions for the insurance industry, with an emerging focus on the broader financial services sector. Sapiens offers core, end-to-end solutions to the global general insurance, property and casualty, life, pension and annuities, reinsurance and retirement markets, as well as business decision management software. The company has a track record of over 30 years in delivering superior software solutions to more than 130 financial services organizations. The Sapiens team of over 1,000 professionals operates through our fully-owned subsidiaries in North America, the United Kingdom, EMEA and Asia Pacific.

9 References

1. von Halle, B., & Goldberg, L. (2010). The Decision Model: A Business Logic Framework Linking Business and Technology. Boca Raton: CRC Press.

2. The 10 Most Stolen and Recovered Cars in the U.S. (2014, June 2). Retrieved January 5, 2015, from http://wallstcheatsheet.com/automobiles/the-10-most-stolen-and-recovered-cars-in-the-u-s.html/?a=viewall

3. UServ Product Derby Case Study. (n.d.). Retrieved January 23, 2015, from http://ai.ia.agh.edu.pl/wiki/_media/hekate:2005_product_derby.pdf

10 Appendix 1: Decision Models in TDM Notation

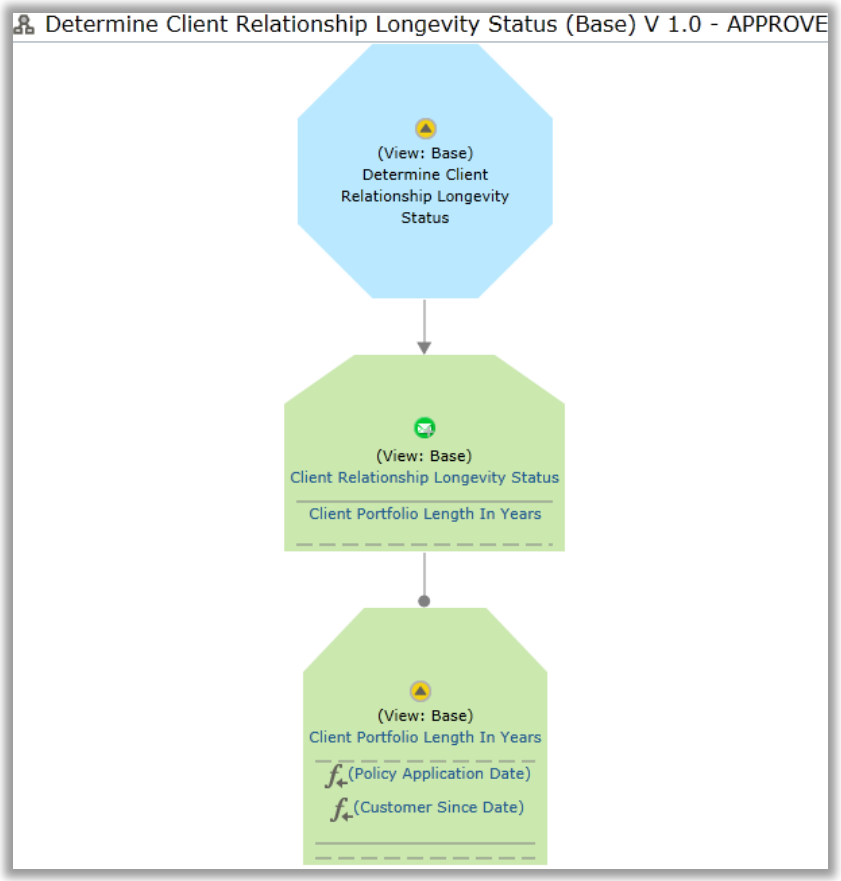
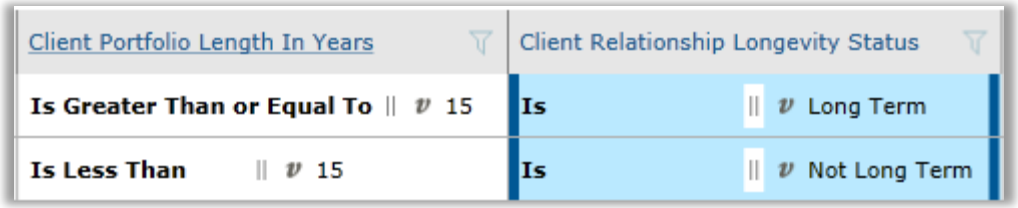
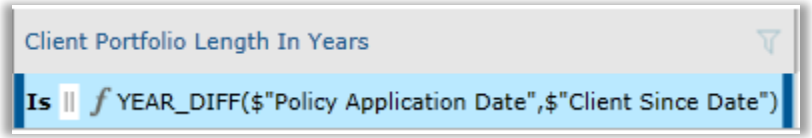


Figure 36. Determine Client Relationship Longevity Status


Client Portfolio Length In Years
Client Relationship Longevity Status
Is Greater Than or Equal To
15
Is
Long Term
Is Less Than
15
Is
Not Long Term


Client Portfolio Length In Years
Is
YEAR_DIFF($"Policy Application Date",$"Client Since Date")

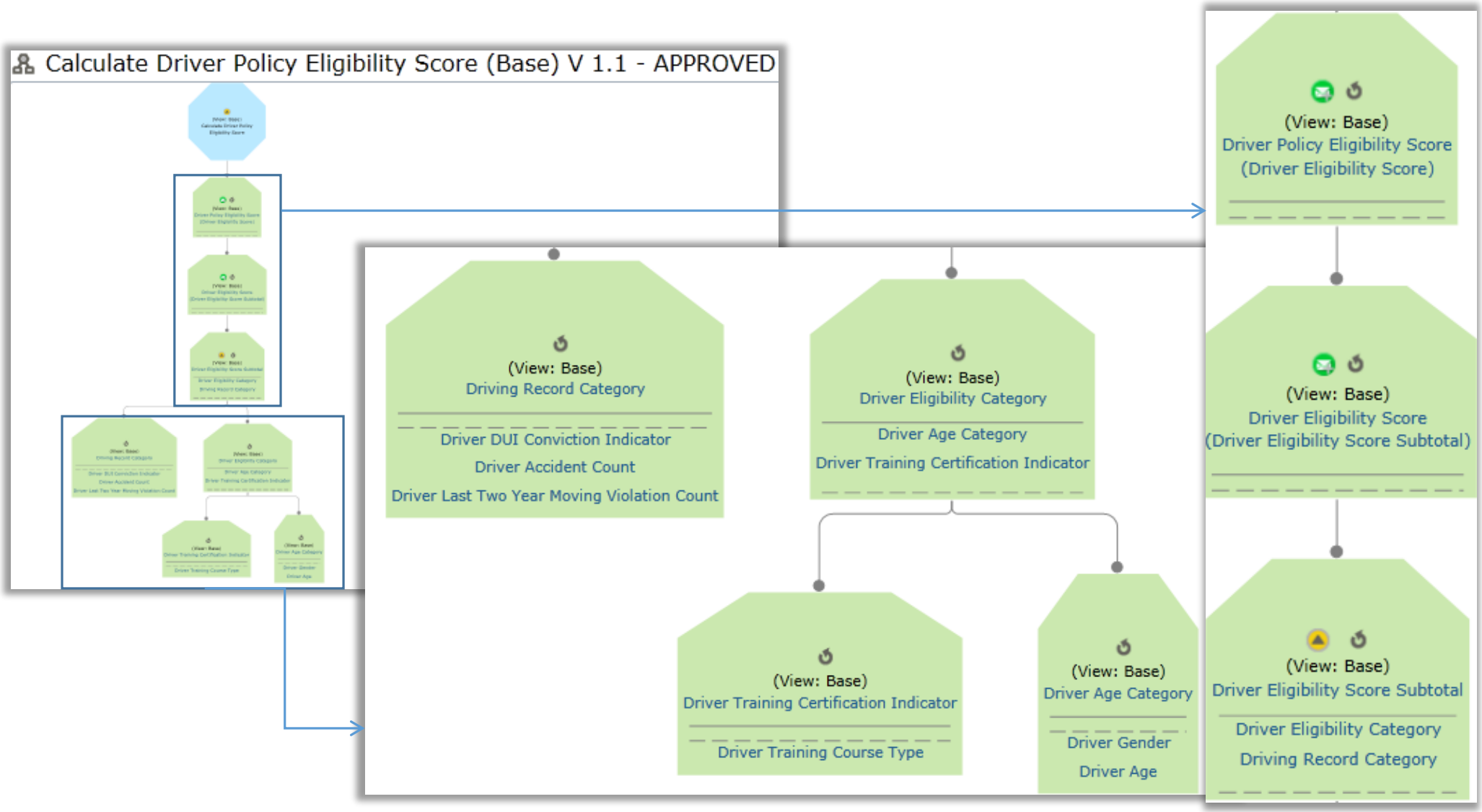


Figure 37. Calculate Driver Policy Eligibility Score

Driver Policy Eligibility Score
Is Incremented By Driver Eligibility Score

Driver Eligibility Score
Is Incremented By Driver Eligibility Score Subtotal

Driving Record Category	Driver Eligibility Category	Driver Eligibility Score Subtotal
Is Not High Risk Driver	**Is** Eligible	**Is Incremented By** 0
Is High Risk Driver		**Is Incremented By** 100
	Is Young Ineligible	**Is Incremented By** 30
	Is Senior Ineligible	**Is Incremented By** 20

