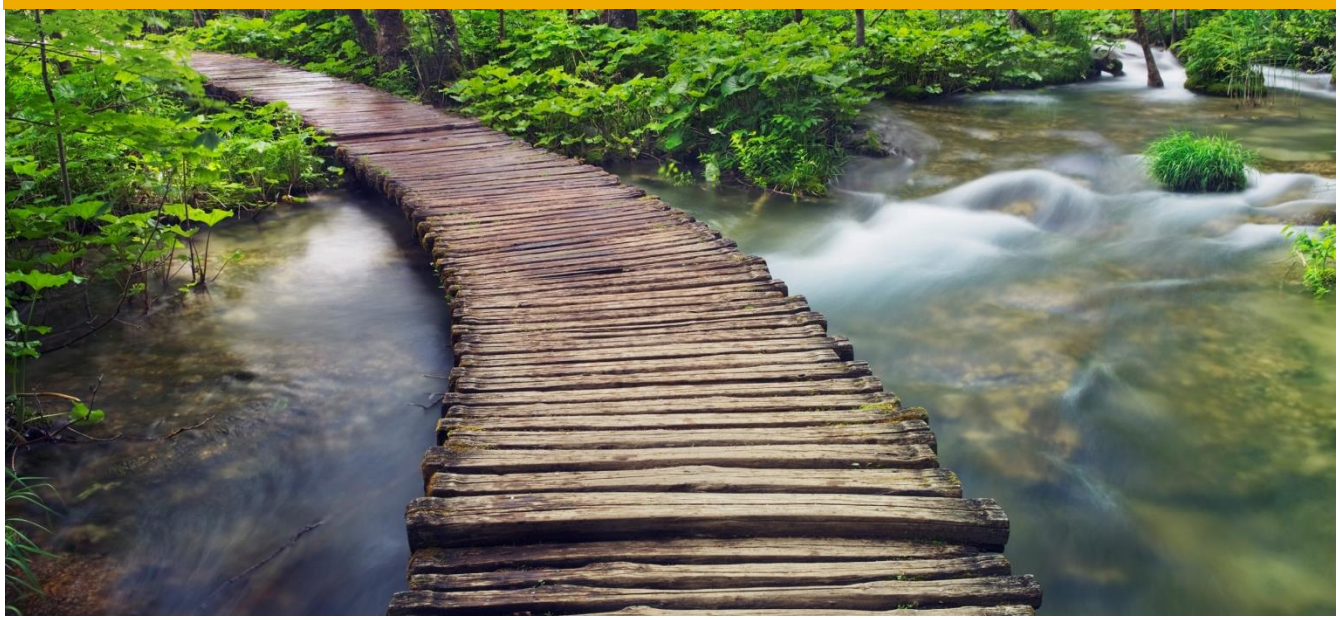


User Guide for Predictive Analytics Cloud Image - Trial Edition

SAP Store – Trial Edition

Table of Contents

1 INTRODUCTION

Users learn how to use SAP Predictive Analytics tools in the context of SAP HANA with a few pre-built scenarios in this trial edition for the cloud. Sample data is available so that the users can understand how the tools could be utilized. Predominantly the emphasis is on SAP Predictive Analytics tool (both Expert Analytics and Automated Analytics roles), SAP Lumira and SAP UI5 (HTML 5). SAP HANA is showcased for housing the data and modeling the data.

2 PREREQUISITES

The trial edition is available in the SAP Store. Users access the trial landscape from their laptop through a remote desktop connection.

3 SYSTEM ACCESS

Process Steps

1. In the SAP Cloud Appliance Library, choose *Instances* to display the list of available instances. Then choose the *Connect* operation for your instance and follow the instructions. Alternatively you can manually configure a connection in the following way.
2. Choose the name of the running **Error! Reference source not found.** instance. The system opens the *Instance* dialog box with the properties of the solution instance. The *IP Addresses* area displays the access details of the solution instance.
3. Copy the IP address of the running instance.
4. Use the SAP Logon New functionality and enter the details of the new system, then start an SAP GUI connection.

Parameter ID	Parameter Value	Note
IP address of the instance	x.x.x.x	To be retrieved from SAP Cloud Appliance Library when viewing the details of the solution instance.
SID	00	System ID of Predictive Analytics Trial Edition on SAP HANA

Remote Desktop

Group	IP	User	PW
All	IP address of your personal instance	Administrator	The **master password** is used for accessing the system. It is provided by the user during the creation of the solution instance in SAP Cloud Appliance Library.

HANA Studio: <your system>, Instance <your instance>

Group	Backend SAP HANAServer Name	User	PW
All	VHCALHDBDB	SYSTEM	**master password**

Client Tools (SAP Predictive Analytics – Expert Analytics role and Automated Analytics role)

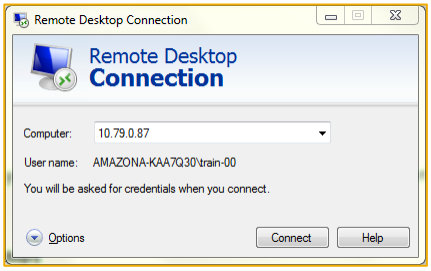
Tool	Group	Backend SAP HANAServer Name	User	PW

Predictive Analytics	All	VHCALHDBDB	RDSPAUSER	**master password**
Predictive Analytics (for Sales&Markeing use cases)	All	VHCALHDBDB	RDS_CRM_DS USER	**master password**

Connect to Remote Desktop

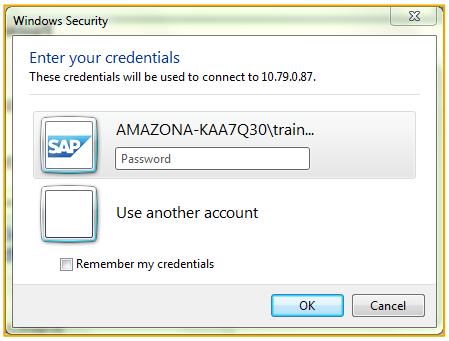
5. Start Remote Desktop by following the menu Start > All Programs > Accessories > Remote Desktop Connection
6. Now the Remote Desktop is launched.
7. Enter the following information:

   - Computer: IP addresses of your personal instance
   - User: *Administrator*



8. Choose *Connect*.
9. Enter the following information:

   - Password: *Master Password*



10. Choose *OK*.

Connect to Data Sources (ODBC)

11. Start Data sources (ODBC) by following the menu Start > All Programs > Administrative Tools > Data Sources (ODBC)
12. Click on System DSN tab and click on the Add button
13. In the new data source pop-up dialog, select HDBODBC as the data source and click Finish

14. Now enter the *data source name*, *data source description* as *vhcalhdbdb* and *Server:Port* as *vhcalhdbdb:30015*
15. Click *connect*
16. Enter user id and password as *RDSPAUSER* and *master password*

NOTE: Location of LUMs files on the instance

1. Once the instance is created and you have done a remote desktop, you get access to the files on the remote desktop.
2. The Predictive Analytics LUMs files are stored in the D:\PA_Documents
3. Most of the LUMs files are already imported and you should find them when you launch "Expert Analytics" from the SAP Predictive Analytics software. If you happen to not find the LUMs file that you are looking to open, please import them from the location specified in step 2.

4 PREDICITIVE SCENARIOS (FRONT-END COMPONENTS)

4.1 Banking

For the Banking industry, as part of the solution, we have a pre-built predictive model for one use case, the customer attrition analysis. In this use case, we focus on analyzing the customer attrition trends using 2 different approaches, identifying the customers like to leave

- Using the Automated Analytics tool in Predictive Analytics
- Using the Expert Analytics tool in Predictive Analytics

We have built a generic data structure and seeded sample data so that compelling predictive models could be built. Most of the fields in the data structure are generic and which are used by many banking customers.

4.1.1 *Customer Attrition Analysis*

The following section describes configuration for the Customer Attrition Analysis scenario, which can be used with either Automated Analytics or Expert Analytics. The generation and applying of this model will generate a table in SAP HANA, which is then combined with *Profile* information and made visible via a database view in SAP HANA. The data in this view can then be displayed using any tool that can read SAP HANA.

Note: Any SAP or non-SAP customer would be able to deploy or mimic the data structure, load the data and use the pre-built models.

Automated Analytics (using the first approach)

Training the Model

1. Launch SAP Predictive Analytics
2. Choose the *Modeler* section
3. Select *Create a Classification/Regression Model*
4. Select *Database* from *Select a Data Source*
5. Select your SAP HANA instance
6. Logon to the <DOMAIN USER> account via the *Browse* button
7. Specify the *Data Set* that is used to *Train* your data model. The set is the table you populated with your data: SAP_RDS_PA_BANK.CUST_ATTRITION

For more information on populating SAP_RDS_PA_BANK.CUST_ATTRITION, see the SAP HANA Deployment for Banking on SAP Predictive Analytics Content Adoption rapid-deployment solution (VD2) configuration guide that is part of this solution.

8. Choose *Analyze*

   BUS_PARTNER is the only column with a Key value of 1. This value is generated by SAP Predictive Analytics that identifies this column as the *Primary Key* of the table

9. On the next screen, enter *Attrition* as the *Target Variable* and make BUS_PARTNER the *Excluded Variable*

   The value of the key is meaningless in terms of the analysis

10. On the next screen, enter the *Model* name: ATTRITION_SAP_RDS_PA_BANK_MODEL
11. Choose *Generate*
12. A *Model* is created with the statistics and the metadata that are applied to the data set of customers to predict whether or not they will attrite.
13. Review the *Training the Model* display to validate your *Model*.

    The most important values are the quality indicator KI and the robustness indicator KR. For more information about SAP Predictive Analytics values and indicators, see the Appendix.

14. On the *Using the Model* screen, verify that you are able to use the *Model* (see the following section on the predict phase)
15. **If you feel confident** that this model is reflective of the additional data sets you are planning to apply this model to for prediction purposes, *Save* this model for these future runs.
    a. Expand the *Save/Export* band and then choose *Save Model*
    b. Specify where you want the model saved (SAP HANA database, Text file, and so on) and SAVE.

    Once saved, models may be opened and reused. The folder location for the saved model is selected when you open a saved model in SAP Predictive Analytics by selecting *Load a Model*.

16. **If you feel less confident about your model** because the Predictive Power (KI) and Predictive Confidence (KR) on the screen are low (less than .9), then more modeling is required.

    When additional modeling fails to indicate a trend or does not provide significant degree of confidence in the results, review the data set used. If the data set is divergent or sparse, it cannot support the generation of a robust model.

17. In *Applying the Model*, select your SAP HANA instance and logon to the <DOMAIN USER> account.
18. In the dialog box, select SAP_RDS_PA_BANK.VW_CUST_PROFILE
19. **Result:** The *Model* is ready for use as the basis for prediction. Continue to the next section for the prediction phase.

Predicting

In SAP Predictive Analytics, the training and the prediction phases are a continuous process. To initiate the *Predict Phase*, continue from the last step of the previous section.

1. From *Run*, select *Apply Model*
2. Specify the data set for predictions using your *Model* in the *Application Data Set* section.
   a. *Select Database*
   b. *Browse* and populate the dialog box with your SAP HANA instance
   c. Logon to the <DOMAIN USER> account.
   d. Choose *Browse Data*
   e. In the dialog box, select SAP_RDS_PA_BANK.CUST_PROFILE (returning the data from the table you previously loaded into SAP HANA)

   If browsing the data doesn't show this view, enter the name in the dialog box to use as a search field

3. From *Generation Options*, select *Decision* for the *Generation Options*
4. Leave *Apply* as the *Mode*
5. Select where the generated output is stored by making the following entries in the *Results Generated by the Model* section:
    a. Select *Database*
    b. *Browse* and populate the dialog box with your SAP HANA instance
    c. Logon to the <DOMAIN USER> account.
    d. *Browse Data* and in the resulting dialog box, select SAP_RDS_PA_BANK.CUST_ATTRITION_RESULTS

       The correct SAP_RDS_PA_BANK.CUST_ATTRITION_RESULTS table is all upper case
6. Select the *Apply* button to execute the *Model*
7. Choose the *Delete* option for the *Update will attempt to merge the runs together* dialog box, to remove output rows from the previous run. When the cycle is complete, SAP Predictive Analytics returns statistical information available under the *Display* bar.
8. **Result:** The predicted data is written back to the SAP HANA schema SAP_RDS_PA_BANK as a table CUST_ATTRITION_RESULTS. To view the results in SAP Predictive Analytics, select the VW_ CUST_ATTRITION_RESULTS *View*, which joins the results with the original data.

Expert Analytics (using the second approach)

Training the Model

1. Select the LUMS for Banking_Customer_Attrition_Analysis - Train
    a. Launch Expert Analytics in SAP Predictive Analytics. Open menu File and choose Import to folder and import or if the LUMS file is already imported browse through the Documents list for Banking_Customer_Attrition_Analysis - Train.lums file.
    b. In the dialog box, enter the SAP HANA server details, your user name, and password
2. Verify the data
    a. Choose *Prepare* panel to ensure that the data has loaded properly.
3. Switch to the *Predict* panel to view the predictive model
4. Adjust the ***HANA C4.5 - 4 independent cols*** Algorithm Component
    a. Choose *Configure Settings*
    b. Select the *Properties/Output Information/Output Mode* to *Trend*
    c. Select *Properties/Column Selection/Features* for the independent columns (variables) for analysis. By default, the following are enabled:
    - Average Tenure
    - Average Income
    - Average Savings Amt
    - Average Investment Amt

    d. Choose *Properties/Column Selection/Target Variable* for the dependent column (variable) for analysis. By default *Attrition* is enabled
    e. Select *Advanced/Tree Pruning/Minimum Split* and enter the value *10.*
    f. Select *Done*
5. At this point, run the *Algorithm Component* (*Run Till Here*) before continuing the analysis. Choose *Yes* to switch to the *Results* view for verifying the execution results
6. Adjust the ***HANA C4.5 - 3 independent cols*** Algorithm Component
    a. Choose *Configure Settings*
    b. Select *Properties/Output Information/Output Mode* to *Trend*

c. Select *Properties/Column Selection/Features* for the independent columns (variables) for analysis. By default, the following are enabled:

- Average Tenure
- Average Income
- Average Investment Amt

d. In the *Properties/Column Selection/Target Variable*, choose the dependent column (variable) for analysis. By default, *Attrition* is enabled

e. Select *Advanced/Tree Pruning/Minimum Split* and enter the value *50.*

f. Select *Done*

7. At this point, run the Algorithm Component first (Run Till Here) before continuing the analysis. Choose Yes to switch to the Results view for verifying the execution results. The results should look similar to HANA C4.5 - 4 independent cols Algorithm, though with less complexity in decision tree.
   a. Select *HANA C4.5 - 3 independent cols* component. From *Component Actions* select *Save as Model.*
   b. Specify the *Save Model Attrition_C4.5_3_indep_cols* as *Model Name*
   c. Select the *Overwrite* row and choose *Save*
8. Export Saved Model
   a. From *Components* list, expand *Models*
   b. Select *Attrition_C4.5_3_indep_cols*
   c. From *Component Actions*, select *Export Model*
   d. Choose *Use this option to export data models to the SAP Predictive Analytics Archive (*.spar) file*
   e. Change File Name to *Attrition_C4.5_3_indep_cols.spar.*
   f. Select *Save*

Predicting

Once the model is trained, the PREDICT LUMS is used with SAP Predictive Analytics for predictive modeling and the visualizations for the analysis using current data. The following steps must be executed to configure the PREDICT LUMS.

1. Select the LUMS for Banking_Customer_Attrition_Analysis - Predict
   a. Launch Expert Analytics in SAP Predictive Analytics. Open menu File and choose Import to folder and import or if the LUMS file is already imported browse through the Documents list for Banking_Customer_Attrition_Analysis - Predict.lums file.
   b. In the dialog box, enter the SAP HANA server details, your user name, and password.
2. Verify the data
   a. Choose *Prepare* panel to ensure that the data has loaded properly.
3. Switch to the *Predict* panel to view the predictive model. Banking_Customer_Attrition_Analysis - Predict.lums include default saved model *Attrition_C4.5_3_indep_cols* imported into the analysis.
4. From Components list, select the '+' button.
5. Select *Import Model*
   a. Locate the saved *Attrition_C4.5_3_indep_cols.spar,* and choose *Open*
   b. Select model *Attrition_C4.5_3_indep_cols* and choose *Finish*
6. Expand Models to select and drag *Attrition_C4.5_3_indep_cols* into *Analysis* screen
7. Adjust the ***HANA C4.5 - 3 independent cols*** Algorithm Component
   a. Choose *Configure Settings*
   b. Select in the *Properties/Output Information/Output Mode* to *Trend*

c. Select *Properties/Column Selection/Features* and choose the independent columns (variables) for analysis.
d. Select: *Average Tenure, Average Income,* and *Average Investment Amt* identical to saved model

8. Adjust the **HANA Writer** Data writer component
    a. Select *Configure Settings*
    b. Specify *Schema Name*, *Table Type*, and *Table Name* as appropriate for your site
9. Choose *Run* to execute the scenario
10. Choose *Yes* to switch to the *Results* view for verifying the execution results.

4.2 Consumer Products

For the Consumer products industry, we have pre-built scenarios for 3 use cases such as Brand sentiment and sales analysis, Demand data analysis, Product fulfillment and Optimization. Depending on the use case and the functionality that we are analyzing, we have picked up either the Automated Analytics or the Expert Analytics approach.

Basically for the Demand data analysis and Product fulfillment and Optimization use cases, we have used the leading SAP application Demand signal management as the data source and sample data sets are available for the same. With regard to the Brand sentiment and sales analysis, we have built a generic data set and seeded sample data set for building the predictive models.

Note: Any SAP or non-SAP customer would be able to deploy or mimic the data structure, load the data and use the pre-built models.

4.2.1 *Brand Sentiment and Sales Analysis*

In this use case, we are trying to identify the brand sentiment during a major event and predicting the sales for the upcoming similar events based on the brand value.

The following section describes configuration for the Brand Sentiment and Sales Analysis scenario. The generation and applying of this model will generate a table in SAP HANA, which is then combined with *Profile* information and made visible via a database view in SAP HANA. The data in this view can then be displayed using any tool that can read SAP HANA.

Automated Analytics

Training the Model

1. Launch SAP Predictive Analytics
2. Choose the *Modeler* section
3. Select *Create a Classification/Regression Model*
4. Select *Database* on the *Select a Data Source* screen
5. Select your SAP HANA instance
6. Logon to the <Domain User> account via the *Browse* button
7. You now need to specify the *Data Set* to use to *Train* your data model. Choose SAP_RDS_PA_CPG.SEM_MODEL_BASE

   For more information on loading data into the SAP_RDS_PA_CPG.SEM_MODEL_BASE data set, see *Predictive Analytics for Consumer Products (K38)* configuration guide that is part of this solution.
8. On the next screen, choose *Analyze*
9. Assign *Key* as “1” against SALES_DATE, PRODUCT_NAME and EVENT
10. Check the *Add Filter in data Set* on the bottom left section of the screen.
11. Choose *Next*
12. Enter a filter for the date range of SALES_DATE using the format of YYYY-DD-MM, for example, SALES_DATE <= 2014-02-15 and SALES_DATE >= 2012-02-13 (your range is based upon the date range of your data set).
13. Enter a filter for the PRODUCT_NAME = PRODUCT 1/PRODUCT 2 (based on which product you want to select for modeling)
14. On the next screen, use SALES_AMT as the target variable and
    a. For training a model, which is **based on event**, use SMC1, SMC2, HLYDSSN, SALES_DATE as Explanatory Variables Selected and exclude the rest of the variables

b. For training a model, which is **not based on event**, use SALES_DATE as predictor variables and exclude the rest of the variables

15. On the next screen, name the *Model*:
    a. P1_EVENT: If you applied “PRODUCT 1” filter on PRODUCT_NAME and kept SMC1, SMC2 and HLYDSSN as predictor variables
    b. P2_EVENT: If you applied “PRODUCT 2” filter on PRODUCT_NAME and kept SMC1, SMC2 and HLYDSSN as predictor variables
    c. P1_NOEVENT: If you applied “PRODUCT 1” filter on PRODUCT_NAME and did not keep SMC1, SMC2 and HLYDSSN as predictor variables
    d. P2_NOEVENT: If you applied “PRODUCT 2” filter on PRODUCT_NAME and did not keep SMC1, SMC2 and HLYDSSN as predictor variables
16. Choose *Generate*
17. You have created a model with the statistics and the metadata used for applying to your date-specific sales data.
18. Review the *Training the Model* display to validate your model. The most important values are the quality indicator KI and the robustness indicator KR. For more information, see the Appendix for links to SAP Predictive Analytics documentation.
19. Choosing *Using the Model* initiates the Predict Phase that is described in the following section.
20. **If you feel confident that this model is reflective** of the additional data sets you are planning to apply this model to for prediction purposes, SAVE this model for future runs.
    a. Expand the *Save/Export* band and then choose *Save Model*
    b. Specify the location where you want the model saved (SAP HANA Database, text file, and so on).
    c. Choose *Save* to that location.

    The location of the saved model is entered when using *Load a Model* for additional predictions.
21. **If you feel less confident about your model** because the Predictive Power (KI) and Predictive Confidence (KR) on the screen are low (less than .9), then more modeling is required. For more information you about modeling using SAP Predictive Analytics, see the User Guide referenced in the Appendix.
22. When additional modeling fails to indicate a trend or does not provide significant degree of confidence in the results, review the data set being used. If the data set is divergent or sparse, it cannot support the generation of a robust model.
23. **Result**: The *Model* is ready for use as the basis for prediction. Continue to the next section for the prediction phase.

Predicting

SAP Predictive Analytics combines the training and the prediction phases into a continuous process. To initiate the *Predict Phase*, continue from the last step of the previous section.

Use the following procedure to specify which data set to apply to the model, what is generated, and where the generated output is stored.

1. From the *Run* band, select *Apply Model*
2. Specify which data set to apply the model in the *Application Data Set* section.
3. Select *Database*
4. Browse and populate the dialog box with your SAP HANA instance
5. Logon using the <Domain User> account
6. Use SAP_RDS_PA_CPG.SEM_MODEL_BASE to apply to the model. The data includes the future values of the dates and events.
7. To specify what is to be generated:

8. From *Generations Options*, select *Predicted Value Only*
9. Use *Apply* as the *Mode*
10. To specify where the generated output is stored, enter the following in *Results Generated by the Model* section:
11. Select *Database*
12. Browse and enter the SAP HANA instances and logon for the <Domain User> account in the dialog box.
13. Depending on the model you use, stored tables that were applied to the model appear, for example SAP_RDS_PA_CPG.SEM_MODEL_BASE_P1_EVENT, SAP_RDS_PA_CPG.SEM_MODEL_BASE_P1_NOEVENT, SAP_RDS_PA_CPG.SEM_MODEL_BASE_P2_EVENT and SAP_RDS_PA_CPG.SEM_MODEL_BASE_P1_NOEVENT.
14. Select the *Apply* button to execute the model
15. In the *Update will attempt to merge the runs together* dialog box, choose the *Delete* option to remove output rows from the previous run.
16. **Result**: The predicted data is written back to the SAP HANA schema SAP_RDS_PA_CPG as tables. To view the results in SAP Predictive Analytics, select the table created in the predict phase.

4.2.2 *Demand Data Analysis*

In this use case, we are identifying what products are doing well in a particular region and how well they are selling across different segments of population in those communities.

The following section describes configuration for two scenarios. The solution preconfigured content is provided in LUMS format files for each scenario. There are no dependencies and scenarios can be deployed individually or together, depending on your needs.

Expert Analytics

Demand Forecasting

1. Select the LUMS for Consumer Demand Forecasting
    a. Launch Expert Analytics in SAP Predictive Analytics. Open menu File and choose Import to folder and import or if the LUMS file is already imported browse through the Documents list for Consumer_Demand_Forecasting_Analysis.lums or Consumer_Demand_Forecasting_Analysis_DSiM.lums (for SAP Demand Signal Management data) file.
    b. In the dialog box, enter the SAP HANA server details, your user name, and password.
2. Verify the data
    a. Choose Prepare panel to ensure that the data has loaded properly.
3. Switch to the *Predict* panel to view the predictive model.
4. Select **Filter** in the analysis panel
    a. Choose *Configure Settings*
    b. Select Row Filter and update the value and Validate
5. Adjust the **HANA Triple Exponential Smoothing independent cols** Algorithm Component
    a. Choose Configure Settings
    b. Select Output Mode: Forecast
    c. Select Target Variable
    d. Select Period Custom
    e. Select Period Per Year

f. Select Start Year
g. Select Start Periods
h. Select Periods to Predict

6. Adjust the **HANA Triple Exponential Smoothing Advanced Properties (Optional)**
    a. Select Alpha, Beta, and Gamma
7. Adjust the **HANA Writer** Data writer component
    a. Select Configure Settings
    b. Specify Schema Name, Table Type and Table Name as appropriate for your site. Keep the default configuration whenever possible.
8. Choose *Run* to execute the scenario
9. Choose *OK* to switch to the *Results* view for verifying the execution results.
10. Select available charts icon to display results in charts.
11. Switch to Visualize panel and Select Components selector to display results in additional charts.
12. Switch to Compose panel and Select Components selector to display results in storyboards.

Demand Cluster

1. Select the LUMS for Demand Cluster Analysis
    a. Launch Expert Analytics in SAP Predictive Analytics. Open menu File and choose Import to folder and import or if the LUMS file is already imported browse through the Documents list for Customer_Demand_Cluster_Analysis.lums or Customer_Demand_Cluster_Analysis_DSiM.lums (for SAP Demand Signal Management data) file.
    b. In the dialog box, enter the SAP HANA server details, your user name, and password.
2. Verify the data
    a. Choose *Prepare* panel to ensure that the data has loaded properly.
3. Switch to the *Predict* panel to view the predictive model.
4. Adjust the **SAP HANA K-Means** Algorithm Component
    a. Choose *Configure Settings*
    b. Select *Features*
    c. Select *Number of Clusters*
5. Adjust the **Filter** (only in Customer_Demand_Cluster_Analysis.lums)
    a. Choose *Configure Settings*
    b. Select *Row Filter* and update the value and Validate
6. Adjust the **SAP HANA C4.5 Component** (only in Customer_Demand_Cluster_Analysis.lums)
    a. Choose *Configure Settings*
    b. Select *Features*
    c. Select *Advanced* and select *Minimum Split*
7. Adjust the **SAP HANA Normalization**
    a. Choose *Configure Settings*
    b. Select *Selected Columns*
    c. Select *Normalization Type*
    d. Select *New Maximum*
    e. Select *New Minimum*
8. Adjust the **SAP HANA Writer** Data writer component
    a. Select *Configure Settings*
    b. Specify *Schema Name*, *Table Type* and *Table Name* as appropriate for your site
9. Choose *Run* to execute the scenario

10. Choose *OK* to switch to the *Results* view for verifying the execution results.
11. Select available charts icon to display the results in charts.
12. Switch to *Visualize* panel and *Select Components* selector to display results in charts.
13. Switch to *Compose* panel and *Select Components* selector to display results in storyboards.

4.2.3 *Product Fulfillment and Optimization*

In this use case, we are identifying the different clusters of population and their buying trends of products. Based on this we are doing product association of what products are being sold together and how many quantities and if any outliers. Finally we also do a forecasting analysis of the sales of these different products.

The following section describes configuration for the two scenarios provided as part of the Cloud Trial. The solution preconfigured content is provided in LUMS format files for each scenario. There are no dependencies and scenarios can be deployed individually or together, depending on your needs.

Expert Analytics

Product Cluster

1. Select the LUMS for Product Cluster
    a. Launch Expert Analytics in SAP Predictive Analytics. Open menu File and choose Import to folder and import or if the LUMS file is already imported browse through the Documents list for Consumer_Product_Cluster_Analysis.lums or Consumer_Product_Cluster_Analysis_DSiM.lums (for SAP Demand Signal Management data)file.
2. Verify the data
    a. Choose *Prepare* panel to ensure that the data has loaded properly.
    b. To edit the input data, from *Data* menu select *Edit.*
    c. In the dialog box, enter your SAP HANA username and password.
3. Switch to the *Predict* panel to view the predictive model.

For Consumer_Product_Cluster_Analysis.lums, adjust the **R-K-Means** Algorithm Component

    a. Choose *Configure Settings*
    b. Select *Number of Clusters*
    c. Select *Features*
    d. Select Cluster *Name*
    e. Select Advanced and select *Algorithm Type*

For Consumer_Product_Cluster_Analysis_DSiM.lums, adjust the **HANA K-Means** Algorithm Component

    a. Choose *Configure Settings*
    b. Select *Number of Clusters*
    c. Select *Features*
    d. Select Cluster *Name*

4. Choose *Run* to execute the scenario
5. Choose *OK* to switch to the *Results* view for verifying the execution results. Choose available charts icon to display the results in charts.
6. Switch to *Visualize* panel and *Select Components* selector to display results in charts.

Product InterQuartile

1. Select the LUMS for Product Interquartile

a. Launch Expert Analytics in SAP Predictive Analytics. Open menu File and choose Import to folder and import or if the LUMS file is already imported browse through the Documents list for Consumer_Product_InterQuartile_Analysis.lums or Consumer_Product_InterQuartile_Analysis_DSiM.lums (for SAP Demand Signal Management data) file.
b. In the dialog box, enter the SAP HANA server details, your user name, and password.

2. Verify the data
    a. Choose *Prepare* panel to ensure that the data has loaded properly.
    b. To edit the input data, from *Data* menu select *Edit.*
    c. In the dialog box, enter your SAP HANA username and password.
3. Switch to the *Predict* panel to view the predictive model
4. Select **Filter** in the analysis panel
    a. Choose *Configure Settings*
    b. Select *Row Filter* and update the value and Validate

For Consumer_Product_InterQuartile_Analysis.lums, adjust the **Inter Quartile Range** Algorithm Component

a. Choose Configure Settings
b. Select Output Mode: Show Outliers
c. Select Features: Quantity_Sold
d. Select Predicted Column Name

For Consumer_Product_InterQuartile_Analysis_DSiM.lums, adjust the **HANA Inter Quartile Range Test** Algorithm Component

a. Choose Configure Settings
b. Select Output Mode: Show Outliers
c. Select Features: Sales Quantity
d. Select Predicted Column Name

5. Choose *Run* to execute the scenario
6. Choose *OK* to switch to the *Results* view for verifying the execution results.
7. Choose available charts icon to display the results in charts.
8. Switch to *Visualize* panel and *Select Components* selector to display results in charts.

Product Time Series

1. Select the LUMS for *Product Timeseries*
    a. Launch Expert Analytics in SAP Predictive Analytics. Open menu File and choose Import to folder and import or if the LUMS file is already imported browse through the Documents list for Consumer_Product_Timeseries_Analysis.lums or Consumer_Product_Timeseries_Analysis_DSiM.lums (for SAP Demand Signal Management data) file.
    b. In the dialog box, enter the SAP HANA server details, your user name, and password.
2. Verify the data
    a. Choose *Prepare* panel to ensure that the data has loaded properly.
    b. To edit the input data, from *Data* menu select *Edit.*
    c. In the dialog box, enter your SAP HANA username and password.
3. Switch to the *Predict* panel to view the predictive model.

4. Select **Filter** in the analysis panel
    a. Choose *Configure Settings*
    b. Select *Row Filter* and update the value and *Validate*

For Consumer_Product_Timeseries_Analysis.lums, adjust the **R-Triple Exponential Smoothing** Algorithm Component

    a. Choose *Configure Settings*
    b. Select *Output Mode:* Forecast
    c. Select *Period to Predict:* 10
    d. Select *Target Variable:* Quantity_Sold
    e. Select *Period*
    f. Select *Periods per Year*
    g. Select *Start Period*
    h. Select *Start Year*
    i. Select *Year Values*
    j. Select *Period Values*

For Consumer_Product_Timeseries_Analysis_DSiM.lums

    c. Adjust the **HANA Triple Exponential Smoothing** Algorithm Component
    d. Choose *Configure Settings*
    e. Select *Output Mode:* Forecast
    f. Select *Period to Predict:* 10
    g. Select *Target Variable:* Sales Quantity
    h. Select *Period*
    i. Select *Periods per Year*
    j. Select *Start Period*
    k. Select *Start Year*
    l. Select *Year Values*
    m. Select *Period Values*

5. Choose *Run* to execute the scenario
6. Choose *OK* to switch to the *Results* view for verifying the execution results.
7. Choose available charts icon to display the results in charts.
8. Switch to *Visualize* panel and *Select Components* selector to display results in charts.

Product Association

1. Select the LUMS for Product Association
    a. Launch Expert Analytics in SAP Predictive Analytics. Open menu File and choose Import to folder and import or if the LUMS file is already imported browse through the Documents list for Consumer_Product_Association_Analysis.lums or Consumer_Product_Association_Analysis_DSiM.lums (for SAP Demand Signal Management data) file.
    b. In the dialog box, enter the SAP HANA server details, your user name, and password.
2. Verify the data
    a. Choose *Prepare* panel to ensure that the data has loaded properly.
3. Switch to the *Predict* panel to view the predictive model.

4. Select **Filter** in the analysis panel
    a. Choose *Configure Settings*
    b. Select *Row Filter* and update the value and Validate
5. Adjust the SAP HANA Apriori Algorithm Component
    a. Choose *Configure Settings*
    b. Select *Apriori Type: Apriori Lite*
    c. Select *Item Column: Product Name*
    d. Select *TransactionID Column: Transaction ID*
6. Choose *Run* to execute the scenario
7. Choose *OK* to switch to the *Results* view for verifying the execution results.
8. Choose available charts icon to display the results in charts.
9. Switch to *Visualize* panel and *Select Components* selector to display results in charts.
10. Switch to *Compose* panel to see the results in storyboard.

4.3 Finance

For the Finance LoB, we have pre-built scenarios for 3 use cases such as Company performance analysis, Late payment management, Customer cash collection analysis. Depending on the use case and the functionality that we are analyzing, we have picked up either the Automated Analytics or the Expert Analytics approach.

Basically for the Late Payment management use case, we have used the SAP HANA Live views for Finance as the data source and sample data sets are available for the same. With regard to the Company performance analysis and Customer cash collection analysis use cases, we have built a generic data set and seeded sample data set for building the predictive models.

Note: Any SAP or non-SAP customer would be able to deploy or mimic the data structure, load the data and use the pre-built models.

4.3.1 *Company Performance Analysis*

In this use case, we focus on leveraging the key trends such as fuel prices, unemployment and many more variables to do more accurate predictions of revenue, margin and profit for a particular company.

Expert Analytics

1. Select the LUMS for Company_Performance_Correlation.lums
    a. Launch Expert Analytics in SAP Predictive Analytics. Open menu File and choose Import to folder and import or if the LUMS file is already imported browse through the Documents list for Company_Performance_Correlation.lums file.
    b. In the dialog box, enter the SAP HANA server details, your user name, and password.
2. Choose Prepare tab and ensure that the data has loaded properly
3. Switch to the *Predict* tab to view the predictive model.
4. Configure the filter components for filtering the data, when necessary
5. Adjust the properties of the Correlation of revenue with external factors component, for example, the independent columns selected for the analysis.
6. Adjust the properties for the other algorithm components:
    - Correlation of profit with external factors
    - Correlation of margin with external factors
7. Choose *Run* to run the algorithm and execute the scenario
8. Choose *Yes* to switch to the *Results* view.

4.3.2 *Late-Payment Management*

In this use case, we focus on vendors who are likely to be the late payers ahead of time so that they can be handled accordingly.

There are two LUMS files used for this scenario. In the configuration, you use the F*inance_Customer_Late_Payments_**train**.lums* to train the prediction model. When predicting, you use the *Finance_Customer_Late_Payments_**predict**.lums.*

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Expert Analytics

1. Select the LUMS for Finance_Customer_Late_Payments_Train

a. Launch Expert Analytics in SAP Predictive Analytics. Open menu File and choose Import to folder and import or if the LUMS file is already imported browse through the Documents list for Finance_Customer_Late_Payments_train.lums file.
b. In the dialog box, enter the SAP HANA server details, your user name, and password.

2. To verify the data, choose *Prepare* tab to ensure that the data has loaded properly
3. Switch to the *Predict* panel to view the predictive model.
4. Configure the following components:
   a. Adjust the Filter component, if necessary. For example, you can choose to restrict the time period of the financial documents being analyzed for training the model.
   b. Adjust the **HANA C4.5 Decision Tree Component**, if necessary.
   c. Select/deselect from the independent columns already selected for the analysis, if needed.
   d. Adjust any other properties, if necessary. For more information about properties, see the SAP Predictive Analytics User Guide in the Appendix.
5. Choose *Run* to execute the scenario and run the algorithm
6. Choose *Yes* to switch to the *Results* view to verify the execution results.
7. (Optional) Highlight the SAP HANA C4.5 Decision Tree and save the model
8. (Optional) Export the model as SAP Predictive Analytics (.spar) file, for use with PREDICT LUMS file.

   For configuration purposes, only the procedure for the TRAIN LUMS is described. Actual data is run with the PREDICT LUMS after the model has been trained.

4.3.3 *Customer Cash Collection Analysis*

In this use case, we focus on the debt collectors who are likely to recover payments from a pool of customers who would likely pay, if approached ahead of time in a particular mode.

Automated Analytics

Training the Model

1. Launch SAP Predictive Analytics
2. Choose Automated Analytics - Modeler - Create a Classification/Regression Model
3. On the Select a Data Source enter the SAP HANA server details, your user name and password and specify the Data Set name VW_PREDICT.
4. Choose Analyze and wait for the metadata to appear
5. Set the Key and Order of TENANCY_SKEY to 1's, for PERSON_SKEY to 2's, and KxIndex to 3's
6. On the Selecting Variables screen, move PAYMENT_EVALUATION to be the only Target Variables entry,
7. Move all variables that are not part of the Regression Analysis to the Excluded Variables box

   The ones to be moved are:

   TENANCY_SKEY
   PERSON_SKEY
   PAR_REFNO
   PAR_REUSABLE_REFNO
   CREATE_RUN_SKEY
   MODIFY_RUN_SKEY
   ACCOUNT_BALANCE_AVG
   HOW_CONTACTED
   CONTACT_SUCCESSFUL
   DAYS_BEFORE_DUE
   REPAIR_NOTICE_DATE_1
   REPAIR_TYPE_1

REPAIR_DEBT_WITHHELD_1
DEBT_PAID_AFTER_COMPLETION_1
REPAIR_NOTICE_DATE_2
REPAIR_TYPE_2
REPAIR_DEBT_2_WITHHELD
DEBT_PAID_AFTER_COMPLETION_2
REPAIR_TYPE_3
REPAIR_DEBT_WITHHELD_3
DEBT_PAID_AFTER_COMPLETION_3
REPAIR_NOTICE_DATE_3
TOTAL_REPAIR_DEBT_OUTSTANDING
CONTACTED
CONTACTED_BY_EMAIL
CONTACTED_BY_HOME_VISIT
CONTACTED_BY_LETTER
CONTACTED_BY_LARGE_PRINT
EMAIL_SUCCESS
HOME_VISIT_SUCCESS
LETTER_SUCCESS
LARGE_PRINT_SUCCESS

8. On the next screen, Summary of Modeling Parameters, select Generate
9. The Model Overview screen then appears
10. View the KI and KR values
11. Go to the Next and view various Display Views.
12. For additional displays of the data, go to Section 5.4 Visualization, Insight Portion

Predicting

1. Launch SAP Predictive Analytics
2. Choose Automated Analytics - Modeler - Create a Clustering Model
3. On the Select a Data Source enter the SAP HANA server details, your user name and password and specify the Data Set name VW_PREDICT_1_HOME_VISIT.
4. Choose Analyze and wait for the metadata to appear
5. Set the Key and Order of TENANCY_SKEY to 1's, for PERSON_SKEY to 2's, and KxIndex to 3's
6. On the Selecting Variables screen, move HOME_VISIT_SUCCESS to be the only Target Variables entry and move all variable that are not part of the Clustering Analysis to the Excluded Variables box
   The ones to be moved are:

TENANCY_SKEY
PERSON_SKEY
PAR_REFNO
PAR_REUSABLE_REFNO
CREATE_RUN_SKEY
MODIFY_RUN_SKEY
ACCOUNT_BALANCE_AVG
HOW_CONTACTED
CONTACT_SUCCESSFUL
DAYS_BEFORE_DUE
REPAIR_NOTICE_DATE_1
REPAIR_TYPE_1
REPAIR_DEBT_WITHHELD_1
DEBT_PAID_AFTER_COMPLETION_1

REPAIR_NOTICE_DATE_2
REPAIR_TYPE_2
REPAIR_DEBT_2_WITHHELD
DEBT_PAID_AFTER_COMPLETION_2
REPAIR_TYPE_3
REPAIR_DEBT_WITHHELD_3
DEBT_PAID_AFTER_COMPLETION_3
REPAIR_NOTICE_DATE_3
TOTAL_REPAIR_DEBT_OUTSTANDING
CONTACTED
CONTACTED_BY_EMAIL
CONTACTED_BY_HOME_VISIT
CONTACTED_BY_LETTER
CONTACTED_BY_LARGE_PRINT
EMAIL_SUCCESS
HOME_VISIT_SUCCESS
LETTER_SUCCESS
LARGE_PRINT_SUCCESS

1. On the next screen, Summary of Modeling Parameters, select Generate
2. The Model Overview screen then appears
3. View the KI and KR values
4. Go to the Next and view various Display Views

   It is important to display Clusters Summary as it is necessary to know which Clusters are "good" ones in the sense that people grouped within them are likely to respond favorably to a Home Visit and will then make their payment. Let the mouse hover over the cluster circles on the right hand side until the Cluster Number appears (like to be 2,3, and 5). Another way to determine the "good" clusters is to display the Cluster Profiles and note which ones have a high percentage of 1. The same cluster numbers should be determined: 2, 3, and 5.
5. On the Using the Model screen, select RUN then Apply Model
6. On the Applying the Model screen, enter VW_PREDICT_0 - these are all of the non-payers to be evaluated
7. Leave the Generation Options as they are
8. In the Results Generated by the Model section, set the Data Type to Text Files, then specify a directory and a file name on your computer where you want the output file to go.
9. When the model was applied successfully, select View Output

   Note that this same output is in the output file specified previously.
10. To save this Model, select Save /Export – Save Model on the Using the Model screen
11. Fill in the Model Name and Description, set the Data Type to Text File and specify the folder and filename where it is to be saved.

    If other Contact Methods are to be predicted, substitute VW_PREDICT_1_EMAIL, VW_PREDICT_1_LETTER, or VW_PREDICT_1_LARGE_PRINT for VW_PREDICT_1_HOME_VISIT in the Select a Data Source when building the Cluster Model.

4.4 Manufacturing

For the Manufacturing LoB, we have pre-built scenarios for 4 use cases such as Customer demand and inventory management, Overall equipment effectiveness, Asset breakdown analysis and Maintenance cost analysis. Depending on the use case and the functionality that we are analyzing, we have picked up either the Automated Analytics or the Expert Analytics approach.

Basically for the Overall equipment effectiveness, Asset Breakdown Analysis use cases and Maintenance cost analysis use cases, we have used the HANA Live views for SAP PM as the data source and sample data sets are available for the same. With regard to the Customer demand and inventory management use case, we have built a generic data set and seeded sample data set for building the predictive models.

Note: Any SAP or non-SAP customer would be able to deploy or mimic the data structure, load the data and use the pre-built models.

4.4.1 *Customer Demand and Inventory Management*

In this use case, we focus on what particular brand of products would do well if released in a particular time of the year and do predictions about how this can be applied for new set of products.

Expert Analytics

1. Set the following parameters by using this Parameters Table:

Parameter	Filter Setting
Period	Length of the actual or predictive period: Q for Quarter, M for Month
Start_Year	Starting year of the actual data
Start_Qtr	IF the period is Q, the starting quarter of the actual data
Start_Mth	IF the period is M, the starting month of the actual data
Act_Periods	Actual number of periods (quarters or months) for review in the Predictive Analytics
Dim_1_Val (Region_Key)	Value of the Region Key in the data: ALL if all Regions are to be used
Dim_2_Val (Distr_Chan_Key)	The value of the Distribution Channel Key in the data: ALL if all Distr_Chan are to be used
Dim_3_Val (Product_Key)	The value of the Product Key in the data: ALL if all Products are to be used

2. Launch Expert Analytics in SAP Predictive Analytics. Open menu File and choose Import to folder and import or if the LUMS file is already imported browse through the Documents list for Mfg_Pred_Sales_Set_Parameters.lums file.
3. In the dialog box, enter the SAP HANA server details, your user name, and password.
4. Choose *Prepare* to ensure that the data has loaded properly
5. Switch to the *Predict* panel to view the predictive model.
6. Find the eight possible filter settings (described in the previous parameters table) to be made that define the data to analyze for projection; some filter settings are mutually exclusive. (If all filter settings are not visible, scroll down to reveal).
7. Values for the three Keys (Region, Distribution Channel, and Product) must be equal to the values in the dimension tables in the star schema SAP HANA account (SAP_RDS_PA_MFG).If you are

uncertain these values are equal, choose Execute the document icon on the far left-hand side of the screen (PREFERENCES_MFG_SALES_PARAMETER_VALUES) and choose Yes when asked Do you want to switch to the Results view? A matrix of the input table appears. Scroll to find the values for the parameter to ensure that they are equal.

8. If all of a dimension is to be included for analysis, enter *ALL* in the parameter setting box when configuring the *Filter*.
9. Choose *Run* to run the algorithm and execute the scenario
10. Choose *Yes* to switch to the *Results* view.
11. *Close* and *Save* the Settings

4.4.2 *Overall Equipment Effectiveness*

In this use case, we focus on identifying the overall availability, performance and quality of equipment.

Expert Analytics

1. Set the following parameters by using this Parameters Table:

Parameter	Filter Setting
Period	Length of the actual/predictive period: Y for Year, Q for Quarter, M for Month, W for Week
Start_Year	Starting year of the actual data
Start_Qtr	IF the period is Q, the starting quarter of the actual data
Start_Mth	IF the period is M, the starting month of the actual data
Start_Wk	IF the period is W, the starting week of the actual data
Act_Periods	Actual number of periods (years, quarters, months, or weeks) for review in the Predictive Analytics
Zero_Fill_Missing_Time_Periods	'N' for No, 'Y' for yes Note: only use if you having missing period data and want to use 0 for the absent periods.
Corp_Node_ID	The value of the Corp Node ID- values is in the input document Note: the ID will begin with 'E' for Explosion, 'S' for single level The corporate hierarchy root node is always 'E1'

2. Launch Expert Analytics in SAP Predictive Analytics. Open menu File and choose Import to folder and import or if the LUMS file is already imported browse through the Documents list for Mfg_OEEQUERY_Set_Parameters.lums file.
3. In the dialog box, enter the SAP HANA server details, your user name, and password.
4. Choose *Prepare* to ensure that the data has loaded properly
5. Switch to the *Predict* panel to view the predictive model.
6. Find the 8 possible filter settings (described in the previous parameters table) to be made that define the data to analyze for projection; some filter settings are mutually exclusive. (If all filter settings are not visible, scroll down to reveal).
7. Value for the Corp_Hier_ID must be equal to one of the values in the table in the star schema SAP HANA account (SAP_RDS_PA_MFG).
8. IF you are uncertain these values are equal, choose *Execute the document* icon on the far left-hand side of the screen *(PREF_MFG_OEEQUERY_PARAM_VALUES) and* choose *Yes* when asked *Do*

you want to switch to the Results view? A matrix of the input table appears. Scroll to find the values for the parameter to ensure that they are equal.

Note that for the *Explosion* values (ID starting with 'E') the values of the node below the one being listed in the row is displayed

Note that for the Single values (ID starting with 'S') the values of the nodes above the one being listed in the row is displayed

9. Choose *Run* to run the algorithm and execute the scenario
10. Choose *Yes* to switch to the *Results* view.
11. *Close* and *Save* the Settings
12. Adjust the properties of the *Advanced Properties* if needed.
13. When running the *SAP HANA Double Exponential Smoothing Algorithm* in Predictive Analytics, the following parameters are available to set for the execution in the *Advanced Properties* section:

Name	Data Type	Description
ALPHA	DOUBLE	Value of the smoothing constant alpha ($0 < \alpha < 1$).
BETA	DOUBLE	Value of the smoothing constant beta ($0 < \beta < 1$).

4.4.3 *Asset Breakdown Analysis*

In this use case, we focus on identifying the assets that are likely to break down based on historic facts and mean time between failures, repairs etc.

Automated Analytics

Manipulating the Data

1. Launch SAP Predictive Analytics
2. Choose the *Data Manager* section
3. Select *Create a Data Manipulation*
4. Create a separate data manipulation set for EQUIPMENT, CLASS and MANUFACTURER attributes.
5. In the *Define New Data Manipulation* window, select your SAP HANA instance and connect using the <HANA Domain User> account via the *Browse* button
6. Now specify the data set that will serve as the base table for your data manipulation and time series analysis. The database views with your SAP HANA Live maintenance object breakdown data are:

Attribute	Data Source
EQUIPMENT	SAP_RDS_PA_MFG.VW_MAINTBREAKDOWN_EQUIPMENT
CLASS	SAP_RDS_PA_MFG.VW_MAINTBREAKDOWN_CLASS
MANUFACTURER	SAP_RDS_PA_MFG.VW_MAINTBREAKDOWN_MANUFACTURER

7. Choose *Next* to load the data set
8. In the Data Manipulation Editor Window, select 'Main' tab.

9. Select the *Prompts* tab. Add prompt using data set column from data source. Set ‘Default Value’ from the data set as needed.