Driver DUI Conviction Indicator	Driver Accident Count	Driver Last Two Year Moving Violation Count	Driving Record Category
Is DUI Conviction Not Present	**Is Less Than or Equal To** 2	**Is Less Than or Equal To** 3	**Is** Not High Risk Driver
Is DUI Conviction Present			**Is** High Risk Driver
	Is Greater Than 2		**Is** High Risk Driver
		Is Greater Than 3	**Is** High Risk Driver

Driver Age Category	Driver Training Certification Indicator	Driver Eligibility Category
Is ‖ v Typical Driver		**Is** ‖ v Eligible
Is In ‖ v {Senior Driver,Young Driver}	**Is** ‖ v Certified	**Is** ‖ v Eligible
Is ‖ v Young Driver	**Is** ‖ v Not Certified	**Is** ‖ v Young Ineligible
Is ‖ v Senior Driver	**Is** ‖ v Not Certified	**Is** ‖ v Senior Ineligible

Driver Gender	Driver Age	Driver Age Category
Is ‖ v Male	**Is Less Than** ‖ v 25	**Is** ‖ v Young Driver
Is ‖ v Female	**Is Less Than** ‖ v 20	**Is** ‖ v Young Driver
Is ‖ v Male	**Is Between** ‖ v {25,70}	**Is** ‖ v Typical Driver
Is ‖ v Female	**Is Between** ‖ v {20,70}	**Is** ‖ v Typical Driver
	Is Greater Than ‖ v 70	**Is** ‖ v Senior Driver

Driver Training Course Type	Driver Training Certification Indicator
Is In ‖ v {Licensed Company,School,Senior Citizen Driver Refresher Course}	**Is** ‖ v Certified
Is Not In ‖ v {Licensed Company,School,Senior Citizen Driver Refresher Course}	**Is** ‖ v Not Certified

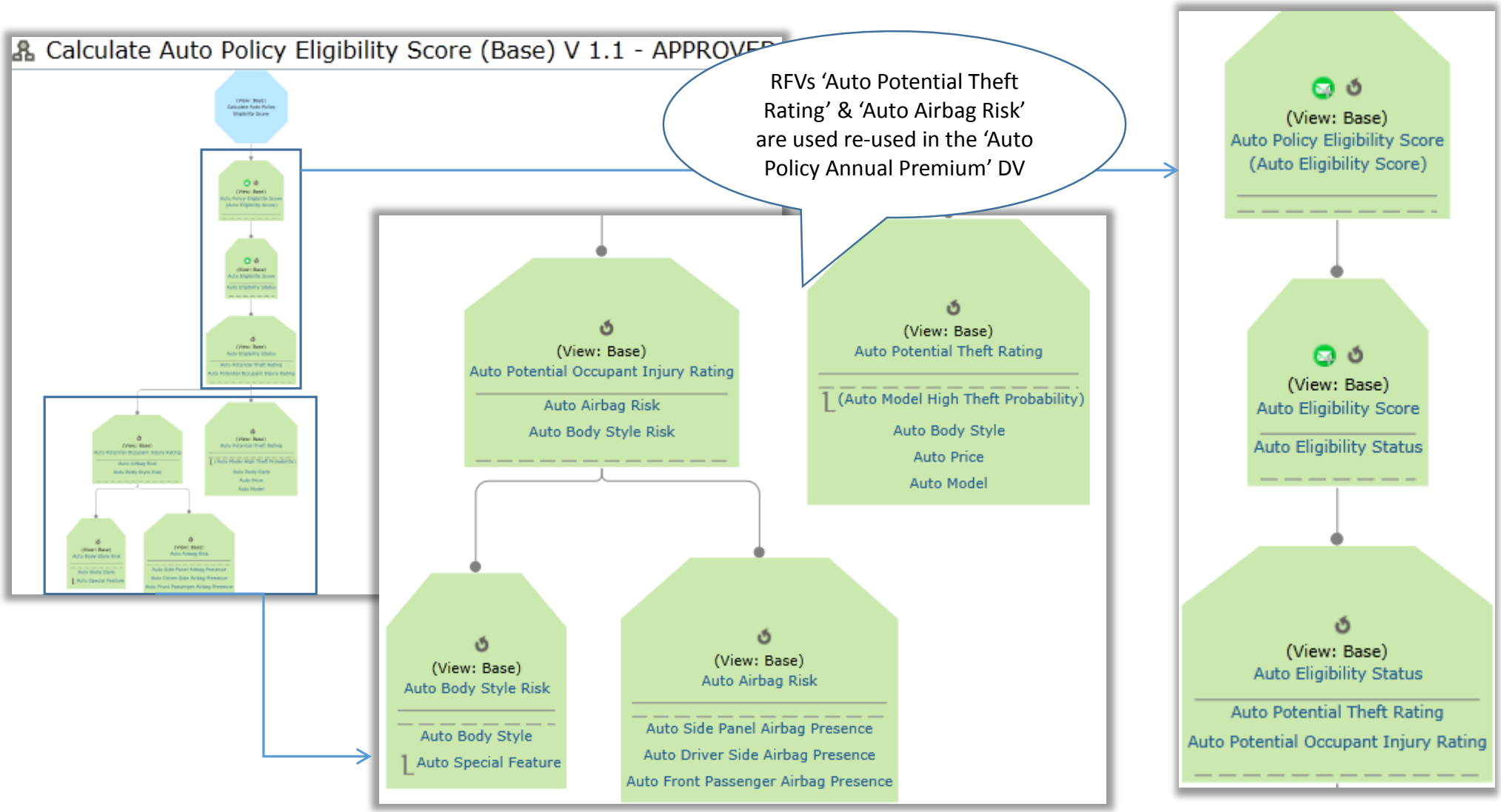


Figure 38. Calculate Auto Policy Eligibility Score

Auto Policy Eligibility Score
Is Incremented By || Auto Eligibility Score

Auto Eligibility Status	Auto Eligibility Score
Is || Eligible	**Is Incremented By** || 0
Is || Provisional	**Is Incremented By** || 50
Is || Not Eligible	**Is Incremented By** || 100

Auto Potential Occupant Injury Rating	Auto Potential Theft Rating	Auto Eligibility Status
Is Not In || {High,Extremely High}	**Is Not** || High	**Is** || Eligible
Is || High		**Is** || Provisional
Is Not || Extremely High	**Is** || High	**Is** || Provisional
Is || Extremely High		**Is** || Not Eligible

Auto Airbag Risk	Auto Body Style Risk	Auto Potential Occupant Injury Rating
Is ‖ v High	Is ‖ v Not Extremely High	Is ‖ v High
Is ‖ v Moderate	Is ‖ v Not Extremely High	Is ‖ v Moderate
Is ‖ v Low	Is ‖ v Not Extremely High	Is ‖ v Low
Is ‖ v Extremely High		Is ‖ v Extremely High
	Is ‖ v Extremely High	Is ‖ v Extremely High

Auto Body Style	Auto Special Feature *List*	Auto Body Style Risk
Is ‖ v Convertible	Contains ‖ v {Roll Bar}	Is ‖ v Not Extremely High
Is ‖ v Convertible	Does Not Contain ‖ v {Roll Bar}	Is ‖ v Extremely High
Is ‖ v Not Convertible		Is ‖ v Not Extremely High

Auto Driver Side Airbag Presence	Auto Front Passenger Airbag Presence	Auto Side Panel Airbag Presence	Auto Airbag Risk
Is ‖ v Not Present			Is ‖ v Extremely High
Is ‖ v Present	Is ‖ v Not Present		Is ‖ v High
Is ‖ v Present	Is ‖ v Present	Is ‖ v Not Present	Is ‖ v Moderate
Is ‖ v Present	Is ‖ v Present	Is ‖ v Present	Is ‖ v Low