Prompt	Data Set Column
Selected_Equipment	EQUIPMENT
Selected_Class	CLASS
Selected_Manufacturer	ASSETMANUFACTURERNAME

10. Select the *Filters* tab. Add condition data set column equal to prompt. *Keep Only Records* option to *Match All of the Following*.

Prompt	Data Set Column
Selected_Equipment	EQUIPMENT
Selected_Class	CLASS
Selected_Manufacturer	ASSETMANUFACTURERNAME

11. Select the *New* button and select the *Expression Editor.*
12. Add expression:
stringToDate(concat(concat(concat(left(intToString(BREAKDOWNDATEYEARMONTH) ,4) ,"-")
,right(intToString(BREAKDOWNDATEYEARMONTH) ,2)) ,"-01"))
13. Manufacturer attribute needs following expression:
14. stringToDate(concat(concat(concat(left(intToString(YEARMONTH) ,4) ,"-")
,right(intToString(YEARMONTH) ,2)) ,"-01"))
15. Enter new field name ‘BREAKDOWNDATE’ in *Enter the Computed Field Name* and select *OK.*
16. In the *Data Manipulation Editor Window,* select field ‘BREAKDOWNDATE’ and set following column values:
17. *Order* = 1*, Key* = 1, *Type* = continuous.
18. No other fields should have *Order* column set to 1.
19. Set *Key* column to 1

Attribute	Fields	Key column
EQUIPMENT	EQUIPMENT, EQUIPMENTNAME	1
CLASS	CLASS, CLASSNAME	1
MANUFACTURER	ASSETMANUFACTURERNAME	1

20. Set field *Type* column to ‘continuous’

Attribute	Measure	Type column
EQUIPMENT	NMBROFACTUALMAINTOBJECTBRKDWNS	continuous
CLASS	NMBROFACTUALMAINTOBJECTBRKDWNS	continuous
MANUFACTURER	NMBROFREPORTEDMAINTOBJBRKDWNS	continuous

21. Select *Next.*
22. Save the data manipulation to SAP HANA for use in predictive modeling

Attribute	Data Manipulation
EQUIPMENT	DM_MAINTBREAKDOWN_EQUIPMENT
CLASS	DM_MAINTBREAKDOWN_CLASS
MANUFACTURER	DM_MAINTBREAKDOWN_MANUFACTURER

23. Repeat these steps to create data manipulation for each attribute.
24. **Result:** The Data Manipulation is ready for use in predictive model development. Continue to the next section for information on developing a predictive model.

Predicting

This section describes how to use the data manipulation created above to build a predictive model for maintenance object breakdown forecasting based on maintenance history. Using maintenance object breakdown reports, the model is created to forecast future breakdown frequencies.

1. From the home screen of SAP Predictive Analytics, select the *Modeler* section
2. Select *Create a Time Series Analysis*
3. In the *Select a Data Source* window,
4. Choose *Browse* and connect to your SAP HANA instance using the <Domain User> logon
5. Then select the *Browse* button again to select the data set that will be used for predictive modeling. Data manipulations appear at the top of the list of options

Attribute	Data Manipulation
EQUIPMENT	DM_MAINTBREAKDOWN_EQUIPMENT
CLASS	DM_MAINTBREAKDOWN_CLASS
MANUFACTURER	DM_MAINTBREAKDOWN_MANUFACTURER

6. Choose *Next* to continue.
7. Enter the attribute prompt value to filter the data set, for example, EQUIPMENT, CLASS, MANUFACTURER
8. After entering the value, choose *OK* to begin modeling
9. Choose *Analyze* and a description for the data set appears.
10. Choose *Next* when the data description accurately describes the data

    The data set description was previously completed during the data manipulation steps. You will not need to change anything in this window
11. Validate Key, Order and Value column definition ‘BREAKDOWNDATE’ column: *Order* = 1, *Key* = 1, *Type* = continuous.

Attribute	Fields	Key column
EQUIPMENT	EQUIPMENT, EQUIPMENTNAME	1
CLASS	CLASS, CLASSNAME	1
MANUFACTURER	ASSETMANUFACTURERNAME	1

12. In the *Selecting Variables* screen, set BREAKDOWNDATE as the TIME variable and NMBROFACTUALMAINTOBJECTBRKDWNS as the TARGET variable. Exclude the all other variables from the analysis. You can keep the Predictive Analytics selected to *Last Training Date* or choose your own.
13. Select *Next*
14. Set *Number of Forecasts:* to desired number of months, for example *12*, for 12 monthly forecast
15. If desired, select *Advanced* button to set additional parameters.
16. Choose *Generate to build your time series analysis with SAP Predictive Analytics*
17. In the *Using the Model* screen, select *Display* and review the resulting model by viewing *Model Overview, View Forecast, View Signal Components, Regressions:Contributions* by *Variables, Statistical Reports*
18. After reviewing the model results, choose *Save/Export* and select *Apply Model*
19. In the *Applying the Model* screen,

    Application Data Set

    Data Type: Data Base

    Folder: HANA ODBC connection

    Data: data manipulation

Attribute	**Data Manipulation**
EQUIPMENT	DM_MAINTBREAKDOWN_EQUIPMENT
CLASS	DM_MAINTBREAKDOWN_CLASS
MANUFACTURER	DM_MAINTBREAKDOWN_MANUFACTURER

    Generation Options

    Generate: choose 'Only First Forecast Column and the Error Bars'

    Results Generated by the Model

    Data Type: Database

    Folder: HANA ODBC connection

    Data:

Attribute	**Model Results**
EQUIPMENT	SAP_RDS_PA_MFG.SII_RESULTS_BREAKDOWN_EQUIPMENT
CLASS	SAP_RDS_PA_MFG.SII_RESULTS_BREAKDOWN_CLASS
MANUFACTURER	SAP_RDS_PA_MFG.SII_RESULTS_BREAKDOWN_MANUFACTURER

20. Select *Apply*
21. After reviewing model results, save this model to the SAP HANA schema SAP_RDS_PA_MFG

    Saving the Model

    Model Name: default

    Description: description of model

Data Type: Data Base
Folder: HANA ODBC connection
File/Table:

Attribute	Model
EQUIPMENT	SAP_RDS_PA_MFG.SII_MODEL_BREAKDOWN_EQUIPMENT
CLASS	SAP_RDS_PA_MFG.SII_MODEL_BREAKDOWN_CLASS
MANUFACTURER	SAP_RDS_PA_MFG.SII_MODEL_BREAKDOWN_MANUFACTURER

22. **Result:** A maintenance breakdown time series forecasting analysis using HANA Live maintenance breakdown reports data is saved to SAP HANA.

4.4.4 *Maintenance Cost Analysis*

In this use case, we focus on identifying the maintenance costs for assets based on historic data and trends.

Automated Analytics

Manipulating the Data

1. Launch SAP Predictive Analytics
2. Choose the *Data Manager* section
3. Select Create a Data Manipulation

   You will need to create a separate data manipulation set for ACTIVITYTYPE, EQUIPMENT, FUNCLOCATION, MANUFACTURER, ORDERTYPE, and PLANNERGROUP attributes.
4. In the Define New Data Manipulation window, select your SAP HANA instance and connect using the <HANA Domain User> account via the *Browse* button
5. Now specify the data set that will serve as the base table for your data manipulation and time series analysis. The database views with your HANA live maintenance cost data are:

Attribute	Data Source
ACTIVITYTYPE	SAP_RDS_PA_MFG.VW_MAINTCOST_ACTIVITYTYPE
EQUIPMENT	SAP_RDS_PA_MFG.VW_MAINTCOST_ACTIVITYTYPE
FUNCLOCATION	SAP_RDS_PA_MFG.VW_MAINTCOST_FUNCLOCATION
MANUFACTURER	SAP_RDS_PA_MFG.VW_MAINTCOST_MANUFACTURER
ORDERTYPE	SAP_RDS_PA_MFG.VW_MAINTCOST_ORDERTYPE
PLANNERGROUP	SAP_RDS_PA_MFG.VW_MAINTCOST_PLANNERGROUP

6. Choose *Next* to load the data set
7. In the Data Manipulation Editor Window, select ‘Main’ tab.
8. Select the *Prompts* tab. Add prompt using data set column from data source. Set ‘Default Value’ from the data set as needed.

Prompt	Data Set Column
Selected_ActivityType	MAINTENANCEACTIVITYTYPE
Selected_Equipment	EQUIPMENT
Selected_Funclocation	FUNCTIONALLOCATION
Selected_Manufacturer	ASSETMANUFACTURERNAME
Selected_OrderType	MAINTENANCEORDERTYPE
Selected_PlannerGroup	MAINTENANCEPLANNERGROUP

9. Select the *Filters* tab. Choose New condition data set column equal to prompt. *Keep Only Records* option to *Match All of the Followin*g.

Prompt	Data Set Column
Selected_ActivityType	MAINTENANCEACTIVITYTYPE
Selected_Equipment	EQUIPMENT
Selected_Funclocation	FUNCTIONALLOCATION
Selected_Manufacturer	ASSETMANUFACTURERNAME
Selected_OrderType	MAINTENANCEORDERTYPE
Selected_PlannerGroup	MAINTENANCEPLANNERGROUP

10. Select the *New* button and select the *Expression Editor.*
11. Add expression: stringToDate(concat(concat(concat(left(intToString(POSTINGDATEYEARMONTH) ,4) ,"-") ,right(intToString(POSTINGDATEYEARMONTH) ,2)) ,"-01"))
12. Enter new field name 'POSTINGDATE' in *Enter the Computed Field Name* and select *OK.*
13. In the *Data Manipulation Editor Window,* select field 'POSTINGDATE' and set following column values:
14. *Order* = 1*, Key* = 1, *Type* = continuous.
15. No other fields should have *Order* column set to 1.
16. Set *Key* column to 1.

Attribute	Fields	Key column
ACTIVITYTYPE	MAINTENANCEACTIVITYTYPE, MAINTENANCEACTIVITYTYPENAME	1
EQUIPMENT	EQUIPMENT, EQUIPMENTNAME	1
FUNCLOCATION	FUNCTIONALLOCATION, FUNCTIONALLOCATIONNAME	1
MANUFACTURER	ASSETMANUFACTURERNAME	1
ORDERTYPE	MAINTENANCEORDERTYPE, MAINTENANCEORDERTYPENAME	1
PLANNERGROUP	MAINTENANCEPLANNERGROUP, MAINTENANCEPLANNERGROUPNAME	1

17. Set field *Type* column to ‘continuous’

Attributes	Measures	Type columns
ACTIVITYTYPE	PLNDMAINTCOSTINDISPLAYCRCY_E	continuous
EQUIPMENT	PLNDMAINTCOSTINDISPLAYCRCY_E	continuous
FUNCLOCATION	PLNDMAINTCOSTINDISPLAYCRCY_E	continuous
MANUFACTURER	PLNDMAINTCOSTINDISPLAYCRCY_E	continuous
ORDERTYPE	PLNDMAINTCOSTINDISPLAYCRCY_E	continuous
PLANNERGROUP	PLNDMAINTCOSTINDISPLAYCRCY_E	continuous

18. Select *Next.*
19. Save the data manipulation to SAP HANA for use in predictive modeling

Attribute	Data Manipulation
ACTIVITYTYPE	DM_MAINTCOST_ACTIVITYTYPE
EQUIPMENT	DM_MAINTCOST_EQUIPMENT
FUNCLOCATION	DM_MAINTCOST_FUNCLOCATION
MANUFACTURER	DM_MAINTCOST_MANUFACTURER
ORDERTYPE	DM_MAINTCOST_ORDERTYPE
PLANNERGROUP	DM_MAINTCOST_PLANNERGROUP

20. Repeat these steps to create data manipulation for each attribute.

Predicting

1. From the home screen of SAP Predictive Analytics, select the *Modeler* section
2. Select Create a Time Series Analysis
3. In the Select a Data Source window,
4. Choose *Browse* and connect to your SAP HANA instance using the <Domain User> logon
5. Then select the *Browse* button again to select the data set that will be used for predictive modeling. Data manipulations appear at the top of the list of options.

Attribute	Data Manipulation
ACTIVITYTYPE	DM_MAINTCOST_ACTIVITYTYPE
EQUIPMENT	DM_MAINTCOST_EQUIPMENT
FUNCLOCATION	DM_MAINTCOST_FUNCLOCATION
MANUFACTURER	DM_MAINTCOST_MANUFACTURER
ORDERTYPE	DM_MAINTCOST_ORDERTYPE
PLANNERGROUP	DM_MAINTCOST_PLANNERGROUP

6. Choose *Next* to continue.
7. Enter the attribute prompt value to filter the data set, for example ACTIVITYTYPE, EQUIPMENT, FUNCLOCATION, MANUFACTURER, ORDERTYPE, PLANNERGROUP
8. After entering the value, choose *OK* to begin modeling
9. Choose *Analyze* and a description for the data set appears.
10. Choose *Next* when the data description accurately describes the data

    The data set description was previously completed during the data manipulation steps. You will not need to change anything in this window
11. Validate Key, Order and Value column definition 'POSTINGDATE' column: *Order* = 1*, Key* = 1, *Type* = continuous.

Attribute	Fields	Key column
ACTIVITYTYPE	MAINTENANCEACTIVITYTYPE, MAINTENANCEACTIVITYTYPENAME	1
EQUIPMENT	EQUIPMENT, EQUIPMENTNAME	1
FUNCLOCATION	FUNCTIONALLOCATION, FUNCTIONALLOCATIONNAME	1
MANUFACTURER	ASSETMANUFACTURERNAME	1
ORDERTYPE	MAINTENANCEORDERTYPE, MAINTENANCEORDERTYPENAME	1
PLANNERGROUP	MAINTENANCEPLANNERGROUP, MAINTENANCEPLANNERGROUPNAME	1

12. In the *Selecting Variables* screen, set POSTINGDATE as the TIME variable and PLNDMAINTCOSTINDISPLAYCRCY_E as the TARGET variable. Exclude the all other variables from the analysis. You can keep the Predictive Analytics selected to *Last Training Date* or choose your own.
13. Select *Next*
14. Set *Number of Forecasts: to desired number of months that is, 12, for 12 monthly forecast*
15. If desired, select *Advanced* button to set additional parameters.
16. Choose *Generate to build your time series analysis with SAP Predictive Analytics*
17. In the *Using the Model* screen, select *Display* and review the resulting model by viewing *Model Overview, View Forecast, View Signal Components, Regressions:Contributions by Variables,* and *Statistical Reports*
18. After reviewing the model results, choose *Save/Export* and select *Apply Model*
19. In the *Applying the Model* screen,

    Application Data Set

    Data Type: Data Base

    Folder: HANA ODBC connection

    Data: data manipulation

Attribute	Data Manipulation
ACTIVITYTYPE	DM_MAINTCOST_ACTIVITYTYPE
EQUIPMENT	DM_MAINTCOST_EQUIPMENT

FUNCLOCATION	DM_MAINTCOST_FUNCLOCATION
MANUFACTURER	DM_MAINTCOST_MANUFACTURER
ORDERTYPE	DM_MAINTCOST_ORDERTYPE
PLANNERGROUP	DM_MAINTCOST_PLANNERGROUP

Generation Options
Generate: choose '*Only First Forecast Column and the Error Bars'*

Results Generated by the Model
Data Type: Database
Folder: HANA ODBC connection
Data:

Attribute	**Model Result**
ACTIVITYTYPE	SAP_RDS_PA_MFG.SII_RESULT_MAINTCOST_ACTIVITYTYPE
EQUIPMENT	SAP_RDS_PA_MFG.SII_RESULT_MAINTCOST_EQUIPMENT
FUNCLOCATION	SAP_RDS_PA_MFG.SII_RESULT_MAINTCOST_FUNCLOCATION
MANUFACTURER	SAP_RDS_PA_MFG.SII_RESULT_MAINTCOST_MANUFACTURER
ORDERTYPE	SAP_RDS_PA_MFG.SII_RESULT_MAINTCOST_ORDERTYPE
PLANNERGROUP	SAP_RDS_PA_MFG.SII_RESULT_MAINTCOST_PLANNERGROUP

20. Select *Apply*
21. After reviewing model results, save this model to the SAP HANA schema SAP_RDS_PA_MFG

Saving the Model
Model Name: default
Description: description of model
Data Type: Data Base
Folder: HANA ODBC connection
File/Table:

Attribute	**Model Result**
ACTIVITYTYPE	SAP_RDS_PA_MFG.SII_MODEL_MAINTCOST_ACTIVITYTYPE
EQUIPMENT	SAP_RDS_PA_MFG.SII_MODEL_MAINTCOST_EQUIPMENT
FUNCLOCATION	SAP_RDS_PA_MFG.SII_MODEL_MAINTCOST_FUNCLOCATION
MANUFACTURER	SAP_RDS_PA_MFG.SII_MODEL_MAINTCOST_MANUFACTURER

ORDERTYPE	SAP_RDS_PA_MFG.SII_MODEL_MAINTCOST_ORDERTYPE
PLANNERGROUP	SAP_RDS_PA_MFG.SII_MODEL_MAINTCOST_PLANNERGROUP

22. **Result:** A maintenance costs time series forecasting analysis using HANA Live maintenance costs reports data saved to SAP HANA.

4.5 Portfolio & Project Management

For the Portfolio & Project management LoB, we have pre-built scenarios for the use case Project Profitability analysis. Depending on the use case and the functionality that we are analyzing, we have picked up either the Automated Analytics or the Expert Analytics approach.

Basically for the Project profitability use case, we have built a generic data set and seeded sample data set for building the predictive models.

Note: Any SAP or non-SAP customer would be able to deploy or mimic the data structure, load the data and use the pre-built models.

SAP Predictive Analytics Metadata Repository
The following section describes the configuration of a local metadata repository file to re-use pre-built SAP Predictive Analytics metadata in the building of predictive models.

Editing the Metadata Repository File

1. Copy packaged repository files ConnectorsTable and KxAdmin.txt file to the file system where SAP Predictive Analytics has access. For example c:\MDR_PPM.
2. Make sure HANA ODBC DSN is added to your system
3. Open KxAdmin.txt with text editor

Name	Class	ClassVersion	SpaceName	Version	CreationDate	Comment
DM_PROJECT_TRANSACTION	Kxen.Connector;Kxen.ODBCStore;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-06-01 12:55:11	"Project Transactions Data"
DM_PROJECT_TRANSACTION_ACTIVE	Kxen.Connector;Kxen.ODBCStore; <HANA ODBC DSN>	3	ConnectorsTable	1	2015-06-01 12:56:28	"Project Transactions Data - Active Projects"
DM_PROJECT_TRANSACTION_CLOSED	Kxen.Connector;Kxen.ODBCStore; <HANA ODBC DSN>	3	ConnectorsTable	1	2015-06-01 12:57:26	"Project Transactions Data - Closed Projects"
DM_PROJECT_TRANSACTION_CUSTOMERID	Kxen.Connector;Kxen.ODBCStore; <HANA ODBC DSN>	3	ConnectorsTable	1	2015-06-01 12:59:19	"Project Transactions Data - Selected Customer"
DM_PROJECT_TRANSACTION_PROJECTID	Kxen.Connector;Kxen.ODBCStore; <HANA ODBC DSN>	3	ConnectorsTable	1	2015-06-01 13:00:28	"Project Transactions Data - Selected Project"
DM_PROJECT_SUMMARY	Kxen.Connector;Kxen.ODBCStore; <HANA ODBC DSN>	3	ConnectorsTable	1	2015-06-01 13:15:26	"Project Transactions Data - Project Summary Total"
DM_TS_PROJECT_TRANSACTION_PROJECTID	Kxen.Connector;Kxen.ODBCStore; <HANA ODBC DSN>	3	ConnectorsTable	1	2015-06-18 18:01:30	"Project Transaction Data - Selected Project for Tim Series."
DM_PROJECT_TRANSACTION_ACTIVE_BACKLOG	Kxen.Connector;Kxen.ODBCStore; <HANA ODBC DSN>	3	ConnectorsTable	1	2015-06-21 18:11:31	"Project Transactions Data - Active

						Order Backlog"
DM_PROJECT_TOTAL	Kxen.Connector;Kxen.ODBCStore; <HANA ODBC DSN>	3	ConnectorsTable	1	2015-06-25 10:51:26	"Project Transaction Date - Aggregated to Project Level"
DM_TS_PROJECT_TOTAL	Kxen.Connector;Kxen.ODBCStore; <HANA ODBC DSN>	3	ConnectorsTable	1	2015-06-25 15:27:08	"Project Transaction Data - Selected Project Transaction Data for Time Series"

4. Replace string "<HANA ODBC DSN>" with your HANA ODBC DSN. For example HDB_ODBC and save
5. Configure to use local metadata repository
6. Launch SAP Predictive Analytics.
7. Open *File* menu.
8. Choose *Preferences*.
9. Choose *Metadata Repository*
10. Select *Store the metadata in a single place* and enter as follows:

    Data Type: Text Files

    Folder: <location where metadata repository files are stored> for example, c:\MDR_PPM.
11. Select *OK*

4.5.1 *Project Profitability Analysis*

In this use case, we focus on identifying what projects profitable to be picked up and how they can increase or contribute to the bottom line revenues based on a lot of external and internal factors.

Automated Analytics

Manipulating the Data

1. Launch SAP Predictive Analytics
2. Choose the *Data Manager* section
3. Select *Load an existing Data Manipulation*
4. In the Load existing Data Manipulation window, select your SAP HANA instance and connect using the <Domain User> account via the *Browse* button
5. Ensure that the following data manipulations are available

Name	Comment
DM_PROJECT_TRANSACTION	Project transaction
DM_PROJECT_TRANSACTION_ACTIVE	Active project transaction
DM_PROJECT_TRANSACTION_CLOSED	Closed project transaction
DM_PROJECT_TRANSACTION_CUSTOMERID	Project transaction with customer prompt
DM_PROJECT_TRANSACTION_PROJECTID	Project transaction with project prompt

DM_PROJECT_SUMMARY	Project transaction summary by project, customer, entity, bill-to
DM_PROJECT_TOTAL	Project transaction total by project, customer.
DM_PROJECT_TRANSACTION_ACTIVE_BACKLOG	Active project transaction by net backlog.
DM_TS_PROJECT_TRANSACTION_PROJECTID	Project transaction for time series analysis
DM_TS_PROJECT_TOTAL	Project transaction total for time series analysis

Building the Classification/Regression Model

1. From the home screen of SAP Predictive Analytics, select the *Modeler* section
2. Select *Create a Classification/Regression Model*
3. In the *Select a Data Source* window,
   a. Choose Use a File or a Database Table option
   b. Data Type: Database
   c. Folder: select *Browse* and connect to your SAP HANA instance using the <Domain User> logon
   d. Data Set: select the *Browse* button to select the data set that will be used for predictive modeling.

   Data manipulations appear at the top of the list of options
4. Choose DM_PROJECT_TOTAL
5. Choose *Next* to continue.
6. Enter the Select Closed Project? prompt value to filter the data set i.e. Closed = 1
7. After entering the value, choose *OK* to begin modeling
8. Choose *Analyze* and a description for the data set appears.

   Choose *Next* when the data description accurately describes the data

   The data set description was previously completed during the data manipulation steps. You will not need to change anything in this window
9. Choose *Next* to *Selecting Variables* screen
10. In the *Selecting Variables* screen, select PREFERENCE_INDICATOR as the Target Variable. Select PROJECT_ID and CUSTOMERID to Excluded Variable.
11. Select *Next. Review Summary of Modeling Parameter to set additional setting.*
12. Select Generate. Engine runs the Training the Model. Review the Model Overview.
13. In the *Using the Model* screen, select *Display* and review the resulting model by viewing *Model Overview, Model Graphs, Contributions by Variables, etc.*
14. After reviewing the model results, choose *Run* and select *Apply Model*
15. In *the Applying the Model* screen:

    Application Data Set
    Data Type: Data Base
    Folder: HANA ODBC connection
    Data: DM_PROJECT_TOTAL - select CLOSED = 0

    Generation Options
    Generate: choose ‘Advanced Apply Settings’ – select all the options
    Mode: Apply

Results Generated by the Model
Data Type: Text Files
Folder: local folder
Data: result_class_pref_ind_summary_active_adv.txt

16. Select *Apply*
17. After reviewing model results, choose Next.
18. Choose Save/Export and choose Save Model

Saving the Model
Model Name: default
Description: description of model
Data Type: Text Files
Folder: local folder
File/Table: md_regression_preference_ind_summary_closed.txt

19. Choose Save
20. **Result**: A regression analysis on profitable project is created and saved.

Building the Clustering Model

1. From the home screen of SAP Predictive Analytics, select the *Modeler* section
2. Select *Create a Clustering Model*
3. In the *Select a Data Source* window,
   a. Choose Use a File or a Database Table option
   b. Data Type: Database
   c. Folder: select *Browse* and connect to your SAP HANA instance using the <Domain User> logon
   d. Data Set: select the *Browse* button to select the data set that will be used for predictive modeling.