Auto Body Style	Auto Price	Auto Model	Auto Potential Theft Rating
Is Convertible			Is High
	Is Greater Than $45,000.00		Is High
		Is In Auto Model High Theft Probability *List*	Is High
Is Not Convertible	Is Between {$20,000.00,$45,000.00}	Is Not In Auto Model High Theft Probability *List*	Is Moderate
Is Not Convertible	Is Less Than $20,000.00	Is Not In Auto Model High Theft Probability *List*	Is Low

Auto Model High Theft Probability *List*
Is Appended With Cadillac Escalade
Is Appended With Acura Integra
Is Appended With Chevrolet Silverado
Is Appended With Chevrolet Tahoe
Is Appended With Ford F-350
Is Appended With Honda Accord
Is Appended With Honda Civic
Is Appended With Nissan Altima
Is Appended With Toyota Corolla
Is Appended With VW Bug
Is Appended With Dodge Caravan

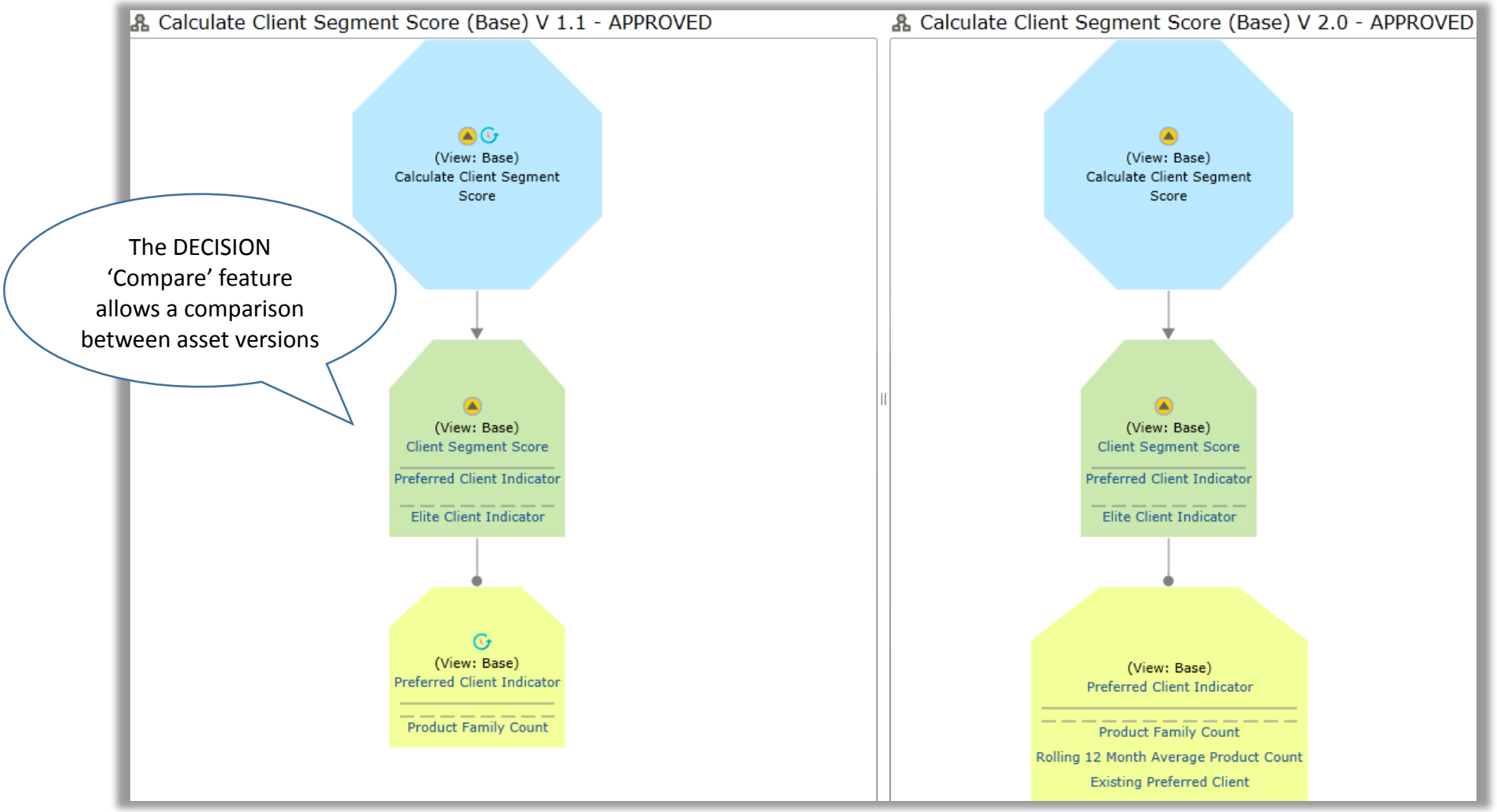


Figure 39. Calculate Client Segment Score

Preferred Client Indicator	Elite Client Indicator	Client Segment Score
Is = Preferred		Is Incremented By = -50
	Is = Elite	Is Incremented By = -100
Is = Not Preferred	Is = Not Elite	Is Incremented By = 0

Product Family Count	Preferred Client Indicator
Is Greater Than or Equal To = 3	Is = Preferred
Is Less Than = 3	Is = Not Preferred

Version 1

Existing Preferred Client	Product Family Count	Rolling 12 Month Average Product Count	Preferred Client Indicator
Is = Yes	Is Greater Than or Equal To = 3		Is = Preferred
Is = Yes	Is Less Than = 3		Is = Not Preferred
Is = No		Is Greater Than or Equal To = 3	Is = Preferred
Is = No		Is Less Than = 3	Is = Not Preferred

Version 2

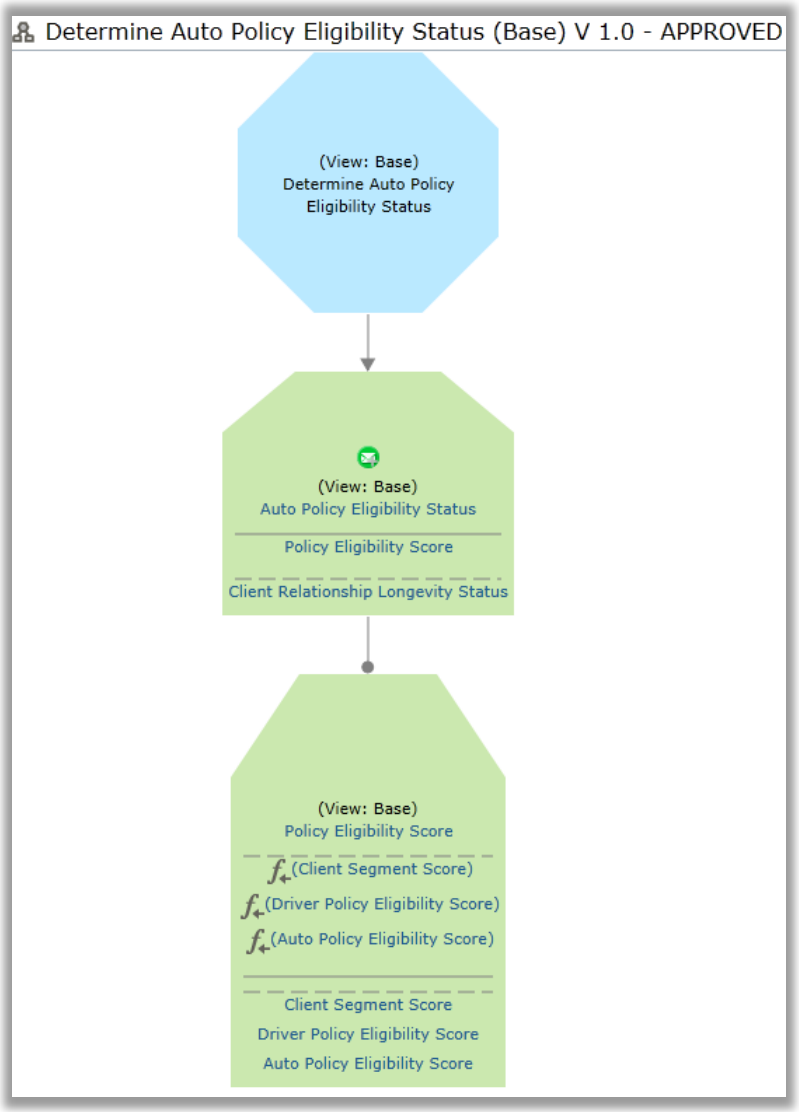


Figure 40. Determine Auto Policy Eligibility Status

Client Relationship Longevity Status	Policy Eligibility Score	Auto Policy Eligibility Status
Is || v Long Term		**Is** || v Eligible
Is || v Not Long Term	**Is Less Than** || v 100	**Is** || v Eligible
Is || v Not Long Term	**Is Between** || v {100,250}	**Is** || v Manual Review
Is || v Not Long Term	**Is Greater Than** || v 250	**Is** || v Not Eligible

Auto Policy Eligibility Score (Pc)	Driver Policy Eligibility Score (Pc)	Client Segment Score (Pc)	Policy Eligibility Score
[Is] Populated	[Is] Populated	[Is] Populated	[Is] $"Driver Policy Eligibility Score"+ $"Auto Policy Eligibility Score"+ $"Client Segment Score"
[Is] NotPopulated			[Is] 0
	[Is] NotPopulated		[Is] 0
		[Is] NotPopulated	[Is] 0

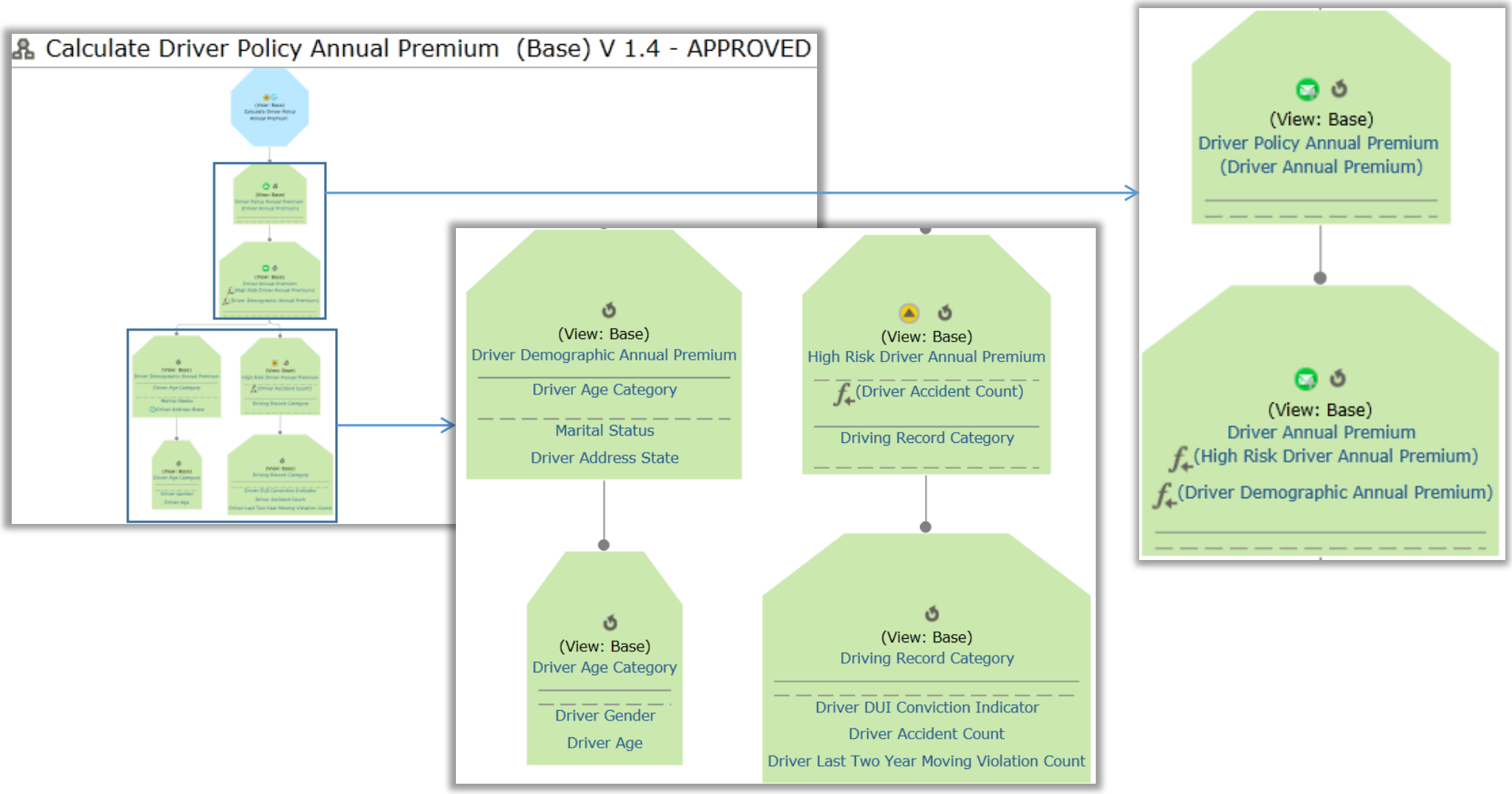


Figure 41. Calculate Driver Policy Annual Premium

Driver Policy Annual Premium
Is Incremented By Driver Annual Premium

Driver Annual Premium
Is Incremented By SUM($"High Risk Driver Annual Premium",$"Driver Demographic Annual Premium")

Driver Age Category	Marital Status	Driver Address State	Driver Demographic Annual Premium
Is Young Driver	**Is** Married	**Is In** {CA,NY,VA}	**Is Incremented By** $700.00
Is Young Driver	**Is** Single	**Is In** {CA,NY,VA}	**Is Incremented By** $720.00
Is Young Driver	**Is In** {Married,Single}	**Is Not In** {CA,NY,VA}	**Is Incremented By** $300.00
Is Senior Driver		**Is In** {CA,NY,VA}	**Is Incremented By** $500.00
Is Senior Driver		**Is Not In** {CA,NY,VA}	**Is Incremented By** $200.00
Is Typical Driver			**Is Incremented By** $0.00

Driver Gender	Driver Age	Driver Age Category
Is v Male	Is Less Than v 25	Is v Young Driver
Is v Female	Is Less Than v 20	Is v Young Driver
Is v Male	Is Between v {25,70}	Is v Typical Driver
Is v Female	Is Between v {20,70}	Is v Typical Driver
	Is Greater Than v 70	Is v Senior Driver

Driving Record Category	High Risk Driver Annual Premium
Is v High Risk Driver	Is Incremented By f (1000 + ($"Driver Accident Count"*150))
Is v Not High Risk Driver	Is Incremented By f ($"Driver Accident Count"*150)

Driver DUI Conviction Indicator	Driver Accident Count	Driver Last Two Year Moving Violation Count	Driving Record Category
Is v DUI Conviction Not Present	Is Less Than or Equal To v 2	Is Less Than or Equal To v 3	Is v Not High Risk Driver
Is v DUI Conviction Present			Is v High Risk Driver
	Is Greater Than v 2		Is v High Risk Driver
		Is Greater Than v 3	Is v High Risk Driver