   Data manipulations appear at the top of the list of options
4. Choose DM_PROJECT_TOTAL
5. Choose *Next* to continue.
6. Enter the Select Closed Project? prompt value to filter the data set i.e. Closed = 1
7. After entering the value, choose *OK* to begin modeling
8. Choose *Analyze* and a description for the data set appears.
   Choose *Next* when the data description accurately describes the data

   The data set description was previously completed during the data manipulation steps. You will not need to change anything in this window
9. Choose *Next* to *Selecting Variables* screen
10. In the *Selecting Variables* screen, select TURNOVER, PROJECT_EBIT, PROJECT_EBIT_RATIO as the Target Variables. Select PROJECT_ID and CUSTOMERID to Excluded Variable.
11. Select *Next. Review Summary of Modeling Parameter to set additional setting.*
12. Set Find the best number of clusters in this range : (5 ; 10)
13. Select Generate. Engine runs the Training the Model. Review the Model Overview.
14. In the *Using the Model* screen, select *Display* and review the resulting model by viewing *Model Overview, Model Graphs, Cluster Profiles, Statistical Reposts, etc.*
15. After reviewing the model results, choose *Run* and select *Apply Model*

16. In *the Applying the Model* screen

    Application Data Set
    Data Type: Data Base
    Folder: HANA ODBC connection
    Data: DM_PROJECT_TOTAL - select CLOSED = 0

    Generation Options
    Generate: choose 'Advanced Apply Settings' – select all the options
    Mode: Apply

    Results Generated by the Model
    Data Type: Text Files
    Folder: local folder
    Data: result_seg_3_targets _summary_active_adv.txt

17. Select *Apply*
18. After reviewing model results, choose Next.
19. Choose Save/Export and choose Save Model

    Saving the Model
    Model Name: default
    Description: description of model
    Data Type: Text Files
    Folder: local folder
    File/Table: md_segmentation_3_targets_project_summary_closed.txt

20. Choose Save
21. **Result**: A segmentation analysis on project based on turnover, profit and profit ratio is created and saved.

Building the Classification/Regression Model for Order Backlog

1. From the home screen of SAP Predictive Analytics, select the *Modeler* section
2. Select *Create a Classification/Regression Model*
3. In the *Select a Data Source* window,

    Choose Use a File or a Database Table option
    Data Type: Database
    Folder: select *Browse* and connect to your SAP HANA instance using the <Domain User> logon
    Data Set: select the *Browse* button to select the data set that will be used for predictive modeling.

    Data manipulations appear at the top of the list of options

4. Choose DM_PROJECT_TRANSACTION_ACTIVE_BACKLOG
5. Choose *Next* to continue.
6. Enter Report Start Period & Report End Period prompt values to filter the data set i.e. 201203, 201412
7. After entering the value, choose *OK* to begin modeling
8. Choose *Analyze* and a description for the data set appears.
9. Choose *Next* when the data description accurately describes the data

    The data set description was previously completed during the data manipulation steps. You will not need to change anything in this window

10. Choose *Next* to *Selecting Variables* screen

11. In the *Selecting Variables* screen, select EBIT_ON_BACKLOG, ORDER_BACKLOG as the Target Variable. Select PROJECT_ID, CUSTOMERID, BILL_TO_ID, EXECUTE_ENTITY to Excluded Variable.
12. Select *Next. Review Summary of Modeling Parameter to set additional setting.*
13. Select Generate. Engine runs the Training the Model. Review the Model Overview.
14. In the *Using the Model* screen, select *Display* and review the resulting model by viewing *Model Overview, Model Graphs, Contributions by Variables, etc.*
15. After reviewing the model results, choose *Run* and select *Apply Model*
16. In *the Applying the Model* screen

    Application Data Set
    Data Type: Data Base
    Folder: HANA ODBC connection
    Data: DM_PROJECT_TRANSACTION_ACTIVE_BACKLOG - enter Report Start Date, Report End Date

    Generation Options
    Generate: choose 'Advanced Apply Settings' – select all the options
    Mode: Apply

    Results Generated by the Model
    Data Type: Text Files
    Folder: local folder
    Data: result_regr_orderbacklog_active_key.txt

17. Select *Apply*
18. After reviewing model results, choose Next.
19. Choose Save/Export and choose Save Model

    Saving the Model
    Model Name: default
    Description: description of model
    Data Type: Text Files
    Folder: local folder
    File/Table: md_regression_order_backlog_active_trans.txt

20. Choose Save
21. **Result**: A regression analysis on order backlog profit forecast is created and saved.

Building the Time Series Analysis for Turnover & Profit

1. From the home screen of SAP Predictive Analytics, select the *Modeler* section
2. Select *Create a Time Series Analysis*
3. In the *Select a Data Source* window,
   a. Choose Use a File or a Database Table option
   b. Data Type: Database
   c. Folder: select *Browse* and connect to your SAP HANA instance using the <Domain User> logon
   d. Data Set: select the *Browse* button to select the data set that will be used for predictive modeling.

      Data manipulations appear at the top of the list of options
4. Choose DM_TS_PROJECT_TOTAL

5. Choose *Next* to continue.
6. Enter Select Project ID prompt values to filter the data set i.e. 3019767
7. After entering the value, choose *OK* to begin modeling
8. Choose *Analyze* and a description for the data set appears.
9. Choose *Next* when the data description accurately describes the data

   The data set description was previously completed during the data manipulation steps. You will not need to change anything in this window
10. Choose Next to Selecting Variables screen
11. In the Selecting Variables screen,
    a. Time: select PERIODSTARTDATE
    b. Target: select TURNOVER. Re-run using PROJECT_EBIT
    c. Exclude Variable: Select PROJECT_ID, CUSTOMERID.
    d. Last Training Date: select Date and change to last valid transaction date.
12. Select Next. Review Summary of Modeling Parameter to set additional setting.
13. Enter Number of Forecasts: 12
14. Select Generate. Engine runs the Training the Model. Review the Model Overview.
15. In the Using the Model screen, select Display and review the resulting model by viewing Model Overview, View Forecasts, Regressions: Contributions by Variables, and so on.
16. After reviewing the model results, choose Save/Export and select Apply Model
17. In the Applying the Model screen

    Application Data Set
    Data Type: Data Base
    Folder: HANA ODBC connection
    Data: DM_TS_PROJECT_TOTAL - enter Select Project ID

    Generation Options
    Generate: Predicted Value Only
    Results Generated by the Model
    Data Type: Text Files
    Folder: local folder
    Data: result_ts_forecast_selected_project_turnover.txt

18. Select *Apply*
19. After reviewing model results, choose *Next*.
20. Choose *Save Model*

    Saving the Model
    Model Name: default
    Description: description of model
    Data Type: Text Files
    Folder: local folder
    File/Table: md_timeseries_selected_project_turnover.txt

21. Choose *Save*
22. To repeat the process for another variable PROJECT_EBIT, choose *Previous* to go back.
23. Continue to choose *Previous*, to return to *Selecting Variables* screen.
24. Select *Target: PROJECT_EBIT* and repeat steps 12 to 21. Change the model name and result file name appropriately.

25. **Result**: A regression analysis on order backlog profit forecast is created and saved.

Expert Analytics - Visualization

The solutions' preconfigured content is provided in five LUMS format files. The LUMS files are dependent, in that you first generate the results dataset as describe earlier with Automated Analytics predictive modeling. Then you use these results files/tables as an input dataset for the LUMS files.

1. Select the LUMS using the following steps.
    a. Open menu *File* and choose *Import to folder* and open the LUMS file to import, or if the file is imported previously, select the file in the *Documents* list in SAP Predictive Analytics (Expert Analytics).
    b. In the dialog box, enter the SAP HANA server details, your user name, and password

LUMS file	**Input Dataset**
PPM_Project_Insight_Analysis.lums	result_class_pref_ind_summary_active_adv.txt result_regr_ebit_summary_active_adv.txt result_seg_3_targets_summary_active_adv.txt
PPM_Project_Insight_Detail_Analysis.lums	result_seg_3_targets_transaction_active_w_period_adv.txt result_seg_3_target_summmary_active_adv.txt
PPM_Project_OrderBacklog_EBIT_Detail_analysis.lums	result_regr_orderbacklog_active_key.txt
PPM_Project_OrderBacklog_EBIT_Clusters_Analysis.lums	result_regr_orderbacklog_ca_project_period_total.txt

2. Verify the data
3. Choose *Prepare* panel to ensure that the data has loaded properly
4. Switch to the *Compose* panel to view the dashboards

4.6 Retail

For the Retail industry, we have pre-built scenarios for 3 use cases such as Market basket analysis, Customer loyalty programs, Store clustering. Depending on the use case and the functionality that we are analyzing, we have picked up either the Automated Analytics or the Expert Analytics approach.

Basically for all 3 use cases, we have used the leading SAP application Customer activity repository as the data source and sample data sets are available for the same.

Note: Any SAP or non-SAP customer would be able to deploy or mimic the data structure, load the data and use the pre-built models.

4.6.1 *Market Basket Opportunities*

In this use case, we focus on identifying what products sell well as a basket during different times of a day, week and weekends.

Expert Analytics

For non-SAP Customer Activity Repository installation

1. Select the LUMS file for Retail Market Basket Analysis
    a. Launch Expert Analytics in SAP Predictive Analytics. Open menu File and choose Import to folder and import or if the LUMS file is already imported browse through the Documents list for Retail_Market_Basket_Analysis.lums file
    b. In the dialog box, enter the SAP HANA server details, your user name, and password.
2. Verify the data
3. Choose Prepare panel to ensure that the data has loaded properly.
4. Switch to the *Predict* panel to view the predictive model.
5. Adjust the **Time Period** filter component
    a. Choose *Configure Settings* in the *Time Period* filter component.
    b. Under *Row Filter*, change the filter properties for the *Business Date* and enter a date range applicable for transaction analysis.
6. Adjust the **Filter:Store xxxx Weekday** filter component
    a. Choose *Configure Settings* in the **Filter:Store xxxx Weekday** component
    b. Under *Row Filter*, change the filter properties for *Store ID* to the appropriate Store ID for analysis.
7. Adjust the **Filter:Store xxxx Weekend** filter component
    a. Choose *Configure Settings* in the **Filter:Store xxxx Weekend** component
    b. Under *Row Filter*, change the filter properties for *Store ID* to the appropriate Store ID for analysis.
8. Adjust the **Apriori : Across all stores** SAP HANA Apriori component
    a. Choose *Configure Settings* in the **Apriori : Across all stores** component
    b. Change the **Support** level to an appropriate value
    c. Change the **Confidence** level to an appropriate value
9. Run the algorithm
10. Choose *Run* to execute the scenario
11. Choose *Yes* to switch to the *Results* view for verifying the execution results.

For SAP Customer Activity Repository installation

1. Select the LUMS file for Retail Market Basket Analysis

a. Launch Expert Analytics in SAP Predictive Analytics. Open menu File and choose Import to folder and import or if the LUMS file is already imported browse through the Documents list for Retail_Market_Basket_Analysis_CAR.lums file
b. In the dialog box, enter the SAP HANA server details, your user name, and password.

2. Verify the data
   a. Choose Prepare panel to ensure that the data has loaded properly.
3. Switch to the *Predict* panel to view the predictive model.
4. Adjust the **Time Period** filter component
   a. Choose *Configure Settings* in the *Time Period* filter component.
   b. Under *Row Filter*, change the filter properties for the *Business Date* and enter a date range applicable for transaction analysis.
5. Adjust the **Filter:Store xxxx Weekday** filter component
   a. Choose *Configure Settings* in the **Filter:Store xxxx Weekday** component
   b. Under *Row Filter*, change the filter properties for *Store ID* to the appropriate Store ID for analysis.
6. Adjust the **Filter:Store xxxx Weekend** filter component
   a. Choose *Configure Settings* in the **Filter:Store xxxx Weekend** component
   b. Under *Row Filter*, change the filter properties for *Store ID* to the appropriate Store ID for analysis.
7. Adjust the **Apriori : Across all stores** SAP HANA Apriori component
   a. Choose *Configure Settings* in the **Apriori : Across all stores** component
   b. Change the **Support** level to an appropriate value
   c. Change the **Confidence** level to an appropriate value
8. Run the algorithm
9. Choose *Run* to execute the scenario
10. Choose *Yes* to switch to the *Results* view for verifying the execution results.

4.6.2 *Customer Loyalty Programs*

In this use case, we focus on how a particular set of customers are moving from one segment to the other. Whether a particular customer is spending more and getting more valuable or is there a decline which would eventually effect the top line revenues.

Expert Analytics

For non-SAP Customer Activity Repository installation

1. Select the LUMS for *Customer Loyalty*
   a. Launch Expert Analytics in SAP Predictive Analytics. Open menu *File* and choose *Import to folder* and import or if the LUMS file is already imported browse through the *Documents* list for Retail_Customer_Loyalty.lums file.
   b. In the dialog box, enter the SAP HANA server details, your user name, and password.
2. Verify the data
3. a. Choose *Prepare* panel to ensure that the data has loaded properly.
4. Switch to the *Predict* panel to view the predictive model.
5. Adjust the **Customer Last Year** Filter component
   a. Choose **Configure Settings** in the *Time Period* filter component.
   b. Under *Row Filter*, change the filter properties for the *Review Period* and enter an appropriate period applicable for clustering analysis.

6. Adjust the **Clustering Customer/Review Period** Algorithm Component
    a. Choose *Configure Settings* in the *Clustering Customer/Review Period* component
    b. Select the independent columns (variables) needed for cluster analysis. By default, *Total Sales, Frequency of Visits,* and *Items Purchased* are enabled
    c. Set *Number of Clusters* to a desired value.
7. Adjust the **Clustering Customers Last Year** Algorithm Component
    a. Choose *Configure Settings* in the *Clustering Customers Last Year* component
    b. Select the independent columns (variables) needed for cluster analysis. By default, *Total Sales, Frequency of Visits,* and *Items Purchased* are enabled
    c. Set *Number of Clusters* to a desired value.
8. Adjust the **HANA K-Means** Algorithm Component
    a. Choose *Configure Settings* in the *HANA K-Means* component
    b. Select the independent columns (variables) needed for cluster analysis. By default, *Total Sales, Frequency of Visits,* and *Items Purchased* are enabled
    c. Set *Number of Clusters* to a desired value.
9. Adjust the **HANA Anomaly Detection Algorithm** Component
    a. Choose *Configure Settings* in the *Clustering Customers Last Year* component
    b. Select the independent columns (variables) needed for cluster analysis. By default, *Total Sales, Frequency of Visits,* and *Items Purchased* are enabled
    c. Choose *Percentage of Anomalies* and enter a desired value.
10. Run the algorithm
11. Choose *Run* to execute the scenario
12. Choose *Yes* to switch to the *Results* view for verifying the execution results.

For SAP Customer Activity Repository installation

1. Select the LUMS for *Customer Loyalty*
    a. Launch Expert Analytics in SAP Predictive Analytics. Open menu *File* and choose *Import to folder* and import or if the LUMS file is already imported browse through the *Documents* list for Retail_Customer_Loyalty_CAR.lums.
    b. In the dialog box, enter the SAP HANA server details, your user name, and password.
2. Verify the data
    a. Choose *Prepare* panel to ensure that the data has loaded properly.
3. Switch to the *Predict* panel to view the predictive model.
4. Adjust the **Customer Last Year** Filter component
    a. Choose **Configure Settings** in the *Time Period* filter component.
    b. Under *Row Filter*, change the filter properties for the *Review Period* and enter an appropriate period applicable for clustering analysis.
5. Adjust the **Clustering Customer/Review Period** Algorithm Component
    a. Choose *Configure Settings* in the *Clustering Customer/Review Period* component
    b. Select the independent columns (variables) needed for cluster analysis. By default, *Total Sales, Frequency of Visits,* and *Items Purchased* are enabled
    c. Set *Number of Clusters* to a desired value.
6. Adjust the **Clustering Customers Last Year** Algorithm Component
    a. Choose *Configure Settings* in the *Clustering Customers Last Year* component
    b. Select the independent columns (variables) needed for cluster analysis. By default, *Total Sales, Frequency of Visits,* and *Items Purchased* are enabled
    c. Set *Number of Clusters* to a desired value.

7. Adjust the **HANA K-Means** Algorithm Component
    a. Choose *Configure Settings* in the *HANA K-Means* component
    b. Select the independent columns (variables) needed for cluster analysis. By default, *Total Sales, Frequency of Visits,* and *Items Purchased* are enabled
    c. Set *Number of Clusters* to a desired value.
8. Adjust the **HANA Anomaly Detection Algorithm** Component
    a. Choose *Configure Settings* in the *Clustering Customers Last Year* component
    b. Select the independent columns (variables) needed for cluster analysis. By default*, Total Sales, Frequency of Visits,* and *Items Purchased* are enabled
    c. Choose *Percentage of Anomalies* and enter a desired value.
9. Run the algorithm
10. Choose *Run* to execute the scenario
11. Choose *Yes* to switch to the *Results* view for verifying the execution results.

4.6.3 *Store Clustering*

In this use case, we focus on what cluster of stores are doing better business and for what kind of products.

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Expert Analytics

For non-SAP Customer Activity Repository installation

1. Select the LUMS for *Store Clustering*
    a. Launch Expert Analytics in SAP Predictive Analytics. Open menu *File* and choose *Import to folder* and import or if the LUMS file is already imported browse through the *Documents* list for Retail_Store_Clustering.lums file.
    b. In the dialog box, enter the SAP HANA server details, your user name, and password.
2. Verify the data
    a. Choose *Prepare* panel to ensure that the data has loaded properly
3. Switch to the *Predict* panel to view the predictive model.
4. Adjust the **Clustering Store – all KPIs** Algorithm Component
    a. Choose *Configure Settings* in *Clustering Store – all KPIs* component
    b. Select the independent columns (variables) needed for cluster analysis
    c. Set *Number of Clusters* to a desired value.
5. Adjust the **Clustering Store – partial KPIs** Algorithm Component
    a. Choose *Configure Settings* in the *Clustering Store – partial KPIs* component
    b. Select the independent columns (variables) needed for cluster analysis.
    c. Set *Number of Clusters* to a desired value.
6. Run the algorithm
7. Choose *Run* to execute the scenario
8. Choose *Yes* to switch to the *Results* view to verify the execution results.

For SAP Customer Activity Repository installation

1. Select the LUMS for *Store Clustering*
    a. Launch Expert Analytics in SAP Predictive Analytics. Open menu *File* and choose *Import to folder* and import or if the LUMS file is already imported browse through the *Documents* list for Retail_Store_Clustering_CAR.lums file.
    b. In the dialog box, enter the SAP HANA server details, your user name, and password.

2. Verify the data
    a. Choose *Prepare* panel to ensure that the data has loaded properly
3. Switch to the *Predict* panel to view the predictive model.
4. Adjust the **HANA K-Means** Algorithm Component
    a. Choose *Configure Settings* in **HANA K-Means** component
    b. Set *Number of Clusters* to a desired value.
    c. Select the Features columns (variables) needed for cluster analysis
    d. Select Category Columns.
5. Run the algorithm
6. Choose *Run* to execute the scenario
7. Choose *Yes* to switch to the *Results* view to verify the execution results.

4.7 Sales & Marketing

For the Sales & Marketing LoB, we have pre-built scenarios for 5 use cases such as Customer Segmentation, Market segmentation, Market campaign success, Product recommendation, Pipeline and revenue forecasting. Depending on the use case and the functionality that we are analyzing, we have picked up either the Automated Analytics or the Expert Analytics approach.

Basically for the Customer segmentation and Market Segmentation use cases, we have used the SAP ECC as the data source and sample data sets are available for the same. And for the Customer Segmentation, Market segmentation, Pipeline and revenue forecasting use cases, we have used HANA Live views for SAP ECC as the data source and sample data sets are available for the same. With regard to the Product recommendation and Market campaign success, we have built a generic data set and seeded sample data set for building the predictive models.

Note: Any SAP or non-SAP customer would be able to deploy or mimic the data structure, load the data and use the pre-built models.

SAP Predictive Analytics Metadata Repository
The following section describes the configuration of a local metadata repository file to re-use pre-built SAP Predictive Analytics metadata in the building of predictive models.

Editing the Metadata Repository File

1. Copy packaged repository files *ConnectorsTable* and *KxAdmin.txt* file to the file system where SAP Predictive Analytics has access. For example c:\MDR_S&M.
2. Make sure SAP HANA ODBC DSN is added to your system.
3. Open *KxAdmin.txt* with text editor.

Name	Class	ClassVersion	SpaceName	Version	CreationDate
DM_SALESORDER_FORECAST_AGGREGATED	Kxen.Connector;Kxen.ODBCStore;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-19 17:39:20
DM_SALESORDER_FORECAST_AGGREGATED					
DM_SALESORDER_FORECAST_MATGRP_MONTHLY	Kxen.Connector;Kxen.ODBCStore; <HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-19 17:46:51
DM_SALESORDER_FORECAST_MATGRP_MONTHLY					
DM_SALESORDER_FORECAST_SALESORG_MONTHLY	Kxen.Connector;Kxen.ODBCStore; <HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-19 18:02:35
DM_SALESORDER_FORECAST_SALESORG_MONTHLY					

4. Replace string "<HANA ODBC DSN>" with your HANA ODBC DSN (for example HDB_ODBC) and save.
5. Configure to use local metadata repository
6. Launch SAP Predictive Analytics.
7. Open *File* menu.
8. Choose *Preferences*
9. Choose *Metadata Repository*
10. Select *Store the metadata in a single place* and enter as follows

11. *Data Type: Text Files*
12. *Folder*: <location where metadata repository files are stored>, for example c:\MDR_S&M.
13. Select *OK*

4.7.1 *Customer Segmentation*

In this use case we focus on the customer buying pattern and cluster them accordingly.

Expert Analytics

Using Logistics Information System tables (ERP) as the data source

1. Select the LUMS file for *Customer Segmentation.*
    a. Launch Expert Analytics in SAP Predictive Analytics.
    b. Open menu *File* and choose *Import to folder,* select SalesAndDistribution_Customer_Segmentation.lums and import, or select the file in the *Documents*, after the file is imported.
    c. In the dialog box, enter the SAP HANA server details, your user name, and password.
2. Verify the data
    a. Choose *Prepare* to ensure that the data has loaded properly
3. Switch to the *Predict* panel to view the predictive model.
4. Adjust the **HANA K-Means Customer Segments– all KPIs** Algorithm Component
    a. Choose *Configure Settings* in *HANA K-Means Customer Segments– all KPIs* component
    b. Select the *Features* and the *Category Columns* needed for cluster analysis.
    c. Choose *Number of Clusters* and enter a desired value.

    The number of clusters must be less than number of transactions. Typically, the number of K is usually between 3 and 10.
5. Adjust the **HANA K-Means Net Value and Incoming Returns** Algorithm Component
    a. Choose *Configure Settings* in the *HANA K-Means Net Value and Incoming Returns* component
    b. Choose the *Features* needed for cluster analysis.
    c. Set *Number of Clusters* to a desired value.
6. Run the algorithm
7. Choose *Run* to execute the scenario
8. Choose *OK* to switch to the *Results* view to verify the execution results.

Using SAP HANA Live for ERP as a data source

1. Select the LUMS file for *Customer Segmentation.*
    a. Launch Expert Analytics in SAP Predictive Analytics.
    b. Open menu *File* and choose *Import to folder* and select SalesAndDistribution_Customer_Segmentation_hba.lums file and import, or select the file in the *Documents*, after the file is imported.
    c. In the dialog box, enter the SAP HANA server details, your user name, and password.
2. Verify the data
    a. Choose *Prepare* to ensure that the data has loaded properly
3. Switch to the *Predict* panel to view the predictive model.
4. Adjust the **HANA K-Means** Algorithm Component
    a. Choose *Configure Settings* in *HANA K-Means Algorithm* component
    b. Select the *Features* and the *Category Columns* needed for cluster analysis.

c. Choose *Number of Clusters* and enter a desired value.

5. Run the algorithm
6. Choose *Run* to execute the scenario
7. Choose *OK* to switch to the *Results* view to verify the execution results.

4.7.2 *Market Segmentation*

In this use case we focus on the different distribution and marketing channels and cluster accordingly to identify the business revenues.

Expert Analytics

Using Logistics Information System tables (ERP) as the data source

1. Select the LUMS file for *Market Segmentation*
   a. Launch Expert Analytics in SAP Predictive Analytics.
   b. Open menu *File* and choose *Import to folder* and select SalesAndDistribution_Market_Segmentation.lums file and import, or select the file in the *Documents* list after the file is imported.
   c. In the dialog box, enter the SAP HANA server details, your user name, and password.
2. Verify the data
   a. Choose *Prepare* to ensure that the data has loaded properly
3. Switch to the Predict panel to view the predictive model.
4. Adjust the **HANA K-Means Product-Dist Chnl Segments** Algorithm Component
   a. Choose *Configure Settings* in *HANA K-Means Product-Dist Chnl Segments* component
   b. Select the *Features* and *Category Columns* needed for cluster analysis.
   c. Choose *Number of Clusters* and enter a desired value.
5. Adjust the **HANA K-Means Invoiced orders and Returns KPI** Algorithm Component
   a. Choose *Configure Properties* in the *HANA K-Means Invoiced orders and Returns KPI* component
   b. Select the *Features* needed for cluster analysis
   c. Set *Number of Clusters* to a desired value.
6. Run the algorithm
7. Choose *Run* to execute the scenario
8. Choose *OK* to switch to the *Results* view to verify the execution results

Using SAP HANA Live for SAP ERP as a data source

1. Select the LUMS file for *Market Segmentation*
   a. Launch Expert Analytics in SAP Predictive Analytics.
   b. Open menu *File* and choose *Import to folder and select* SalesAndDistribution_Market_Segmentation_hba.lums file and import, or select the file in the *Documents* list after the file is imported.
   c. In the dialog box, enter the SAP HANA server details, your user name, and password.
2. Verify the data
   a. Choose *Prepare* to ensure that the data has loaded properly
3. Switch to the *Predict* panel to view the predictive model.
4. Adjust the **HANA K-Means** Algorithm Component
   a. Choose *Configure Settings* in *HANA K-Means Algorithm* component

b. Select the *Features* and *Category Columns* needed for cluster analysis.
c. Choose *Number of Clusters* and enter a desired value.

5. Run the algorithm
6. Choose *Run* to execute the scenario
7. Choose *OK* to switch to the *Results* view to verify the execution results

4.7.3 *Market Campaign Success*

In this use case, we identify what particular marketing campaigns are successful and how to position, on what cluster of the customers.

Expert Analytics

1. Select the LUMS for Market Campaign Success
   a. Launch Expert Analytics in SAP Predictive Analytics.
   b. Open menu File and choose Import to folder and select SalesAndMarketing_Market_Campaign_Success.lums file and import, or select the file in the *Documents* list, after the file is imported.
2. Verify the data
   a. Choose *Prepare* to ensure that the data has loaded properly
3. Switch to the *Predict* panel to view the predictive model.
4. Adjust the **R-K Means** Algorithm Component, if needed.
   a. Select *Configure Settings* in each of the *Cluster Customers Survey* components
   b. Select the Features needed for cluster analysis.
   c. Set *Number of Clusters* to a desired value.
5. Adjust the **R-MONMLP Neural Network** Algorithm Component, if needed.
   a. Select *Configure Settings* in each of the *Cluster Customers Survey* components
   b. Select the Features needed for training the neural network.
   c. Select Cluster Number from previous R-K Means Clustering as the Target Variable.
6. Run the algorithm
7. Choose *Run* to execute the scenario
8. Choose *OK* to switch to the *Results* view to verify the execution results.
9. Choose **Save as Model** and give a name for the model (The default is called TrainedNeuralNetworkModel).
10. Choose **Overwrite, if exists** if you intend to train the model more than once.
11. Switch to Prepare panel. Choose **New Data Set** button on the upper right corner of the screen and add the new dataset (Market_Campaign_Success_data_netnew.xlsx),
12. Once the new dataset to predict the cluster is added, switch to the **Predict** panel again. Choose the TrainedNeuralNetworkModel from the Components selector Models.
13. Configure the properties of the TrainedNeuralNetworkModel
    a. Select *Configure Settings* of the TrainedNeuralNetworkModel
    b. Select the Features needed for neural network analysis.
14. Run the algorithm
    a. Choose Run to execute the scenario
15. Choose *OK* to switch to the *Results* view to verify the execution results

4.7.4 *Product Recommendation*

In this use case, we focus on identifying what products could be recommended to a particular customer based on similar buying trends and other historic facts.

Automated Analytics

Building the Rules

1. Launch SAP Predictive Analytics
2. From the home screen Choose the *Modeler* Section
   a. Select *Create Association Rules*
3. In *Select a Data Source* screen enter the following values:

   Data Type: Text Files
   Folder: <input files location>
   *Data S*et: <Browse> select CUSTOMERS.csv
4. *Next* to *Data Description,* select *Open Description* to open saved *Description* file.
5. Browse and select CUSTOMERS_DESC.txt

   or
6. Select *Analyze* and set the following values:

   CUST_NO Value to nominal
   CUST_NO Key to 1, Order to 1
   IF CUST_NO has not already been set to 1, a key is automatically generated. When that occurs, set the following value:
   KxIndex Key to 0
7. *Next* to *Events Data Source* screen, enter:

   Data Type: Text Files
   Folder: <input files location>
   Events: TRANSACTIONS.csv
8. *Next* to *Data Description, b*rowse and select TRANSACTIONS_DESC.txt

   or
9. Select *Analyze* and set the following values:

   CUST_NO Value to nominal
   CUST_NO Key to 1, Order to 1
   PRODUCT_NO Value to nominal
   IF CUST_NO has not already been set to 1, a key is automatically generated.
   When that occurs, set following value:
   KxIndex Key to 0
10. *Next* to *Association Rules Extraction Parameters* screen, enter:

    Columns for Join: Transaction *Data Set* : CUST_NO
    Reference Data Set: CUST_NO
    Item Column: PRODUCT_NO
    Minimum Support : 1
    Minimum Confidence: 20
11. *Next*
12. *Generate*

    Expect a Number of Rules Found will have a value, for example 694. When your value is 0, try lowering the values for *Minimum Support* and *Minimum Confidence*
13. *Next* to *Display*
14. Choose *Association Rules Exploration*
15. Select *Search* and right-click to *Add Lift*

(Observe the Rules)
(Sort on Lift and observe)

16. *Save*
    a. Into the same directory as the spreadsheets
    b. File Name: RULES_FROM_II.txt
17. Statistical Reports
    a. Observe the calculations
18. **Result:** The Rules are now ready to be loaded into SAP Hana for subsequent queries.

Loading Product Recommendation Rules into SAP HANA

1. Launch Excel
    a. Open the previously created RULES_FROM_II.txt file
    b. Save it as a CSV file: RULES_FROM_II.csv
2. Launch SAP HANA studio and logon to your SAP HANA instance
3. Go to the *Quick Launch* page for SAP HANA *Modeler*
4. Truncate or Delete all rows in the SAP_RDS_PA_CRM.RULES_FROM_II table
5. Under *File*, select *Import*
6. Choose Data from Local File and choose Next
7. Choose *Source File Browse* and select the RULES_FROM_II.csv file
   Header Row = 1, Start Line = 3
8. Choose *Target Table Existing*
9. Find SAP_RDS_PA_CRM.RULES_FROM_II
10. Choose *Next*
11. To the right of *Proposed Table Structure*, select *Map 1 to 1*. Or, if using the existing table, drag the *Source Columns* to the *Target Columns* to complete the mapping
12. Next
13. Verify that the data lines up on the *Summary Screen*
14. *Finish*
15. Expose the tables within SAP_RDS_PA_CRM
16. Open *Data Preview* of the RULES_FROM_II table
17. Verify that the data lines up and is correct
18. **Result**: This set of *Product Recommendation Rules* has been loaded into a table in SAP HANA

Retrieving Product Recommendations

19. In the *Content* area of the SAP HANA studio:
    a. sap → rds-pan → crm → Calculation Views
    b. Right-click CA_PREC_PROD
    c. Select Data Preview
    d. Enter a Product for P_PROD
20. Display the Raw Data
    Up to two *Product Recommendations* will be made based upon the highest *Lift* factor calculated in the *Rules.*
21. **Result**: *Product Recommendations* have been dynamically retrieved for a given *Product*.

4.7.5 *Pipeline and Revenue Forecasting*

In this use case, we focus on how the pipeline could affect the sales revenues in the upcoming weeks, months and quarters.

Automated Analytics

Manipulating the Data

1. Launch SAP Predictive Analytics
2. Choose the *Data Manager* section
3. Select *Load an existing Data Manipulation*
4. In the *Load existing Data Manipulation* window, select your SAP HANA instance and connect using the <Domain User> account via the *Browse* button
5. Ensure that the following data manipulations are available

Scenario	Data Manipulation
Sales Forecast Aggregated	DM_SALESORDER_FORECAST_AGGREGATED
Sales Forecast by Sales Organization	DM_SALESORDER_FORECAST_SALESORG_MONTHLY
Sales Forecast by Material Group	DM_SALESORDER_FORECAST_MATGRP_MONTHLY

Building the Predictive Model

1. From the home screen of SAP Predictive Analytics, select the *Modeler* section
2. Select *Create a Time Series Analysis*
3. In the *Select a Data Source* window,
4. Choose *Browse* and connect to your SAP HANA instance using the <Domain User> logon
5. Then select the *Browse* button again to select the data set that will be used for predictive modeling.

Scenario	Data Manipulation
Sales Forecast Aggregated	DM_SALESORDER_FORECAST_AGGREGATED
Sales Forecast by Sales Organization	DM_SALESORDER_FORECAST_SALESORG_MONTHLY
Sales Forecast by Material Group	DM_SALESORDER_FORECAST_MATGRP_MONTHLY

6. Choose *Next* to continue.
7. Enter the attribute prompt value to filter the data set, for example *FromPeriod, ToPeriod, SalesOrg, MatGrp* and so on.
8. After entering the value, choose *OK* to begin modeling
9. Choose *Analyze* and a description for the data set appears.
10. Choose *Next* when the data description accurately describes the data

The data set description was previously completed during the data manipulation steps. You will not need to change anything in this window

Validate *Key, Order* and *Value* columns definitions
TIMEPERIOD column: *Order* = 1*, Key* = 1, *Type* = continuous.

11. Choose *Next* to *Selecting Variables* screen
12. In the *Selecting Variables* screen, set TIMEPERIOD as the TIME variable and NETAMOUNTINDISPLAYCURRENCY.as the Target variable. Exclude the all other variables from the analysis.
13. Select *Next*
14. Set *Number of Forecasts:* to desired number of months, for example 12, for 12 monthly forecasts
15. If desired, select *Advanced* button to set additional parameters.
16. Choose *Generate* to build your times series analysis using *Automated Analytics*
17. In the *Using the Model* screen*,* select *Display* and review the resulting model by viewing *Model Overview, View Forecast, View Signal Components, Regressions:Contributions by Variables,* and *Statistical Reports*
18. After reviewing the model results, choose *Save/Export* and select *Apply Model*
19. In *the Applying the Model* screen
20.

    Application Data Set
    Data Type: Data Base
    Folder: HANA ODBC connection
    Data: data manipulation

Scenario	**Data Manipulation**
Sales Forecast Aggregated	DM_SALESORDER_FORECAST_AGGREGATED
Sales Forecast by Sales Organization	DM_SALESORDER_FORECAST_SALESORG_MONTHLY
Sales Forecast by Material Group	DM_SALESORDER_FORECAST_MATGRP_MONTHLY

Generate: choose *'Only First Forecast Column and the Error Bars'*
Results Generated by the Model
Data Type: Database
Folder: HANA ODBC connection
Data:

Scenario	**Model Results**
Sales Forecast Aggregated	SAP_RDS_PA_CRM.SII_RESULTS_SALES_AGGREGATED
Sales Forecast by Sales Organization	SAP_RDS_PA_CRM.SII_RESULTS_SALES_SALESORG_MONTHLY
Sales Forecast by Material Group	SAP_RDS_PA_CRM.SII_RESULTS_SALES_MATGRP_MONTHLY

21. Select *Apply*

22. After reviewing model results, save this model to the SAP HANA schema SAP_RDS_PA_CRM

Saving the Model
Model Name: default
Description: description of model
Data Type: Data Base
Folder: HANA ODBC connection
File/Table:

Scenario	Model
Sales Forecast Aggregated	SAP_RDS_PA_CRM.SII_MODEL_SALES_AGGREGATED
Sales Forecast by Sales Organization	SAP_RDS_PA_CRM.SII_MODEL_SALES_SALESORG_MONTHLY
Sales Forecast by Material Group	SAP_RDS_PA_CRM.SII_MODEL_SALES_MATGRP_MONTHLY

23. **Result:** A time series analysis for sales forecast using SAP HANA Live is created and saved to the database

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4.8 Telco

For the Telco industry, we have pre-built scenarios for 4 use cases such as Churn modeling and offer recommendation, Post-paid analysis, Rotational churn and Multi-SIM detection. Depending on the use case and the functionality that we are analyzing, we have picked up either the Automated Analytics or the Expert Analytics approach.

Basically for all the use cases, we have built a generic data set and seeded sample data set for building the predictive models. The generic data set is based on the blueprint models from KXEN (acquired by SAP)

Note: Any SAP or non-SAP customer would be able to deploy or mimic the data structure, load the data and use the pre-built models.

Here, the applying of the (Churn modeling and offer recommendation) Pre-Paid Churn model will generate a result table in SAP HANA, which is then combined with *Profile* information and made visible via a database view in SAP HANA. The applying of Post-Paid Churn, Rotational Churn and Multi-SIM Detection will generate results tables in SAP HANA.
The data in the views and the tables can then be displayed using any tools that can read SAP HANA.

Post-Paid Churn, Rotational Churn and Multi-SIM Detection Analysis configurations are delivered with a pre-built metadata repository. The Pre-Paid Churn Analysis (Churn modeling and offer recommendation) is based on new configuration, which includes the building of the metadata objects and the models.

SAP Predictive Analytics Metadata Repository
The following section describes the configuration of a local metadata repository file to re-use pre-built SAP Predictive Analytics metadata in the building of predictive models.

Editing the Metadata Repository File

1. Copy packaged repository files ConnectorsTable and KxAdmin.txt file to the file system where SAP Predictive Analytics has access. For example c:\MDR_Telco
2. Make sure HANA ODBC DSN is added to your system
3. Open KxAdmin.txt with text editor

Name	Class	ClassVersion	SpaceName	Version	CreationDate	Comment
SubscriptionUsageOnNetMultiSIMClassifiedNeighbor	Kxen.Connector;Kxen.ODBCStore;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-21 14:05:01	"DM Subscription Usage On-Network for Multi-SIM Candidate and it's Neighbor"
EntitySubscriptionAnalyticalRecord_PostPaid	Kxen.AnalyticalRecord;Kxen.ODBCStore;<HANA ODBC DSN>;EntitySubscriptionPopulation	3	ConnectorsTable	1	2015-01-21 16:56:46	"Post-paid Churn Analysis Analytical Record"
MultiSIMClassifiedCustomer	Kxen.Connector;Kxen.ODBCStore;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-21 16:57:35	"DM Multi-SIM Classified Customer List"
Account_MultiSIM	Kxen.Connect	3	ConnectorsTabl	1	2015-01-21	"DM Account

	or;Kxen.ODBC Store;<HANA ODBC DSN>		e		16:57:48	Multi-SIM Indicator "
MultiSIMClassifiedCustomerNeighbor	Kxen.Connector;Kxen.ODBC Store;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-21 16:58:09	"DM Multi-SIM candidate first circle neighbors"
SubscriptionHandsetFiltered	Kxen.Connector;Kxen.ODBC Store;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-21 16:58:19	"DM Subscription Handset Filtered"
SubscriptionHandsetMostUsedCount	Kxen.Connector;Kxen.ODBC Store;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-21 16:58:28	"DM Subscription Handset Most Used Count"
SubscriptionHandsetMostUsedDuration	Kxen.Connector;Kxen.ODBC Store;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-21 16:58:38	"DM Subscription Handset Most Used Duration"
SubscriptionHandsetSummary	Kxen.Connector;Kxen.ODBC Store;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-21 16:58:47	"DM Subscription Handset Summary"
SubscriptionUsageOffNetA	Kxen.Connector;Kxen.ODBC Store;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-21 16:58:56	"DM Subscription Usage Off-Network A Call Data"
SubscriptionUsageOffNetAInternational	Kxen.Connector;Kxen.ODBC Store;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-21 16:59:04	"DM Subscription Usage Off-Network A International Call Data"
SubscriptionUsageOffNetB	Kxen.Connector;Kxen.ODBC Store;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-21 16:59:14	"DM Subscription Usage Off-Network Call Data"
SubscriptionUsageOffNetBInternational	Kxen.Connector;Kxen.ODBC Store;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-21 16:59:22	"DM Subscription Usage Off-Network International Call Data"
SubscriptionUsageOnNet	Kxen.Connector;Kxen.ODBC Store;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-21 16:59:31	"DM Subscription Usage On-Network Call Data"
SubscriptionUsageOnNetMultiSIMClassified	Kxen.Connector;Kxen.ODBC Store;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-21 16:59:41	"DM Subscription Usage On-Network for Multi-SIM Classified Data"
SubscriptionUsageSIM	Kxen.Connector;Kxen.ODBC	3	ConnectorsTable	1	2015-01-21 16:59:51	"DM Subscription

	Store;<HANA ODBC DSN>					Usage SIM information"
SubscriptionUsageSegment	Kxen.Connector;Kxen.ODBCStore;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-21 17:00:00	"DM Customer Subscription Usage Segment"
EntitySubscription	Kxen.Entity;Kxen.ODBCStore;<HANA ODBC DSN>;SAP_RDS_PA_TELCO.SUBSCRIPTION;SUBS_ID	3	ConnectorsTable	1	2015-01-21 17:00:59	EntitySubscription
EntitySubscriptionPopulation	Kxen.TimeStampedPopulation;Kxen.ODBCStore;<HANA ODBC DSN>;EntitySubscription;KxTimeStamp	3	ConnectorsTable	1	2015-01-21 17:01:09	"Default Time-stamped Population"
EntitySubscriptionAnalyticalRecord_MultiSIM	Kxen.AnalyticalRecord;Kxen.ODBCStore;<HANA ODBC DSN>;EntitySubscriptionPopulation	3	ConnectorsTable	1	2015-01-21 17:01:33	"Multi-SIM Analysis Analytical Record with SIM activity "
DM_TELCO_CALL_LIST_OF_NEWCOMERS	Kxen.Connector;Kxen.ODBCStore; ;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-01-21 17:01:33	"Call List of Newcomers"
DM_TELCO_LIST_OF_NEWCOMERS	Kxen.Connector;Kxen.ODBCStore; ;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-03-31 16:19:57	"List of New Subscribers"
DM_TELCO_LIST_OF_CHURNERS	Kxen.Connector;Kxen.ODBCStore; ;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-03-31 16:23:33	"List of Churn Subscribers"
DM_TELCO_CALL_LIST_OF_CHURNERS	Kxen.Connector;Kxen.ODBCStore; ;<HANA ODBC DSN>	3	ConnectorsTable	1	2015-03-31 16:23:59	"Call List of Churners"

4. Replace string "<HANA ODBC DSN>" with your HANA ODBC DSN. For example HDB_ODBC and save.
5. Launch SAP Predictive Analytics
6. Choose *File* menu and select *Preferences…*
7. From *Edit Options*… screen, choose *Meta Repository* option.
8. Select *Store the metadata in a single place*. Data Type: Text Files and Folder: <Repository path>.
9. Select OK
10. Choose *Data Manager*
11. Select *Create or Edit Analytical Data*
12. In the *Connect to Data Manager* window, select your SAP HANA instance and connect using the <Domain User> account via the Browse button

13. In the *Data Manager* window, validate each explorer objects *Data Manipulation, Entity, Time-stamped Population and Analytical Record* by open and saving it.
14. **Result:** The Metadata repository objects are ready for use in predictive model development. Continue to the next section for information on developing a predictive model.

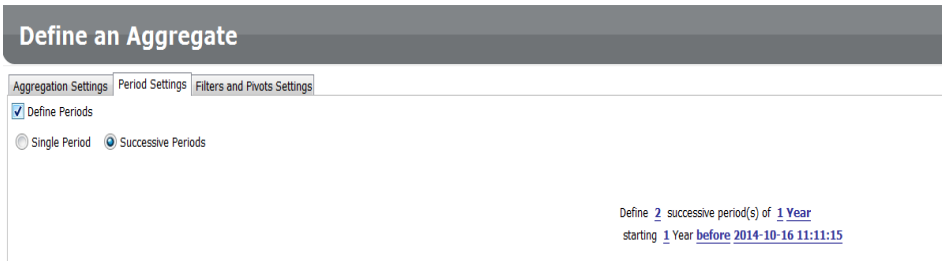
4.8.1 *Churn Modeling and Offer Recommendation*

In this use case, we identify who are the pre-paid customers likely to churn and how we can retain them by providing competitive retention offers.

Automated Analytics

Manipulating the Data

1. Launch SAP Predictive Analytics
2. Choose the *Data Manager* section
3. Select *Create a Data Manipulation*
4. In the Define New Data Manipulation window, select your SAP HANA instance and connect using the <Domain User> account via the *Browse* button
5. Now specify the data set that will serve as the base table for your data manipulation and churn analysis. The table with your customer data: SAP_RDS_PA_TELCO.CUSTOMERS
6. Choose *Next* to load the data set
7. In the *Data Manipulation Editor Window*, select the *Merge* tab. Choose *New* button. You are merging your customer information data set with another table to add the customer's phone number
8. Choose the *Select Target Table* dropdown menu to select the table to merge: SAP_RDS_PA_TELCO.CUSTOMERS_TO_NUMBERS
9. Select the *Source Field* from the ***base*** table on the left that we will be using to join the data sets: CUSTOMER_ID
10. Select the *Source Field* from the ***target*** table on the right that we will be using to join the data sets: CUSTOMER_ID
11. Select the *OK* button at the bottom of the screen to confirm the data set merge with these keys. *Select Close*
12. Select the *Main* tab to return to the main data manipulation area
13. Choose the *New* button, then choose *New Aggregate* to add new aggregates with the customer activities table
14. In the *Events Table Selection* area, select SAP_RDS_PA_TELCO.CUSTOMERS_EVENTS as the events table (for example: calls, texts, picture messages and so on.)
15. The *Date* column should populate with the *TIME* column from the CUSTOMERS_EVENTS table
16. In the *Join Keys* section, select *NUMBER* as the *Reference Table Key*, and the *Events Table Key* can be *SENT* or *RECD* based on the aggregate you are constructing
17. Select the function you will be using for your aggregate (for example: Count, Average, and so on)
    - In the data set designated, some useful aggregates may be average duration, or counting the number of events in a specific period
18. Select the variable you would like to aggregate in the *Target Column* section
19. Choose the *Period Settings* tab to define the periods that your variable will be calculated
20. Select the *Define Periods checkbox to define the aggregation periods manually and select Successive Periods*
21. The data set provided here has call records between January 2011 thru' June 2011. Configure to define *"8" successive periods* of *"1" week* starting *"1" week* before a particular *date*. Please pick the particular *date* as "May 9th 2011" so that you can get good results. Please see the screen shot below for guidance



22. After defining the aggregation periods, define the *End Date* for the aggregation. We recommend developing a Prompt/Argument called Last_DateTime to represent the end of your aggregation period. Using Last_DateTime allows the data set to be continuously used for scoring purposes
23. Select the *Filters and Pivot Settings* tab to create your aggregates for multiple types of events
24. In the *Pivot* section, select the *Search* (binocular icon) then *from the whole data set* to get the category occurrences in the data
25. Select the *TYPE* variable from the dropdown menu and select the types of events you would like to aggregate
26. Select the *Also create aggregates without pivot* box if necessary, which will also create an aggregate over all categories
27. Select OK to complete the aggregate and add it to the data set.
28. Repeat steps 13-26 as necessary for your various aggregate variables
29. Return to the *Fields* tab, then select *Next* to save the data manipulation
30. Save the data manipulation as DM_CHURN_CUSTOMERS for use in predictive modeling
31. **Result:** The *Data Manipulation* is ready for use in predictive model development. Continue to the next section for information on developing a predictive model.

Building the Model for Customer Churn

This section describes how to use the data manipulation created above to build a predictive model for customer churn based on customer history. Using customer demographics and details about their recent usage, the model is created to detect patterns that identify at-risk customers.