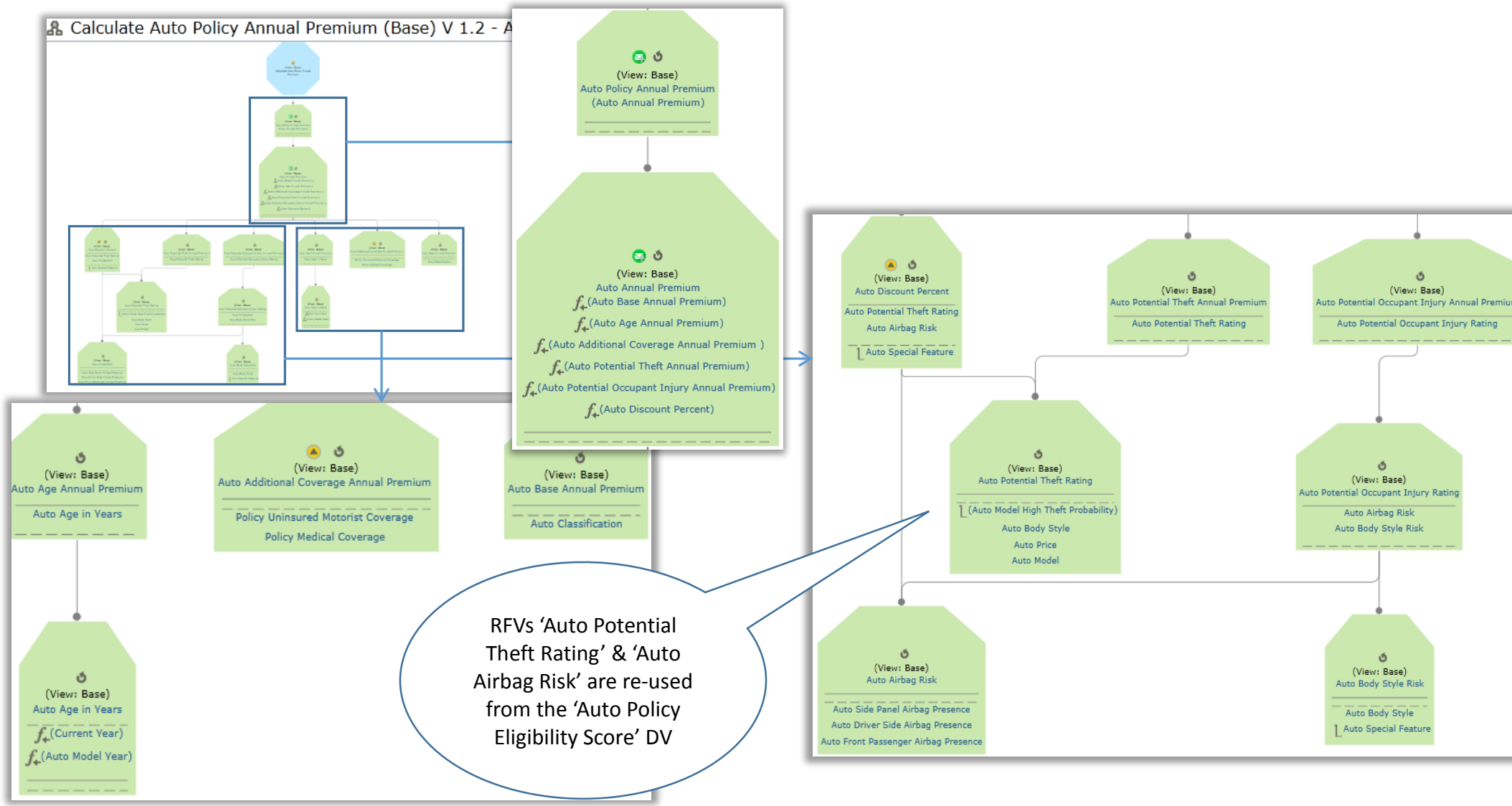


Figure 42. Calculate Auto Policy Annual Premium

Auto Policy Annual Premium
Is Incremented By ‖ Auto Annual Premium

Auto Annual Premium	
Is Incremented By	‖ *f* SUM($"Auto Base Annual Premium",$"Auto Age Annual Premium",$"Auto Additional Coverage Annual Premium ",$"Auto Potential Theft Annual Premium",$"Auto Potential Occupant Injury Annual Premium")*(1-$"Auto Discount Percent")

Auto Potential Theft Rating		Auto Potential Theft Annual Premium	
Is	‖ *v* High	**Is Incremented By**	‖ *v* $500.00
Is Not	‖ *v* High	**Is Incremented By**	‖ *v* $0.00

Policy Uninsured Motorist Coverage		Policy Medical Coverage		Auto Additional Coverage Annual Premium	
Is	‖ *v* Included			**Is Incremented By**	‖ *v* $300.00
		Is	‖ *v* Included	**Is Incremented By**	‖ *v* $600.00
Is	‖ *v* Not Included	**Is**	‖ *v* Not Included	**Is Incremented By**	‖ *v* $0.00

Auto Classification	Auto Base Annual Premium
Is ‖ v Compact	**Is Incremented By** ‖ v $250.00
Is ‖ v Sedan	**Is Incremented By** ‖ v $400.00
Is ‖ v Luxury	**Is Incremented By** ‖ v $500.00
Is Not In ‖ v {Compact,Luxury,Sedan}	**Is Incremented By** ‖ v $0.00

Auto Airbag Risk	Auto Potential Theft Rating	Auto Special Feature *List*	Auto Discount Percent
Is ‖ v Extremely High			**Is Incremented By** ‖ v 0%
	Is Not ‖ v High		**Is Incremented By** ‖ v 0%
		Does Not Contain ‖ v {Alarm System}	**Is Incremented By** ‖ v 0%
Is ‖ v High			**Is Incremented By** ‖ v 12%
Is ‖ v Moderate			**Is Incremented By** ‖ v 15%
Is ‖ v Low			**Is Incremented By** ‖ v 18%
	Is ‖ v High	**Contains** ‖ v {Alarm System}	**Is Incremented By** ‖ v 10%

Auto Potential Occupant Injury Rating	Auto Potential Occupant Injury Annual Premium
Is v Extremely High	**Is Incremented By** v $1,000.00
Is v High	**Is Incremented By** v $500.00
Is Not In v {Extremely High,High}	**Is Incremented By** v $0.00

Auto Age in Years	Auto Age Annual Premium
Is Less Than or Equal To v 0	**Is Incremented By** v $400.00
Is In the Range v {0,5}	**Is Incremented By** v $300.00
Is Between v {5,10}	**Is Incremented By** v $250.00
Is Greater Than v 10	**Is Incremented By** v $0.00

Auto Age in Years
Is f YEAR(TODAY())-$"Auto Model Year"

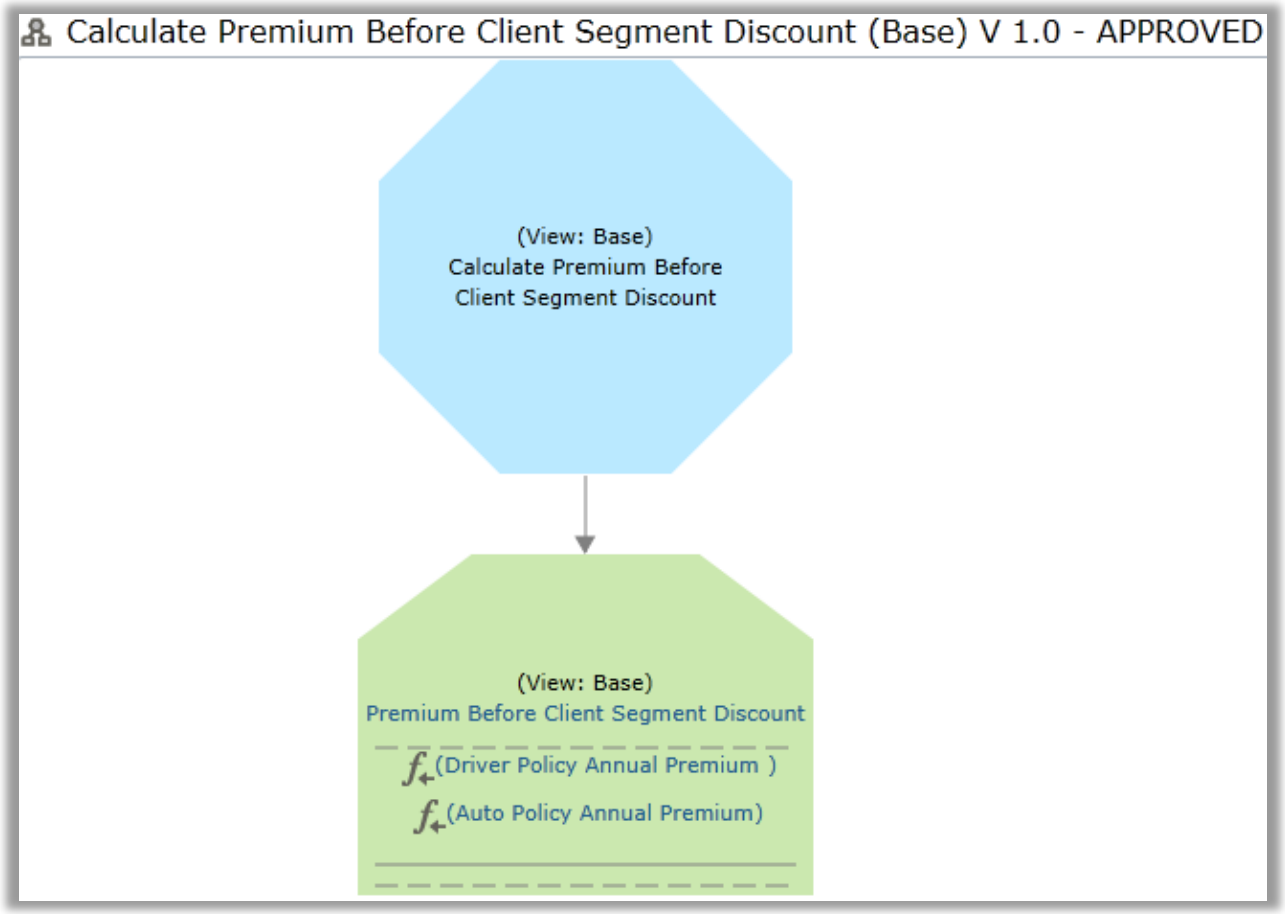
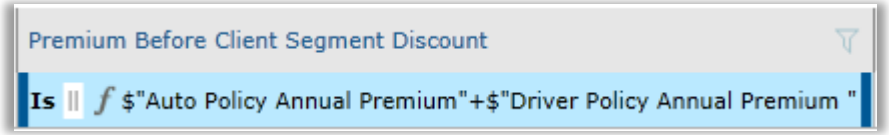