1. From the home screen of SAP Predictive Analytics, select the *Modeler* section
2. Select *Create a Classification/Regression Model*
3. In the *Select a Data Source* window,
4. Choose *Browse* and connect to your SAP HANA instance using the <Domain User> logon
5. Then select the *Browse* button again to select the data set that will be used for predictive modeling, in this case the saved data manipulation DM_CHURN_CUSTOMERS
    - Data manipulations appear at the top of the list of options
6. If your data manipulation is built with the prompt as specified above that prompt requests you enter the last date for the training period
7. After entering the last training date, choose *Next* to begin modeling
8. Choose *Analyze* and a description for the data set appears.
9. Choose *Next* when the data description accurately describes the data
    - The data set description was previously completed during the data manipulation steps. You will not need to change anything in this window
10. In the Selecting Variables screen, set *CHURNED_IN_M1* as your target variable and exclude the variables *CUSTOMER_ID, ZIP_CODE, CHURNED_IN_M2, CHURNED_IN_M3* and *NUMBER* from your analysis.

11. Select *Next*
12. If desired, unselect *Enable Auto-Selection*
13. Choose *Generate* to build your customer churn model with SAP Predictive Analytics
14. After reviewing model results, save this model as SII_CHURN_MODEL to the SAP HANA schema SAP_RDS_PA_TELCO
15. **Result:** A customer churn model built using customer demographic and usage data saved to SAP HANA that can be deployed on current customer data. After reviewing the model results, the next step is using social network analysis to improve the model's predictive power.

Building the Model for a Social Network

1. From SAP Predictive Analytics, select the *Social* section
2. Select *Create a Social Network Analysis*
3. In the *What Type of Graph* dialog box, select *Build a Social Graph From a Data Set*
4. Connect to your SAP HANA instance and logon as <Domain User>
5. Select SAP_RDS_PA_TELCO.CUSTOMERS_EVENTS as your data set
6. Choose *Next*
7. Choose *Analyze* to load an automated data description,
8. Choose *OK* when the description matches the data set
9. In the *Graph Settings* section, enter the parameters as follows:

   Graph Creation Type: Contact
   Source Node: SENT
   Target Node: RECD
   Date Column: TIME
   Links Type: Directed
   Use a weight column: DURATION
   End Date: Enter the end date using the format YYYY-DD-MM
10. Choose *Next*
11. Allow *Community Detection* and *Mega-hub detection* in the next screen
12. Choose *Add Identifiers Conversion Data Set* to add customer identification to the social network output.
13. Select the table SAP_RDS_PA_TELCO.CUSTOMERS_TO_NUMBERS as your conversion data set
14. Choose *Analyze* to create an automated description of the data set
15. Choose *OK* when the description matches the data set
16. In the *Identifiers Conversion* window, set the *Original Identifier* as *NUMBER* and the Converted Identifier as *CUST_ID*
17. Choose *Next* to skip adding *Descriptive Attributes* to the social data set. This data is merged in a later step
18. Choose *Generate* to construct the social graph
19. Choose *Next.*
20. After evaluating the model, select *Run*
21. Choose *Apply Model* to deploy the social model over your customer data set
22. Select the application data set you will be using, the apply-in.txt file included or saved as a table in the SAP_RDS_PA_TELCO schema
23. SAVE the social graph results back to SAP HANA in a table SAP_RDS_PA_TELCO.SII_CUSTOMERS_SOCIAL
24. After applying the model, return to the previous screen and save the social model to the table SAP_RDS_PA_TELCO.SII_SOCIAL_MODEL

25. **Result:** A social network model is saved in SAP HANA for future applications and a table with social network analysis results for each of our existing customers. The following step adds this social network data to the previous data manipulation.

Manipulating the Data for Customer Churn Analysis a Social Network

This section will outline the steps needed to add the social network data to our existing data manipulation. The final predictive model is built on this combined data set.

1. After saving your social data set to SAP HANA, return to the home screen of SAP Predictive Analytics
2. Select the *Data Manager*, then *Load an Existing Data Manipulation*
3. Connect to your SAP HANA instance, logon as a <Domain User>
4. Select the previous data manipulation: DM_CHURN_CUSTOMERS
5. In the *Data Manipulation Editor*, select the *Merge* tab
6. ADD a new merge using CUSTOMER_ID from the source table and SENT from the social data target table SAP_RDS_PA_TELCO.SII_CUSTOMERS_SOCIAL
7. Choose *Next*
8. Save the new data manipulation as DM_CHURN_CUSTOMERS_SOCIAL
9. **Result:** The data manipulation DM_CHURN_CUSTOMERS_SOCIAL is saved to SAP HANA and contains the added data from the social network analysis. In the next section, the final predictive model is built with this data manipulation

Building the Classification/Regression Model for Customer Churn Analysis

1. From the home screen of SAP Predictive Analytics, select the *Modeler* section
2. Select *Create a Classification/Regression Model*
3. In the *Select a Data Source* window, choose *Browse* to select your SAP HANA instance using the logon <Domain User>
4. Select the *Browse* button again to select the data set that will be used for predictive modeling, your previously saved data manipulation DM_CHURN_CUSTOMERS_SOCIAL
    - Note that data manipulations will appear at the top of the list of options
5. If your data manipulation is built with the prompt as specified above that prompt asks for the last date of the training period
6. After specifying the last training date, choosing *Next* begins modeling
7. Choose *Analyze* to read in a description for your data set,
8. Choose *Next* after confirming that the data description is accurate
    - The data description was created previously in the data manipulation steps. You should not need to change the description
9. In the *Selecting Variables* screen, set *CHURNED_IN_M1* as your target variable and exclude the variables *CUSTOMER_ID, ZIP_CODE, CHURNED_IN_M2, CHURNED_IN_M3, KCOMINDEX* and *NUMBER* from your analysis,
10. Choose *Next*
11. If desired, unselect *Enable Auto-Selection*
12. Choose *Generate* to build your customer churn model with SAP Predictive Analytics
13. After reviewing model results, SAVE this model as SII_CHURN_MODEL_FINAL to the SAP HANA schema SAP_RDS_PA_TELCO
14. **Result:** The final churn model is ready to be deployed using current customers data to identify potential churners.

Applying the Model (Optional Exercise)

1. After saving the model, select *Apply Model* from the *Run* section

2. In the *Application Data Set* section, *Browse* to your SAP HANA instance and logon as <Domain User>
3. Select DM_CHURN_CUSTOMERS_SOCIAL as your application data set
    - We will be using more recent aggregates on our current customers to assess their likelihood of churn
4. Choose *Advanced Apply Settings* to configure the variables to be used in your model result
5. In the *General Outputs* section, select *Copy Variables*
6. Select *Individual*
7. Select CUSTOMER_ID to include in your output data set and choose *Apply Date* to include it in your output
8. In *Outputs for Target*, select *Scores* and *Probabilities* then select *All* for both.
9. Select *Predicted Value Quantile* and add 10 quantiles
10. On the *Outputs for Target* dropdown, select *Reason Codes* section
11. Enter the following values in for Reason Codes:

Name	Value
Number of Reason Codes	3
Threshold	Mean
Criterion	Below

12. Select *OK* to return to the previous screen
13. Uncheck *Add Score Deviation* and *Use Direct Apply in the Database*
14. In the *Results Generated* section, SAVE your model output to the table SII_FINAL_MODEL_OUT
15. Choose *Apply*
    - A prompt appears for your data manipulation. You are creating your aggregates using recent customer data to get predicted values for churn likelihood over the next month. Set the value accordingly.
16. **Result:** The predicted values and other additional variables are written back to the SAP HANA schema SAP_RDS_PA_TELCO as a table SII_FINAL_MODEL_OUT. Now this data set can be used to generate potential retention offers and in post-analysis visualizations.

Building the Model for Pre-Analysis

1. Start SAP Predictive Analytics and select *Expert Analytics*
2. Logon with credentials provided to you.
3. Select the LUMS file for *Telco Churn Pre-Analysis*
    a. Either double-click Telco_Churn_Preanalysis.lums file and import, or select the file in the *Documents*, after the file is imported.
    b. In the dialog box, enter the SAP HANA server details, your user name, and password.
4. Verify the data
5. Choose *Prepare* to ensure that the data has loaded properly
6. Switch to the *Visualize* panel to view the pre-constructed visualizations.
7. Switch to the *Compose* tab to view dashboards created to evaluate the effect that customer churn is having on your business.

Building the Model for Post-Analysis (Optional Exercise)

1. Start SAP Predictive Analytics and select Expert Analytics
2. Logon with credentials provided to you.
3. Select the LUMS file for Telco Churn Post-Analysis
    a. Either double-click Telco_Churn_Postanalysis.lums file and import, or select the file in the Documents, after the file is imported.
    b. In the dialog box, enter the SAP HANA server details, your user name, and password.
4. Verify the data
5. Choose Prepare to ensure that the data has loaded properly
    - You are viewing the prediction results from an already created analytic view based on the data available. In reality, after the final churn model is created (SII_FINAL_MODEL_OUT_<your number>)., basically you update the analytic view in HANA studio or create a new analytic view which consumes the results from the table where you have written for eg., SII_FINAL_MODEL_OUT_<your number>.
6. Switch to the Visualize panel to view the pre-constructed visualizations.
7. Switch to the Compose tab to view dashboards created to evaluate the customers predicted to churn and the projected effect on the business.

4.8.2 *Post-Paid Analysis*

In this use case we focus on build churn models and identify the post-paid customers likely to leave.

Automated Analytics

1. Launch SAP Predictive Analytics
2. Choose the Modeler section
3. Select *Create a Classification/Regression Model*
4. In the Select a Data Source window, choose Use Explorer option. Select your SAP HANA instance and connect using the <Domain User> account via the *Browse* button.
5. Specify the data set by selecting Analytical Record EntitySubscriptionAnalyticalRecord_PostPaid and Time-stamped Population EntitySubscriptionPopulation.
6. Choose Next. Enter training cut-off date to Analytical Data Set Reference Date prompt screen.
7. Choose Analyze to read description from Analytical Record.
8. Choose Next to continue to Selecting Variables screen.
9. Select CHURN_FLAG variable as a Target Variables and Kxid,KxTimeStamp,n_days_to_eos to Excluded Variables. Continue Next.
10. Accept the default parameters and choose Generate.
11. Review Model Overview reports for model detail.
12. Choose Next to continue to Run section.
13. Choose Apply Model and use following setting in Applying the Model screen:

Application Data Set
Data Type: Data Base
Folder: <HANA connection>
Data: EntitySubscriptionPopulation

Generation options
Generate: Probability& Error Bars
Mode: Apply

Results Generated by the Model
Data Type: Data Base
Folder: <HANA connection>
Data: SAP_RDS_PA_TELCO. SII_RESULT_POSTPAID_REGRESSION

14. Choose Apply to continue.
    - Also, in this step (13) different decision cuts can be used in order to maximize profit, etc.
15. Choose Apply Model and use following setting in Applying the Model screen:

Application Data Set
Data Type: Data Base
Folder: <HANA connection>
Data: EntitySubscriptionPopulation

Generation options
Generate: Decision
Mode: Apply

Results Generated by the Model
Data Type: Data Base
Folder: <HANA connection>
Data: SAP_RDS_PA_TELCO. SII_RESULT_POSTPAID_DECISION

16. Choose Apply to continue.
17. In Classification Decision, select desired threshold or fill in cost matrix in order to maximize profit and click next
18. Save the model to the repository.
19. **Result**: A post-paid churn model is saved in SAP HANA for future applications and a table with analysis results for each of our existing customers. Now this data set can be used to generate potential retention offers and in post-analysis visualizations.

4.8.3 *Rotational Churn Detection*

In this use case, we focus on identifying the rotational churns who are likely to join and leave and again join back for better offers.

Automated Analytics

Manipulating the Data

1. Launch SAP Predictive Analytics
2. Choose the *Data Manager* section
3. Select *Load a Data Manipulation*
4. In the Load Data Manipulation window, select your SAP HANA instance and connect using the <Domain User> account via the *Browse* button
5. Ensure that the following data manipulations are available

DM Name	Description	Source Tables

DM_TELCO_LIST_OF CHURNERS	List of Churners	SUBSCRIPTIONCHURNED
DM_TELCO_LIST_OFNEWCOMERS	List of Newcomers	SUBSCRIPTION
DM_TELCO_CALL_LIST_OF CHURNERS	Call List of Churners	SUBSCRIPTIONCHURNED & SUBSCRIPTIONUSAGE
DM_TELCO_CALL_LIST_OF_NEWCOMERS	Call List of Newcomers	SUBSCRIPTION and SUBSCRIPTIONUSAGE

- The SUBSCRIPTIONCHURNED table contains the list of churned subscribers.
- The SUBSCRIPTION table contains current subscribers including newly activated subscribers.
- The SUBSCRIPTIONUSAGE table contains call details aggregated at a daily level of all the subscribers.
- If you would like a different logic to determine any of the above lists, then replace them with custom Data Manipulations.

Building the Social Network Model

1. From SAP Predictive Analytics, select the *Social* section
2. Select *Create a Social Network Analysis*
3. In the *What Type of Graph* dialog box, select *Build a Social Graph From a Data Set*
4. Connect to your SAP HANA instance and logon as <Domain User>
5. Choose the dataset option as "Database" and Events as DM "DM_TELCO_CALL_LIST_OF_CHURNERS". Choose *Next*
6. When prompted, enter the Start Event Date and End Event Date. This corresponds to the period for the churners that have churned.
7. Choose *Analyze* to load an automated data description,
8. Choose *OK* when the description matches the data set
9. In the *Graph Settings* section, enter the parameters as follows:

   Graph Name : Churners_Network
   Graph Creation Type: Contact
   Source Node: A_NUMBER
   Target Node: B_NUMBER
   Date Column: EVT_DATE
   Links Type: Directed
   Use a Weight Column: USG_DURATION
10. Choose *Add Graph* and select *Build a Social Graph from a DataSet* to create copy of first graph.
11. Connect to your SAP HANA instance and logon as <Domain User>
12. Choose the dataset option as "Database" and Events as DM "DM_TELCO_CALL_LIST_OF_NEWCOMERS". Choose *Next*
13. When prompted, enter the Start Event Date and End Event Date. This corresponds to the period for the newcomers that need to be analyzed.
14. Choose *Analyze* to load an automated data description,
15. Choose *OK* when the description matches the data set
16. In the *Graph Settings* section, enter the parameters as follows:

    Graph Name : Newcomers_Network
    Graph Creation Type: Contact
    Source Node: A_NUMBER

Target Node: B_NUMBER
Date Column: EVT_DATE
Links Type: Directed
Use a Weight Column: USG_DURATION

17. Choose *Next*
18. In the *Post-Processings* screen, allow *Community Detection* and *Mega-hub detection*
19. Choose *Node Pairing* page and select + to add.
20. In the *Pairing Definition* screen, enter the parameters as follows:
    a. First Graph: Churners_Network
    b. Second Graph: Newcomers_Network
    c. Output Graph Name: Social Network Comparison
    d. Set *Keep Top N* to a desired value for better performance
    e. Enable Minimum Common Neighbours Ratio and enter a value between typically between 0.5 and 1

       Pairing Type : Ratio

    - Ensure that the checkbox for Weighted Ratio and Include Common Neighbours Count Graph are checked
21. Click Ok
22. Choose Next and skip Add Identifiers Conversion Data Set.
23. Choose Next and skip Add Descriptive Attributes
24. Choose Generate to construct the social graph
25. To verify and to analyze the model generated click on "Nodes Display".
    a. Choose Graph "Social_Network_Comparison_Ratio" and choose a phone number and choose display node. The graph shows similar phone numbers
    b. The phone numbers can be individually analyzed in Churners_Network and Newcomers_Network.
    c. Chose Reports -> Compare to compare the two indivudal graphs.
26. After evaluating the model, select *Run*
27. Choose *Apply Model* and use following setting in *Applying the Model* screen:

    Application Data Set

    Data Type: Data Base

    Folder: <HANA connection>

    Data: DM_TELCO_LIST_OF_NEWCOMERS

    In Define Mapping, map the following:

    A_NUMBER -> PHONE_NUMBER

    kxcomIndex -> any arbitrary value(since we are using database option, this is not significant)

    Generation options

    Generate: Neighbors Mode

    In Advanced Apply Settings,

    Check Nodes Neighborhood for Social Network Comparison Ratio.

    Uncheck the checkbox for all other graphs

    Mode: Apply

    Results Generated by the Model

    Data Type: Data Base

Folder: <HANA connection>

Data: SAP_RDS_PA_TELCO.SII_RESULTS_ROTATIONALCHURN

28. After applying the model, return to the previous screen and save the social model to the repository.
29. **Result:** A social network analysis Node Pairing result will provide list of phone numbers and subscribers that are similar.
    - You can analyze details of each model and result in SAP Predictive Analytics using available reports and export options.

    - You can use any tools that can connect to SAP HANA to analyze the results store in following tables:

      SAP_RDS_PA_TELCO.SII_RESULTS_ROTATIONALCHURN

4.8.4 *Multi-SIM Detection*

In thus use case, we identify the customers who are using multiple SIM cards from different carriers and how to get them on-board completely.

Automated Analytics

Building the Cluster Model

1. Launch SAP Predictive Analytics
2. Choose the Modeler section
3. Select *Create a Clustering Model*
4. In the *Select a Data Source* window, choose *Use Explore*r option. Select your SAP HANA instance and connect using the <Domain User> account via the *Browse* button.
5. Specify the data set by selecting

   Analytical Record: EntitySubscriptionAnalyticalRecord_MultiSIM
   Time-stamped Population: EntitySubscriptionPopulation
6. Choose *Ne*xt. Enter training cut-off date to *Analytical Data Set Reference Date* prompt screen.
7. Choose *Analyze* to read description from *Analytical Record*. Validate MULTISIM *Missing* field has 0.
8. Choose *Next* to continue to *Selecting Variables* screen.
9. Select MULTI_SIM variable as a *Target Variable*s. Continue *Next*.
10. Accept the default parameters and choose *Generate*.
11. Review *Model Overview* reports for model detail.
12. Choose *Next* to continue to *Run* section.
13. Choose *Apply Model* and use following setting in *Applying the Model* screen:

    Application Data Set

    Data Type: Data Base

    Folder: <HANA connection>

    Data: EntitySubscriptionPopulation

    Generation options

    Generate: Predictive Value Only

    Mode: Apply

    Results Generated by the Model

Data Type: Data Base

Folder: <HANA connection>

Data: SAP_RDS_PA_TELCO.SII_MULTISIM_SEGMENT

14. Choose *Apply* to continue.
15. Move to *Save/Export* and choose *Save Model* to the repository
16. **Result:** Predictive Analytics Cluster Model is built using Subscription data. Cluster segmentation has been generated and result written to HANA for use in Classification modeling. Continue to the next section for information on classification model.

Building the Classification Model

This section will describe the process for building the classification model on segmentation data.

1. Launch SAP Predictive Analytics
2. Choose the *Modeler* section
3. Select *Create a Classification/Regression Model*
4. In the *Select a Data Source* window, choose *Use Explorer* option. Select your SAP HANA instance and connect using the <Domain User> account via the *Browse* button.
5. Specify the data set by selecting *Analytical Record*

   EntitySubscriptionAnalyticalRecord_MultiSIM and
   Time-stamped Population EntitySubscriptionPopulation
6. Choose *Next*. Enter training cut-off date to *Analytical Data Set Reference Date* prompt screen.
7. Choose *Analyze* to read description from *Analytical Record*. Validate MULTISIM *Missing* field has 0.
8. Choose *Next* to continue to *Selecting Variables* screen.
9. Select MULTI_SIM variable as a *Target Variables*. Continue *Next*.
10. In the *Summary of Modeling Parameters* screen, select *Compute Decision Tree* and *Enable Auto-selection* option.
11. Choose *Generate*.
12. Review *Model Overview* reports for model detail. Browse through *Contributions by Variables* and other links to review details.
13. Choose *Next* and move to *Run* section.
14. Choose *Apply Model* and use following setting in *Applying the Model* screen:

    Application Data Set
    Data Type: Data Base
    Folder: <HANA connection>
    Data: EntitySubscriptionPopulation

    Generation options
    Generate: Predictive Value Only
    Mode: Apply

    Results Generated by the Model
    Data Type: Data Base
    Folder: <HANA connection>
    Data: SAP_RDS_PA_TELCO.SII_MULTISIM_CLASSIFICATION

15. Choose *Apply* to continue
16. Move to *Save/Export* and choose *Save Model* to the repository.

17. **Result:** A classification model built using usage data saved to SAP HANA that can be deployed on current customer data. After reviewing the model results, the next step is using social network analysis to improve the model's predictive power.

Multi-SIM Social Network Analysis Neighbor

The following section describes how the Social Network Analysis capabilities of SAP Predictive Analytics are used with Telco score data info to Identify multi-SIM pairs of customers.

1. From SAP Predictive Analytics, select the *Social* section
2. Select *Create a Social Network Analysis*
3. In the *What Type of Graph* dialog box, select *Build a Social Graph From a Data Set*
4. Connect to your SAP HANA instance and logon as <Domain User>
5. Select SubscriptionUsageOnNetMultiSIMClassified as your data set
6. Choose *Next*
7. Choose *Analyze* to load an automated data description,
8. Choose *OK* when the description matches the data set
9. In the *Graph Settings* section, enter the parameters as follows:

   Graph Name: Multi-SIM Candidate
   Graph Creation Type: Contact
   Source Node: a_number
   Target Node: b_number
   Date Column: evt_date
   Links Type: Directed
10. Choose *Next*
11. Choose *Next* and skip *Add Identifiers Conversion Data Set.*
12. Choose *Next* and skip *Add Descriptive Attributes*
13. Choose *Generate* to construct the social graph
14. After evaluating the model, select *Run*
15. Choose *Apply Model* and use following setting in *Applying the Model* screen:

    Application Data Set
    Data Type: Data Base
    Folder: <HANA connection>
    Data: SubscriptionUsageOnNetMultiSIMClassified

    Generation options
    Generate: Neighbors Mode

    Results Generated by the Model
    Data Type: Data Base
    Folder: <HANA connection>
    Data: SAP_RDS_PA_TELCO.SII_MULTISIM_CLASS_NEIGHBOR

16. Choose *Apply* to save run the model and save the results to HANA.
17. After applying the model, return to the previous screen and save the social model to the repository.
18. **Result:** A social network analysis Neighbors provide list of initial Multi-SIM candidate and their matched pairs. This list will be used in Node Pairing analysis to further optimize the candidate list.

Multi-SIM Social Network Analysis Node Pairing

The following section describes how the Social Network Analysis capabilities of SAP Predictive Analytics are used with Telco score data info to Identify multi-SIM pairs of customer.

1. From SAP Predictive Analytics, select the *Social* section
2. Select *Create a Social Network Analysis*
3. In the *What Type of Graph* dialog box, select *Build a Social Graph From a Data Set*
4. Connect to your SAP HANA instance and logon as <Domain User>
5. Select SuscriptionUsageOnNetMultiSIMClassifiedNeighbor as your data set
6. Choose *Next*
7. Choose *Analyze* to load an automated data description,
8. Choose *OK* when the description matches the data set
9. In the *Graph Settings* section, enter the parameters as follows:

   Graph Name: first graph
   Graph Creation Type: Contact
   Source Node: a_number
   Target Node: b_number
   Date Column: evt_date
   Links Type: Directed
10. Choose *Duplicate Selected* and select *Clone* to create copy of first graph.
11. In the *Graph Settings* section, enter the parameters as follows:

    Graph Name: second graph
    Graph Creation Type: Contact
    Source Node: a_number
    Target Node: b_number
    Date Column: evt_date
    Links Type: Directed
12. Choose *Next*
13. In the *Post-Processings* screen, allow *Community Detection* and *Mega-hub detection*
14. Choose *Node Pairing* page and select + to add.
15. In the *Pairing Definition* screen, enter the parameters as follows:
    a. First Graph: first graph
    b. Second Graph: second graph
    c. Output Graph Name: Multi-SIM Pair
16. Choose *Next* and skip *Add Identifiers Conversion Data Set.*
17. Choose *Next* and skip *Add Descriptive Attributes*
18. Choose *Generate* to construct the social graph
19. After evaluating the model, select *Run*
20. Choose *Apply Model* and use following setting in *Applying the Model* screen:

    Application Data Set
    Data Type: Data Base
    Folder: <HANA connection>
    Data: SubscriptionUsageOnNetMultiSIMClassifiedNeighbor

    Generation options
    Generate: Neighbors Mode
    Mode: Apply

    Results Generated by the Model
    Data Type: Data Base

Folder: <HANA connection>
Data: SAP_RDS_PA_TELCO.SII_MULTISIM_NEIGHBOR

21. Choose *Apply* to save run the model and save the results to HANA.
22. Change

    Generate: Node Pairing Mode

    Data: SAP_RDS_PA_TELCO.SII_MULTISIM_NODEPAIR

23. Choose *Apply* to save run the model and save the results to HANA.
24. After applying the model, return to the previous screen and save the social model to the repository.
25. **Result:** A social network analysis Node Pairing result will provide Multi-SIM candidate list. A social network analysis Neighbors provide list of Multi-SIM candidate and their matched pairs.
    - You can analyze details of each model and result in SAP Predictive Analytics using available reports and export options.
    - You can use any tools that can connect to SAP HANA to analyze the results store in following tables:

      SAP_RDS_PA_TELCO.SII_MULTISIM_SEGMENT
      SAP_RDS_PA_TELCO.SII_MULTISIM_CLASSIFICATION
      SAP_RDS_PA_TELCO.SII_MULTISIM_CLASS_NEIGHBOR
      SAP_RDS_PA_TELCO.SII_MULTISIM_NEIGHBORS
      SAP_RDS_PA_TELCO.SII_MULTISIM_NODEPAIR

5 HANA MODELS (OPTIONAL BACK-END COMPONENTS)

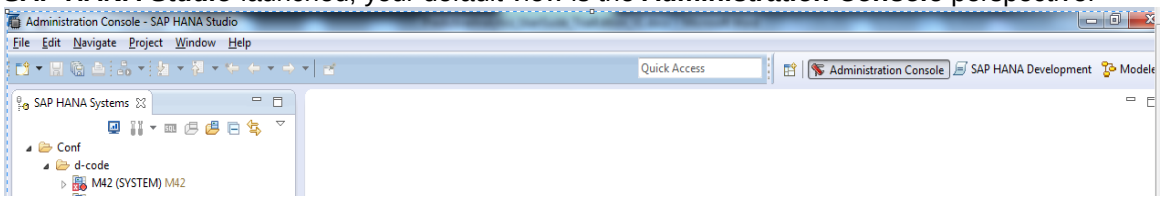
Note: (This section 5 is NOT NEEDED – Optional, You need this section to be done only if you want to create a separate user for your exercises. You can do this section and create users for each of the line of businesses or industry flavors.)

SAP HANA delivery unit is installed. In this unit users configure Solution Schema and Roles in SAP HANA Studio.

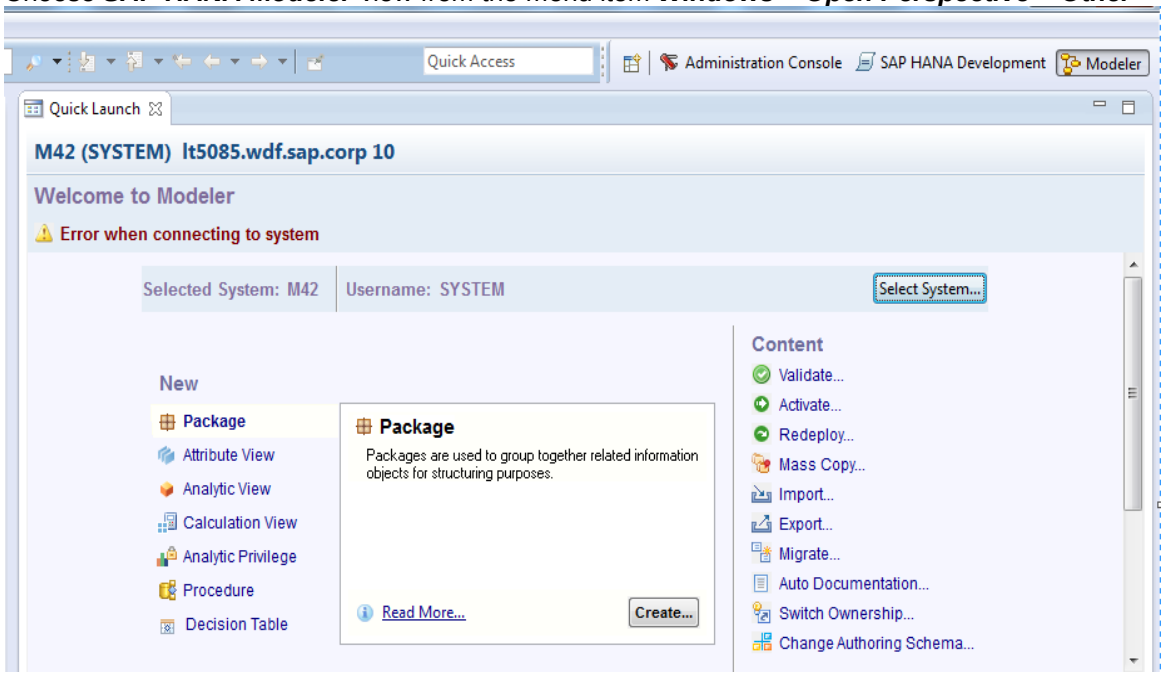
Setting-up Schema Mapping

a) Start SAP HANA Studio by following the menu ***Start > All Programs > SAP HANA > SAP HANA Studio***

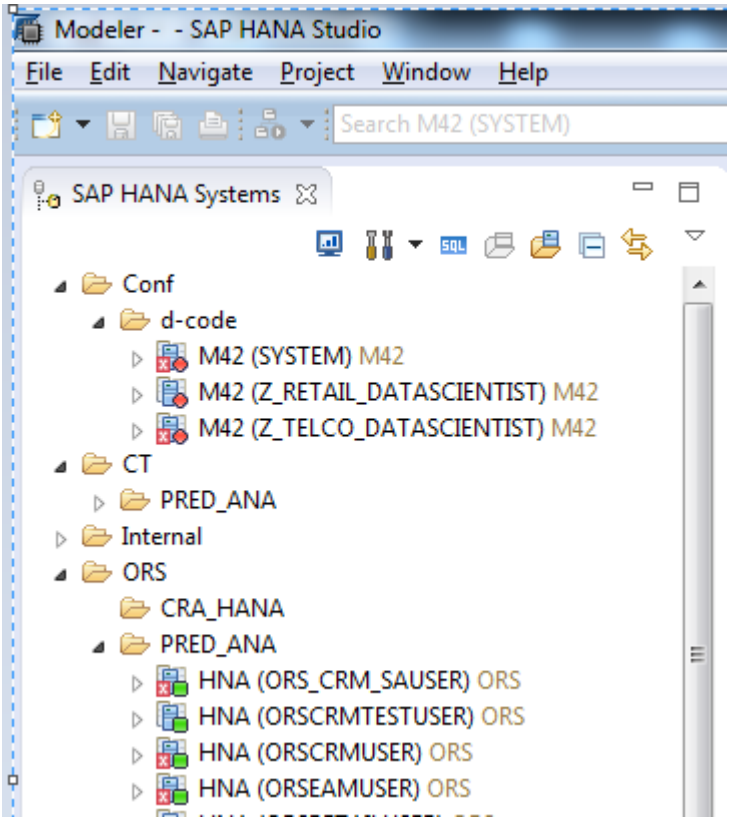
b) ***SAP HANA Studio*** launched, your default view is the ***Administration Console*** perspective.



c) Choose ***SAP HANA Modeler*** view from the menu item ***Windows > Open Perspective > Other***



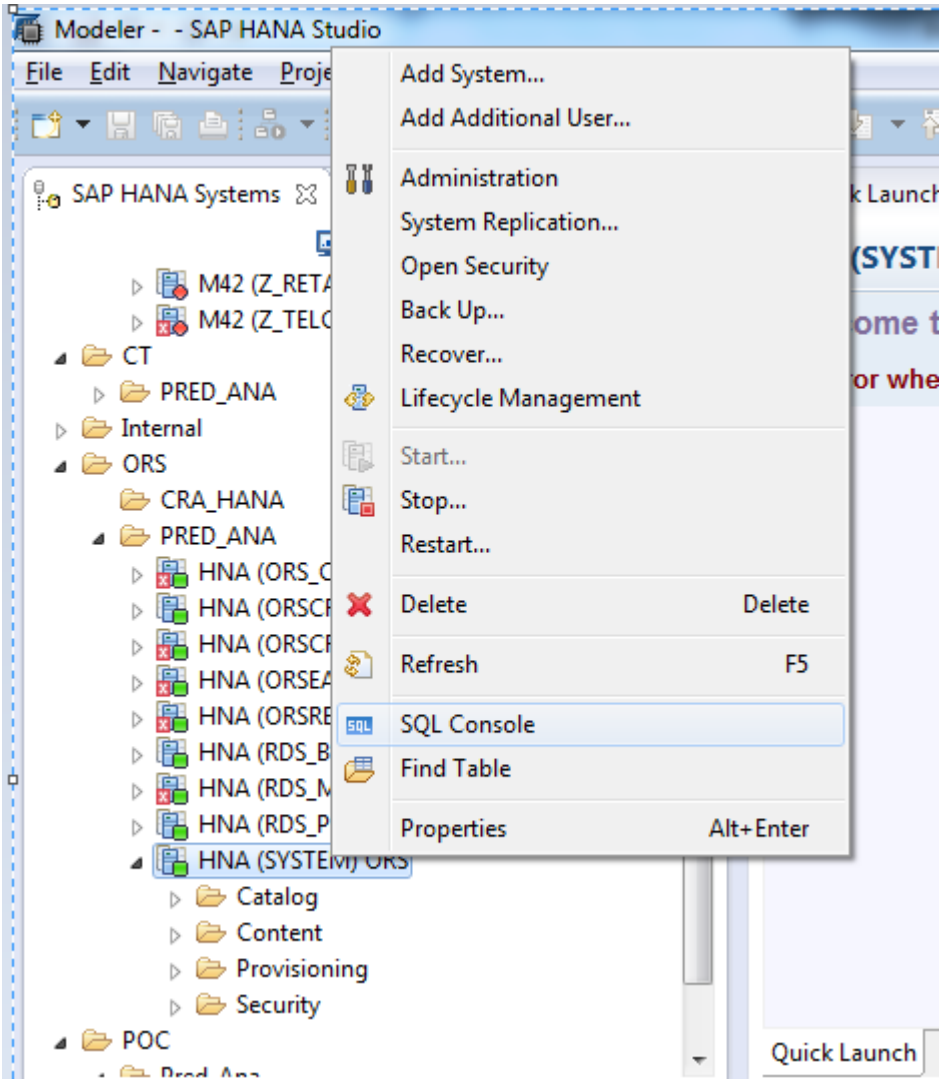
d) Verify your system *vcalhdbdb* in ***SAP HANA Systems*** window



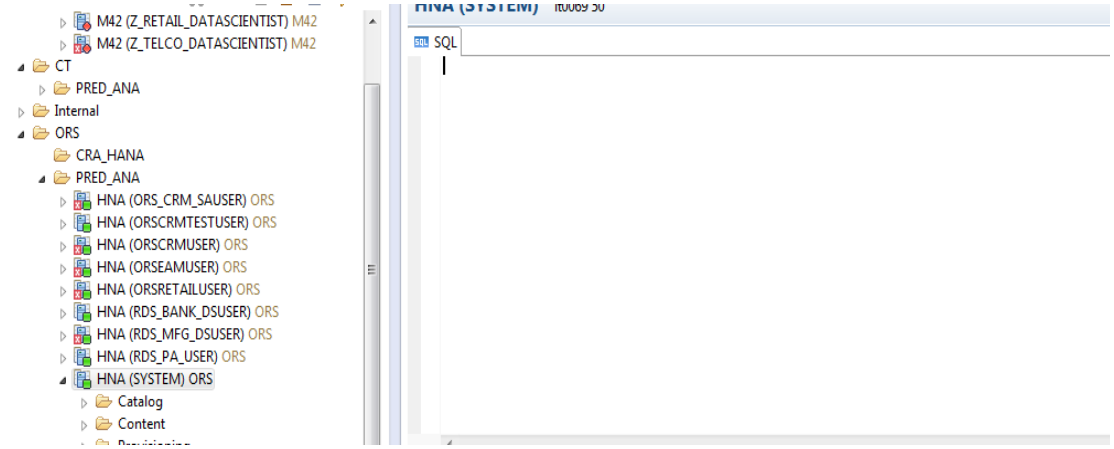
e) If missing, right click in ***SAP HANA Systems*** window and add your system with user account *SYSTEM* and *master* password

Creating Solution Data Schema and System Roles

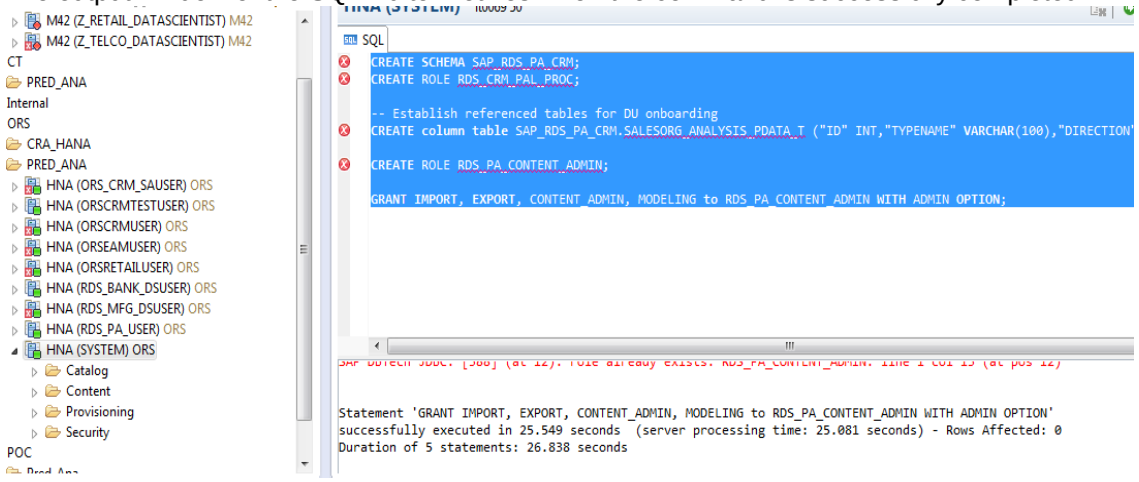
a) To complete the solution data model implementation, the following SQL statements must be executed using SQL Editor Window opened under SYSTEM account in SAP HANA Studio by right-clicking on the ***SYSTEM*** account and selecting ***SQL Console***.



b) You can copy the SQL instructions from **Appendix section** (the electronic version of this document), then paste them directly into the SQL Editor. Depending on the line of business or industry, you copy the respective instructions from the **section – appendix** and copy them in the SQL Editor.



c) The output window of the SQL Editor notifies when the command is successfully completed.



d) Corresponding SAP_RDS_PA_<DOMAIN> schema is created under catalog area of SAP HANA developer studio, and must be visible to SYSTEM account catalog area. For eg., SAP_RDS_PA_CRM

e) Note that some of these objects may have already been set up in your environment. Therefore you may encounter error messages. This is an expected result of this exercise.

Creating Operational and Administrative Roles

In this section, you create operational and administrative roles for users of this solution. The functional roles must be created for specific operational purposes. The designated roles are assigned different operational and access permissions that we recommend.

Functional Roles required for operating and administering this solution:

- *Data Scientist* role for operating SAP Predictive Analytics.
- *Solution Admin User* for full administrative control in managing the solution.
- *Content Admin User* manages SAP HANA content development and deployment.
- *SAP PAL Controller Admin* controls and calibrates the algorithms within the SAP Predictive Analysis Library (PAL).

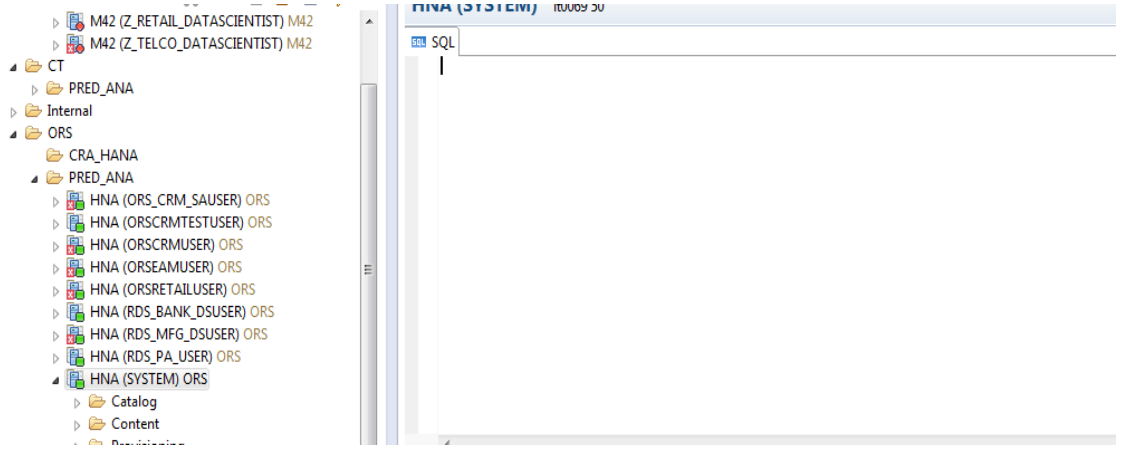
In the creation of the operational and administrative roles, please replace the <DOMAIN> with the following

For Sales & Marketing LoB – CRM
For Manufacturing LoB – MFG
For Finance LoB – FIN
For Banking – BANK
For Telco – TELCO
For Consumer Products – CPG
For Retail – RET
For Project and Portfolio Management – PPM

a) Creating a Data Scientist User for Predictive Analytics Tool.

The Data Scientist role has permission to operate SAP Predictive Analysis. This role is used to prepare predictive analysis, apply appropriate filters, and construct visualizations of the end result of the analysis.

- Execute these steps to establish this type of account. Under the SYSTEM account, open the SQL Editor by right-clicking on the ***SYSTEM*** account and selecting ***SQL Console***. Then copy the SQL instructions from below (the electronic version of this document) and paste them directly into the SQL Editor.



Replace <user name> and <initial password> with your values:
Refer to *step c (Create a password).*

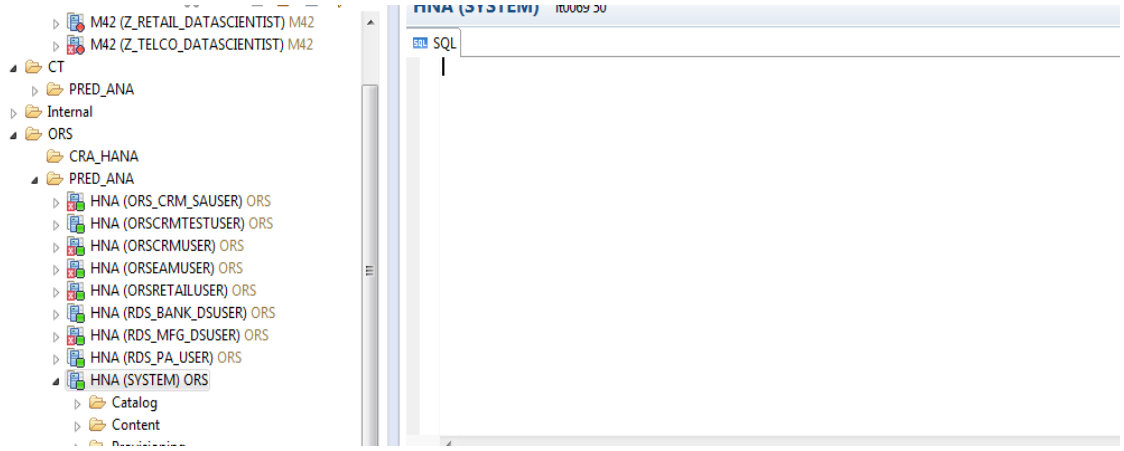
CREATE USER <user name> PASSWORD <initial password> ;
GRANT RDS_<DOMAIN>_PA_ADMIN TO <user name>;
GRANT RDS_<DOMAIN>_PA_BI_ADMIN TO <user name> WITH ADMIN OPTION;
GRANT RDS_<DOMAIN>_PA_ADMIN TO <user name> WITH ADMIN OPTION;

- The output window of the SQL Editor notifies when the command is successfully run.
- The initial password established for this data scientist user has a change password requirement at first logon. Refer to section Establish Permanent password.
- Verify the creation by opening a SQL Window using your data scientist account.
  - SAP_RDS_PA_<DOMAIN> schema is visible in catalog area of that user name
  - SAP_ERP_V4 schema is visible in catalog area of that user name for sales and marketing, manufacturing related scenarios.

b) Creating a Business User Role

The Business User role is a consumer of information provided by the Data Scientist. For some scenarios, the Business User has permission to create predictive analysis and construct visualizations using SAP BusinessObjects Explorer.

- Execute these steps to establish this type of account. Under the SYSTEM account, open the SQL Editor by right-clicking on the ***SYSTEM*** account and selecting ***SQL Console***. Then copy the SQL instructions from below (the electronic version of this document) and paste them directly into the SQL Editor.



Replace <business user name> and <initial password> with your values:
Refer to *step c (Create a password).*

CREATE USER <*business user name*> PASSWORD <*initial password*> ;
GRANT RDS_<DOMAIN>_PA_BI_ADMIN TO <*business user name*> WITH ADMIN OPTION;

- The output window of the SQL Editor notifies when the command is successfully run.

- The initial password established for business user has a change password requirement at first logon. Refer to section Establish Permanent password.

- Verify the role creation by opening a SQL Window using the business user account.
  - SAP_RDS_PA_<DOMAIN> schema is visible in catalog area of the business user
  - SAP_ERP_V4 schema is visible in catalog area of the business user for Sales & Marketing, Manufacturing scenairos.

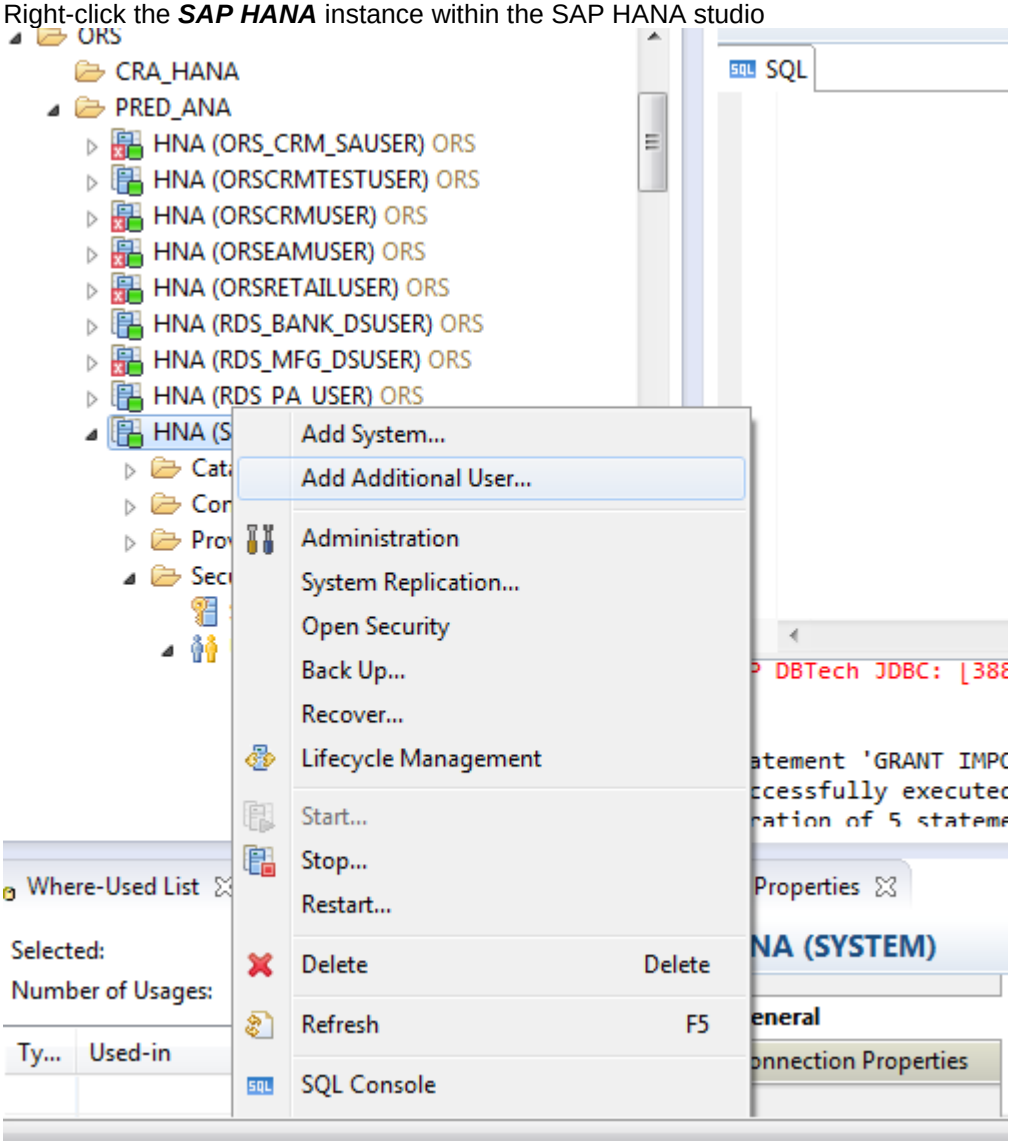
c) Create a password

Create an alphanumeric password with at least 8 characters, the first character being an uppercase letter.