Figure 43. Calculate Premium Before Client Segment Discount


Premium Before Client Segment Discount
Is
$"Auto Policy Annual Premium"+$"Driver Policy Annual Premium "

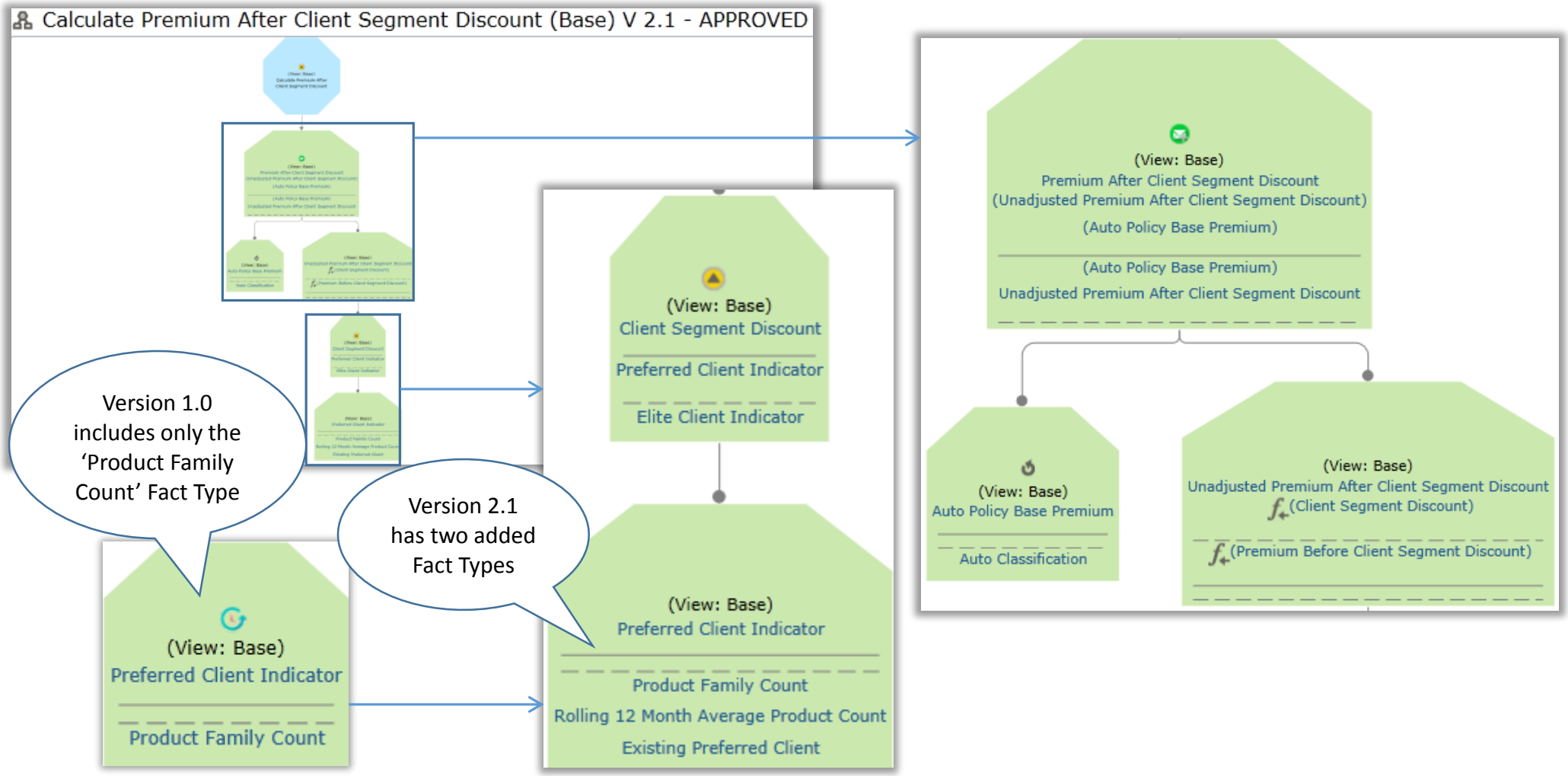


Figure 44. Calculate Premium After Client Segment Discount

Unadjusted Premium After Client Segment Discount	Premium After Client Segment Discount
Is Greater Than Auto Policy Base Premium	**Is** Unadjusted Premium After Client Segment Discount
Is Less Than or Equal To Auto Policy Base Premium	**Is** Auto Policy Base Premium

Unadjusted Premium After Client Segment Discount
Is $"Client Segment Discount"+$"Premium Before Client Segment Discount"

Elite Client Indicator	Preferred Client Indicator	Client Segment Discount
Is Elite		**Is Incremented By** -$500.00
	Is Preferred	**Is Incremented By** -$250.00
Is Not Elite	**Is** Not Preferred	**Is Incremented By** $0.00

11 Appendix 2: Decision Models in DMN Notation

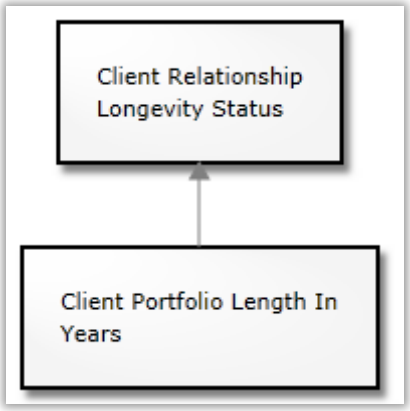


Figure 45. Determine Client Relationship Longevity Status

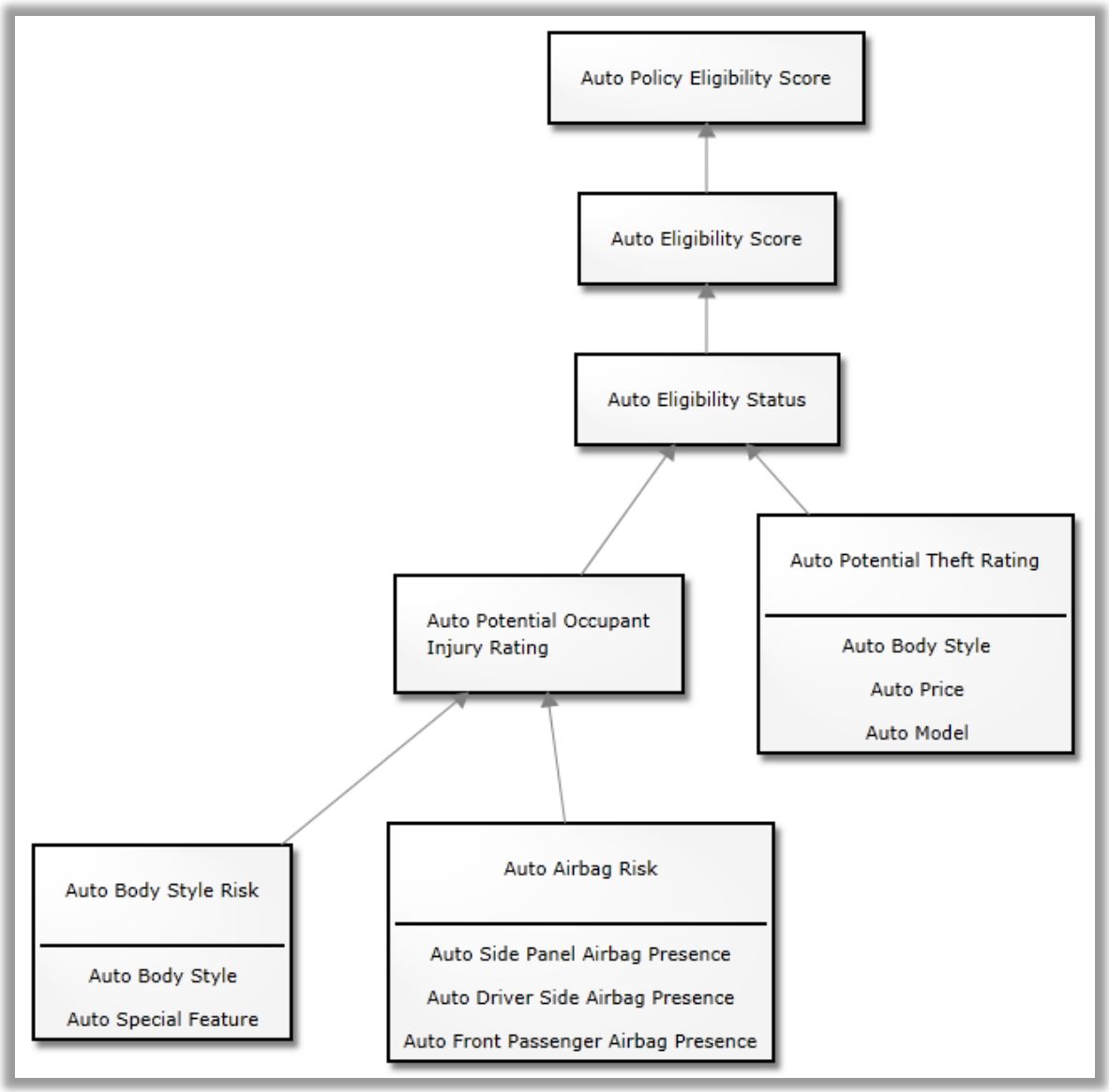


Figure 46. Calculate Auto Policy Eligibility Score

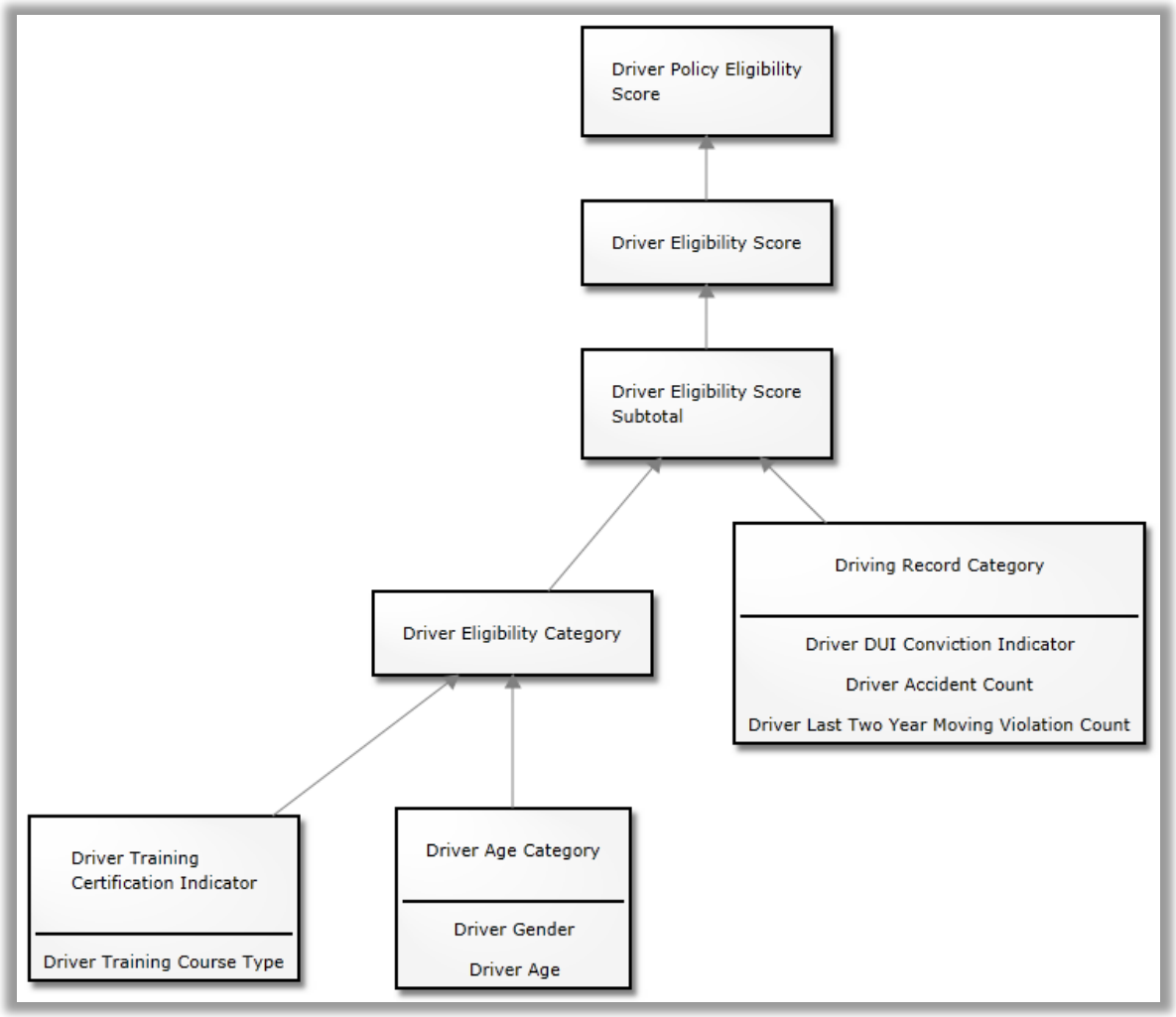


Figure 47. Calculate Driver Policy Eligibility Score

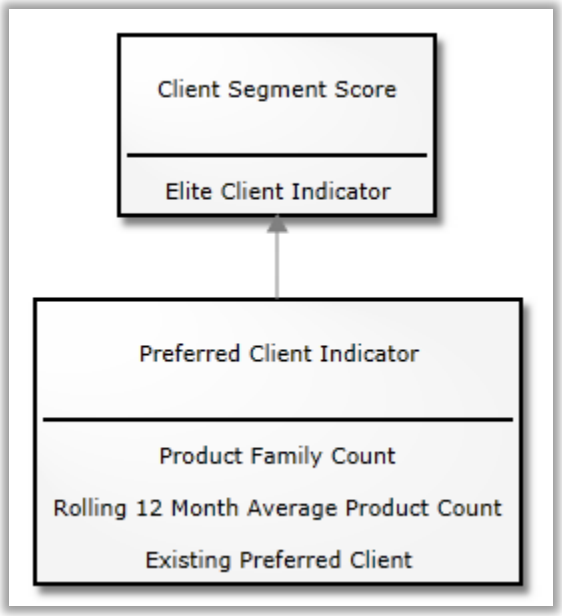


Figure 48. Calculate Client Segment Score Version 2

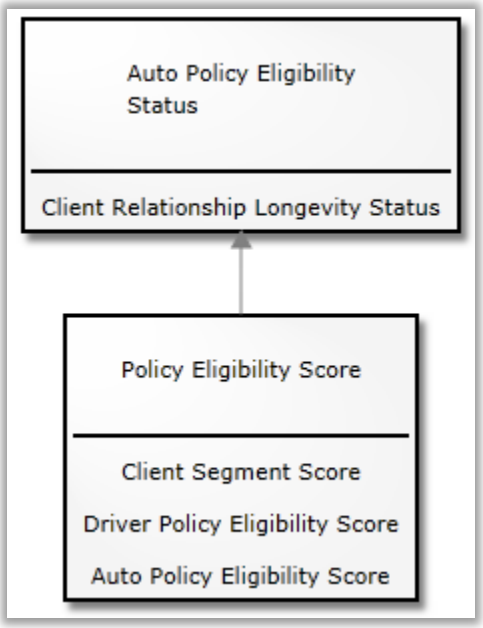


Figure 49. Determine Auto Policy Eligibility Status

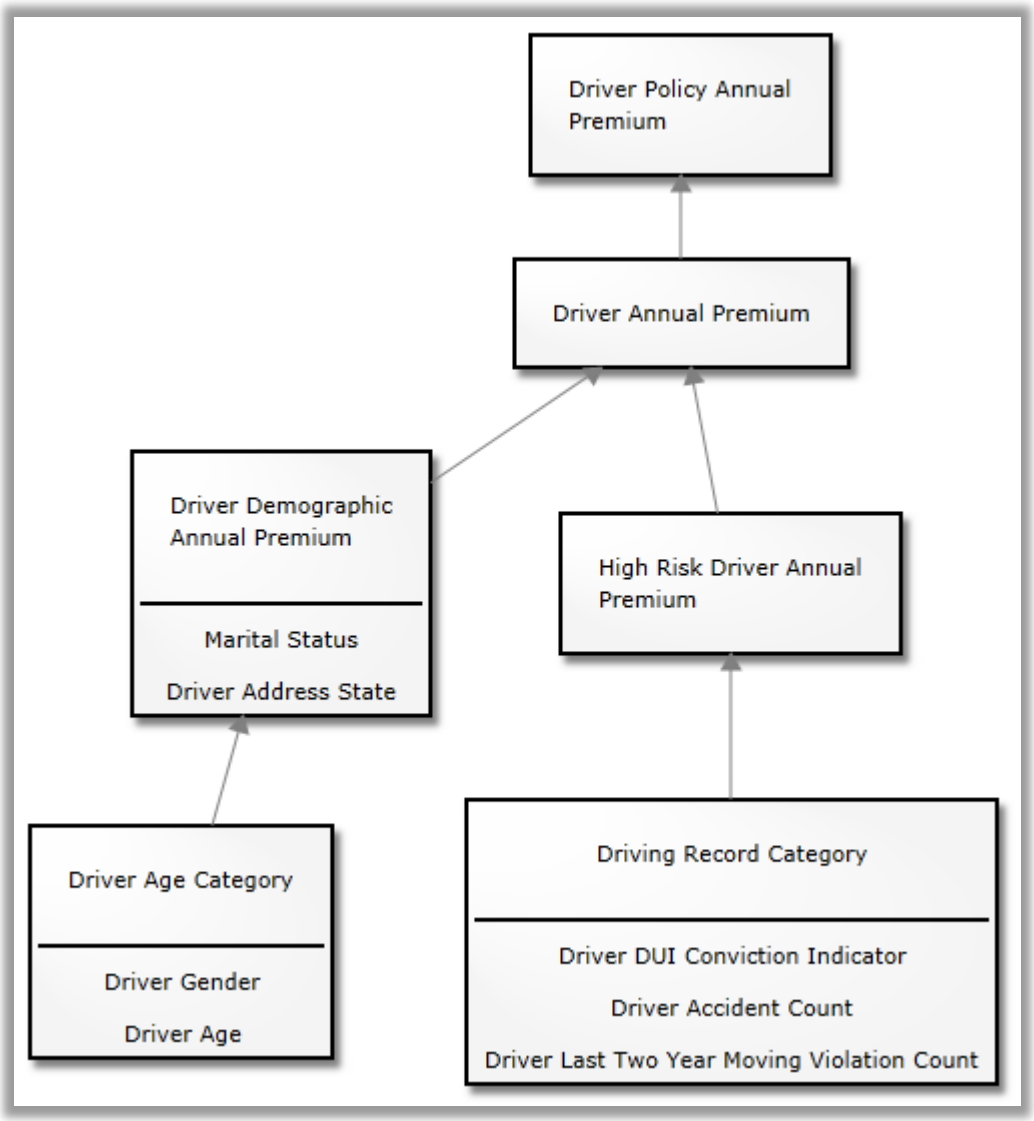


Figure 50. Calculate Driver Policy Annual Premium

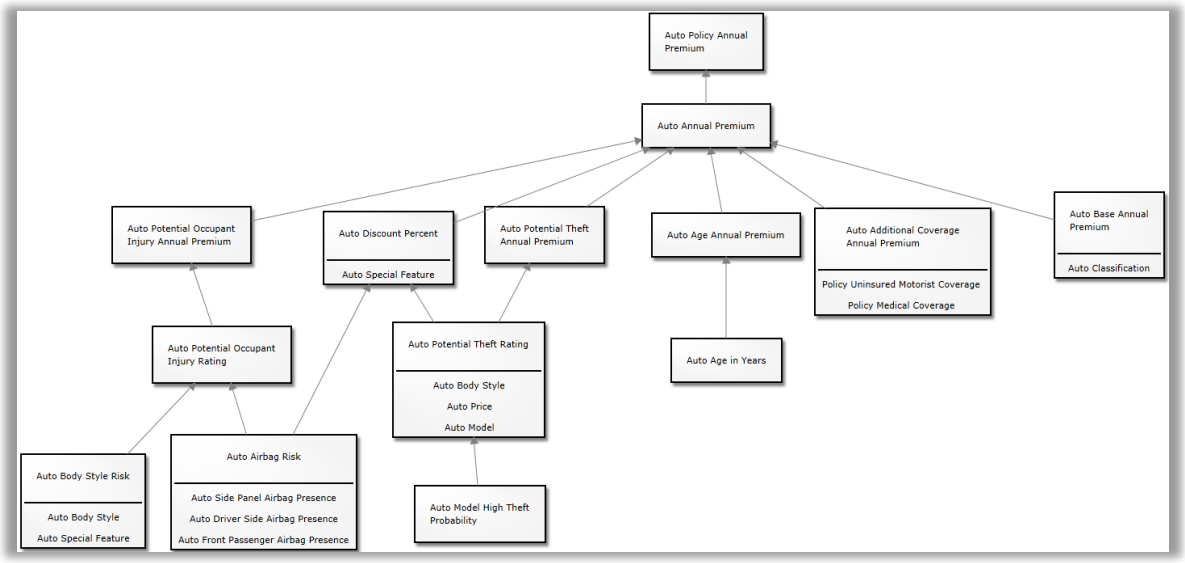


Figure 51. Calculate Auto Policy Annual Premium

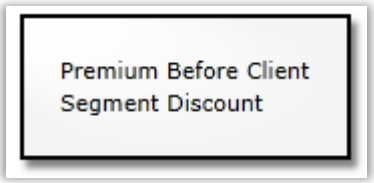


Figure 52. Calculate Premium Before Client Segment Discount

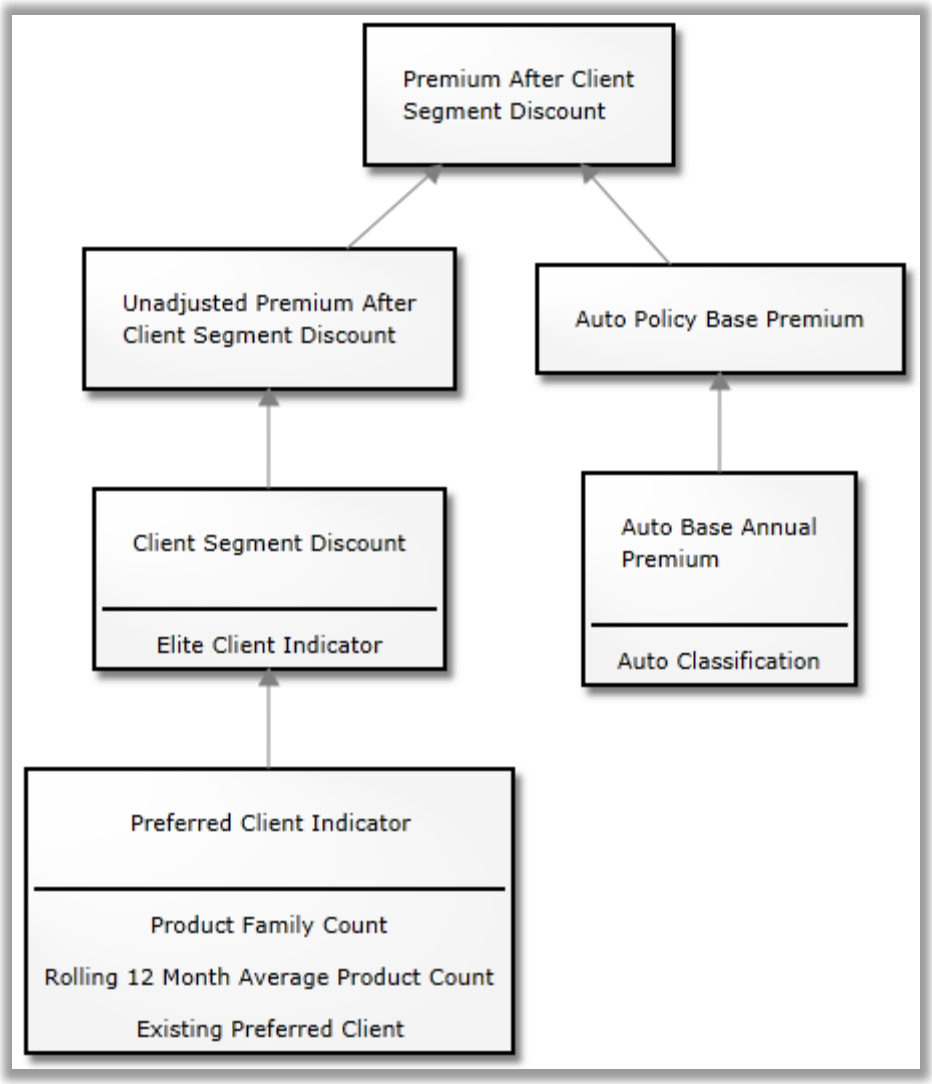


Figure 53. Calculate Premium After Client Segment Discount Version 2