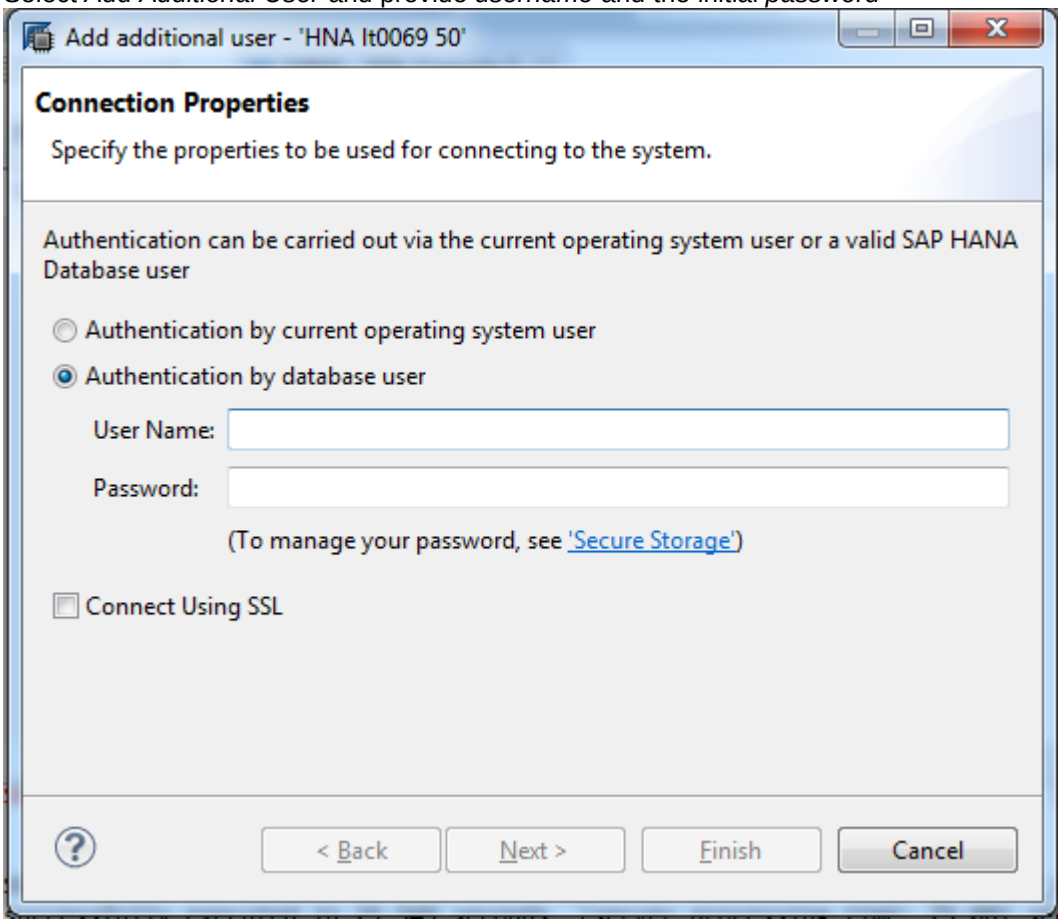
d) Establish Permanent password

For each user, perform the following steps to set the initial password to a permanent password:

- Right-click the ***SAP HANA*** instance within the SAP HANA studio



- Select *Add Additional User* and provide *username* and the initial *password*



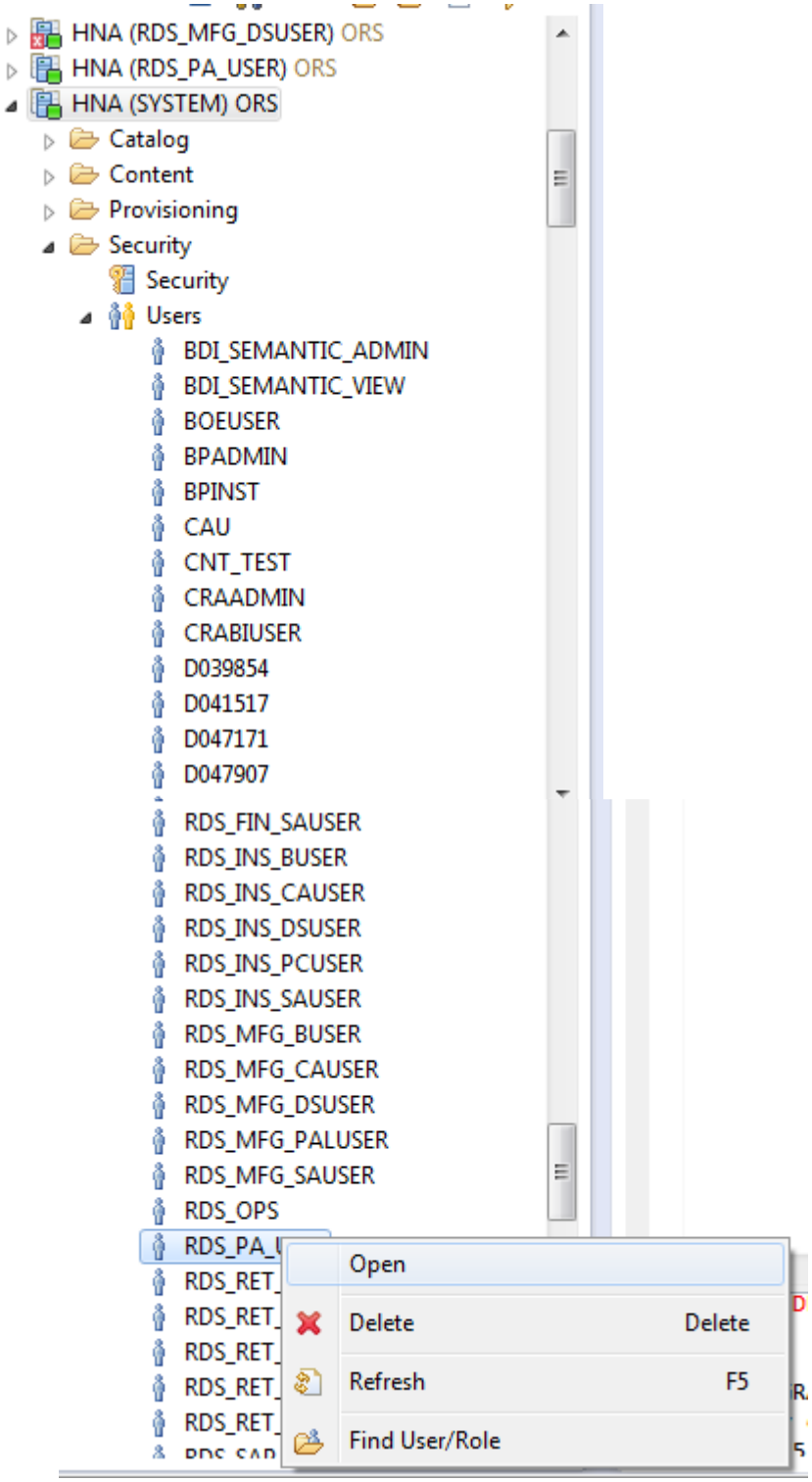
- You are prompted to Enter a new password, which is the permanent password

e) Verify data

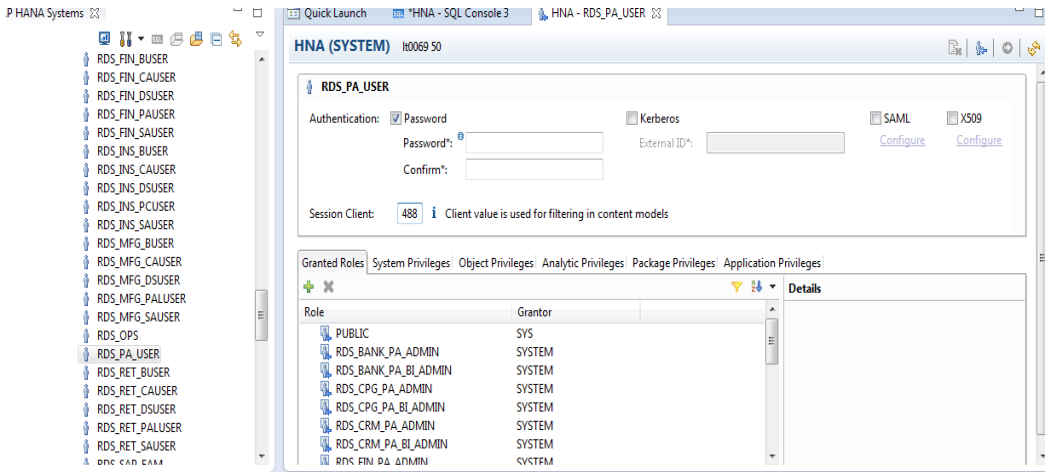
- For each user, open all tables, one after the other, in schema *SAP_RDS_PA_<DOMAIN>* of the Catalog area, right click each table and do a data preview.

f) Set session client

- Logged in with the ***SYSTEM*** user, navigate to the *user XXX* by following the path ***SYSTEM > Security > Users*** and one by one open the users you previously created.



- For each user you previously created set the ***Session Client*** to *488* for **ECC** scenarios.



6 OPEN SOURCE R INCLUDING INSTALLATION (OPTIONAL)

If you want to use the Open source R algorithms, you need to install this component. Follow these steps:

a) Choose File / Install and Configure R

b) Choose *Install R* to install, continue confirming prompts until installation begins.

7 SECURITY ASPECTS

For more information about security vulnerabilities, see this community page.

8 APPENDIX

8.1 Further Documentation

You can find a lot of additional information below.

- SAP SCN: Rapid deployment of SAP Predictive Analytics in the context of SAP HANA for select scenarios.
- SAP JAM: Off-line demos of Predictive Analytics Scenarios.
- SAP Service Marketplace: Related guides, FAQs and more.

8.2 SQL Scripts

a) **Sales & Marketing (Line of Business)**

```
CREATE SCHEMA SAP_RDS_PA_CRM;
```

GRANT CREATE ANY, ALTER, DROP, EXECUTE, SELECT, INSERT, UPDATE, DELETE, INDEX *ON SCHEMA SAP_RDS_PA_CRM TO _SYS_REPO WITH GRANT OPTION;*

-- Establish referenced tables for DU onboarding
CREATE column table SAP_RDS_PA_CRM.SALESORG_ANALYSIS_PDATA_T ("ID" INT,"TYPENAME" VARCHAR(100),"DIRECTION" VARCHAR(100));

--- PAL Content Admin
CREATE ROLE RDS_PA_CONTENT_ADMIN;
GRANT IMPORT, EXPORT, CONTENT_ADMIN, MODELING to RDS_PA_CONTENT_ADMIN WITH ADMIN OPTION;

--- PAL Admin
CREATE ROLE RDS_PA_PAL_ADMIN;

-- Grant afl execute
GRANT AFL__SYS_AFL_AFLPAL_EXECUTE TO RDS_PA_PAL_ADMIN WITH ADMIN OPTION;
GRANT AFL__SYS_AFL_AFLBFL_EXECUTE TO RDS_PA_PAL_ADMIN WITH ADMIN OPTION;
GRANT CREATE R SCRIPT TO RDS_PA_PAL_ADMIN WITH ADMIN OPTION;

-- Role for setting up algorithm using PA tool
CREATE ROLE RDS_PA_DATA_ADMIN;
GRANT DATA ADMIN to RDS_PA_DATA_ADMIN WITH ADMIN OPTION;

CREATE ROLE RDS_CRM_PA_POWER_USER;
GRANT CREATE ANY, ALTER, DROP, EXECUTE, SELECT, INSERT, UPDATE, DELETE, INDEX ON SCHEMA SAP_RDS_PA_CRM to RDS_CRM_PA_POWER_USER WITH GRANT OPTION;
GRANT RDS_CRM_PA_POWER_USER TO _SYS_REPO WITH ADMIN OPTION;

CREATE ROLE RDS_CRM_PA_SELECT_USER;
GRANT SELECT ON SCHEMA SAP_RDS_PA_CRM TO RDS_CRM_PA_SELECT_USER WITH GRANT OPTION;

CREATE ROLE RDS_CRM_PA_ADMIN;
GRANT RDS_PA_CONTENT_ADMIN TO RDS_CRM_PA_ADMIN WITH ADMIN OPTION;

-- append _SELECT_USER to SLT sourced schema and grant to admin role
GRANT **SAP_ERP_V4_POWER_USER** TO RDS_CRM_PA_ADMIN with ADMIN OPTION;
GRANT **SAP_ERP_V4_SELECT_USER** TO _SYS_REPO with ADMIN OPTION;

-- DATA ADMIN
GRANT RDS_PA_CONTENT_ADMIN TO RDS_CRM_PA_ADMIN WITH ADMIN OPTION;
GRANT RDS_CRM_PA_POWER_USER TO RDS_CRM_PA_ADMIN WITH ADMIN OPTION;
GRANT RDS_PA_DATA_ADMIN TO RDS_CRM_PA_ADMIN WITH ADMIN OPTION;

--- PAL Parameter Controller Role
CREATE ROLE RDS_CRM_PAL_PARAMETER_CONTROLLER;
GRANT SELECT, UPDATE, DELETE ON SCHEMA SAP_RDS_PA_CRM TO RDS_CRM_PAL_PARAMETER_CONTROLLER WITH GRANT OPTION;

-- BI Admin Role
CREATE ROLE RDS_CRM_PA_BI_ADMIN;
GRANT RDS_PA_CONTENT_ADMIN to RDS_CRM_PA_BI_ADMIN WITH ADMIN OPTION;
GRANT RDS_CRM_PA_SELECT_USER TO RDS_CRM_PA_BI_ADMIN WITH ADMIN OPTION;
GRANT RDS_PA_PAL_ADMIN TO RDS_CRM_PA_BI_ADMIN WITH ADMIN OPTION;

GRANT **SAP_ERP_V4_SELECT_USER** TO RDS_CRM_PA_BI_ADMIN WITH ADMIN OPTION;
GRANT RDS_PA_PAL_ADMIN TO RDS_CRM_PA_BI_ADMIN WITH ADMIN OPTION;

b) **Manufacturing (Line of Business)**

```
CREATE SCHEMA SAP_RDS_PA_MFG;
GRANT CREATE ANY, ALTER, DROP, EXECUTE, SELECT, INSERT, UPDATE, DELETE, INDEX ON
SCHEMA SAP_RDS_PA_MFG TO _SYS_REPO WITH GRANT OPTION;

--- PA Content
CREATE ROLE RDS_PA_CONTENT_ADMIN;
GRANT IMPORT, EXPORT, CONTENT_ADMIN, MODELING to RDS_PA_CONTENT_ADMIN WITH
ADMIN OPTION;

--- PAL Admin
CREATE ROLE RDS_PA_PAL_ADMIN;

-- Grant AFL EXECUTE
GRANT AFL__SYS_AFL_AFLPAL_EXECUTE TO RDS_PA_PAL_ADMIN WITH ADMIN OPTION;
GRANT AFL__SYS_AFL_AFLBFL_EXECUTE TO RDS_PA_PAL_ADMIN WITH ADMIN OPTION;
GRANT CREATE R SCRIPT TO RDS_PA_PAL_ADMIN WITH ADMIN OPTION;

-- Role for setting up algorithm using PA tool
CREATE ROLE RDS_PA_DATA_ADMIN;
GRANT DATA ADMIN to RDS_PA_DATA_ADMIN WITH ADMIN OPTION;

-- Note this is tied to the SLT Schema and have to append
-- _SELECT USER and grant to admin role

GRANT RDS_SAP_ERP_PA_POWER_USER TO RDS_PA_DATA_ADMIN with ADMIN OPTION;
GRANT RDS_SAP_ERP_PA_SELECT_USER TO _SYS_REPO with ADMIN OPTION;

-- Note this is tied to the HANA Live Schema and have to append
-- _SELECT USER and grant to admin role

GRANT SAP_ECC_POWER_USER TO RDS_PA_DATA_ADMIN with ADMIN OPTION;
GRANT SAP_ECC_SELECT_USER TO _SYS_REPO with ADMIN OPTION;

CREATE ROLE RDS_MFG_PA_POWER_USER;
GRANT CREATE ANY, ALTER, DROP, EXECUTE, SELECT, INSERT, UPDATE, DELETE, INDEX ON
SCHEMA SAP_RDS_PA_MFG to RDS_MFG_PA_POWER_USER WITH GRANT OPTION;
GRANT RDS_MFG_PA_POWER_USER TO _SYS_REPO WITH ADMIN OPTION;

CREATE ROLE RDS_MFG_PA_SELECT_USER;
GRANT SELECT ON SCHEMA SAP_RDS_PA_MFG TO RDS_MFG_PA_SELECT_USER WITH
GRANT OPTION;

CREATE ROLE RDS_MFG_PA_ADMIN;
GRANT RDS_PA_CONTENT_ADMIN TO RDS_MFG_PA_ADMIN WITH ADMIN OPTION;

-- Append _SELECT_USER to SLT sourced schema and grant to admin role

-- DATA ADMIN
GRANT RDS_PA_CONTENT_ADMIN TO RDS_MFG_PA_ADMIN WITH ADMIN OPTION;
GRANT RDS_PA_DATA_ADMIN TO RDS_MFG_PA_ADMIN WITH ADMIN OPTION;
GRANT RDS_MFG_PA_POWER_USER TO RDS_MFG_PA_ADMIN WITH ADMIN OPTION;

--- PAL Parameter Controller Role
```

CREATE ROLE RDS_MFG_PAL_PARAMETER_CONTROLLER;
GRANT SELECT, UPDATE, DELETE ON SCHEMA SAP_RDS_PA_MFG TO
RDS_MFG_PAL_PARAMETER_CONTROLLER WITH GRANT OPTION;

-- BI Admin Role
CREATE ROLE RDS_MFG_PA_BI_ADMIN;
GRANT RDS_PA_CONTENT_ADMIN to RDS_MFG_PA_BI_ADMIN WITH ADMIN OPTION;
GRANT RDS_PA_PAL_ADMIN TO RDS_MFG_PA_BI_ADMIN WITH ADMIN OPTION;
GRANT RDS_MFG_PA_SELECT_USER TO RDS_MFG_PA_BI_ADMIN WITH ADMIN OPTION;

GRANT **RDS_SAP_ERP_PA_SELECT_USER** TO RDS_MFG_PA_BI_ADMIN WITH ADMIN OPTION;
GRANT **SAP_ECC_SELECT_USER** TO RDS_MFG_PA_BI_ADMIN WITH ADMIN OPTION;

c) **Finance (Line of Business)**

CREATE SCHEMA SAP_RDS_PA_FIN;

GRANT CREATE ANY, **ALTER**, **DROP**, **EXECUTE**, **SELECT**, **INSERT**, **UPDATE**, **DELETE**, **INDEX ON SCHEMA** SAP_RDS_PA_FIN **TO** _SYS_REPO **WITH GRANT OPTION**;

--PA Content Admin
CREATE ROLE RDS_PA_CONTENT_ADMIN;
GRANT IMPORT, **EXPORT**, CONTENT_ADMIN, MODELING **to** RDS_PA_CONTENT_ADMIN **WITH** ADMIN **OPTION**;

--PA Pal Admin
CREATE ROLE RDS_PA_PAL_ADMIN;

-- Grant afl execute to PAL Admin
GRANT AFL__SYS_AFL_AFLPAL_EXECUTE **TO** RDS_PA_PAL_ADMIN **WITH** ADMIN **OPTION**;
GRANT AFL__SYS_AFL_AFLBFL_EXECUTE **TO** RDS_PA_PAL_ADMIN **WITH** ADMIN **OPTION**;
GRANT CREATE R SCRIPT **TO** RDS_PA_PAL_ADMIN **WITH** ADMIN **OPTION**;

-- Role for setting up algorithm using PA tool
CREATE ROLE RDS_PA_DATA_ADMIN;
GRANT DATA ADMIN **to** RDS_PA_DATA_ADMIN **WITH** ADMIN **OPTION**;

--- PAL Parameter Controller Role
CREATE ROLE RDS_FIN_PAL_PARAMETER_CONTROLLER;
GRANT SELECT, UPDATE, DELETE ON SCHEMA SAP_RDS_PA_FIN TO
RDS_FIN_PAL_PARAMETER_CONTROLLER WITH GRANT OPTION;

-- Role for setting up hana content modeling
CREATE ROLE RDS_FIN_PA_BI_ADMIN;
GRANT RDS_PA_CONTENT_ADMIN **to** RDS_FIN_PA_BI_ADMIN **WITH** ADMIN **OPTION**;
GRANT SELECT ON SCHEMA SAP_RDS_PA_FIN **TO** RDS_FIN_PA_BI_ADMIN **WITH GRANT OPTION**;

-- Role for setting up algorithm using PA tool
CREATE ROLE RDS_FIN_PA_ADMIN;
GRANT RDS_PA_PAL_ADMIN **TO** RDS_FIN_PA_ADMIN **WITH** ADMIN **OPTION**;
GRANT RDS_PA_DATA_ADMIN **TO** RDS_FIN_PA_ADMIN **WITH** ADMIN **OPTION**;

-- <HANA_LIVE_SCHEMA> refers to the schema managed by the SAP LT
-- process, and is the underlying schema for HANA Live views.

GRANT <HANA_LIVE_SCHEMA>_POWER_USER **TO** RDS_FIN_PA_ADMIN **with** ADMIN **OPTION**;
GRANT RDS_FIN_PA_BI_ADMIN **TO** RDS_FIN_PA_ADMIN **WITH** ADMIN **OPTION**;
GRANT SELECT ON SCHEMA SAP_RDS_PA_FIN **TO** _SYS_REPO **WITH GRANT OPTION**;
GRANT <HANA_LIVE_SCHEMA>_SELECT_USER **TO** _SYS_REPO **with** ADMIN **OPTION**;

d) **Portfolio & Project Management (Line of Business)**

CREATE SCHEMA SAP_RDS_PA_PPM;
GRANT CREATE ANY, ALTER, DROP, EXECUTE, SELECT, INSERT, UPDATE, DELETE, INDEX ON SCHEMA SAP_RDS_PA_PPM TO _SYS_REPO WITH GRANT OPTION;

--PA Content Admin
CREATE ROLE RDS_PA_CONTENT_ADMIN;
GRANT IMPORT, **EXPORT**, CONTENT_ADMIN, MODELING **to** RDS_PA_CONTENT_ADMIN **WITH** ADMIN **OPTION**;

--PA Pal Admin
CREATE ROLE RDS_PA_PAL_ADMIN;

-- Grant afl execute to PAL Admin
GRANT AFL__SYS_AFL_AFLPAL_EXECUTE **TO** RDS_PA_PAL_ADMIN **WITH** ADMIN **OPTION**;
GRANT AFL__SYS_AFL_AFLBFL_EXECUTE **TO** RDS_PA_PAL_ADMIN **WITH** ADMIN **OPTION**;
GRANT AFL__SYS_AFL_APL_AREA_EXECUTE TO RDS_PA_PAL_ADMIN WITH ADMIN OPTION;
GRANT AFLPM_CREATOR_ERASER_EXECUTE TO RDS_PA_PAL_ADMIN WITH ADMIN OPTION;
GRANT CREATE R SCRIPT **TO** RDS_PA_PAL_ADMIN **WITH** ADMIN **OPTION**;

-- Role for setting up algorithm using PA tool
CREATE ROLE RDS_PA_DATA_ADMIN;
GRANT DATA ADMIN **to** RDS_PA_DATA_ADMIN **WITH** ADMIN **OPTION**;

-- Role for PAL Parameter Controller
CREATE ROLE RDS_PPM_PAL_PARAMETER_CONTROLLER;
GRANT SELECT, UPDATE, DELETE ON SCHEMA SAP_RDS_PA_PPM TO RDS_PPM_PAL_PARAMETER_CONTROLLER WITH GRANT OPTION;

-- Role for setting up hana content modeling
CREATE ROLE RDS_PPM_PA_BI_ADMIN;
GRANT RDS_PA_CONTENT_ADMIN to RDS_PPM_PA_BI_ADMIN WITH ADMIN OPTION;
GRANT SELECT ON SCHEMA SAP_RDS_PA_PPM TO RDS_PPM_PA_BI_ADMIN WITH GRANT OPTION;

-- Role for setting up algorithm using PA tool
CREATE ROLE RDS_PPM_PA_ADMIN;
GRANT RDS_PA_PAL_ADMIN **TO** RDS_PPM_PA_ADMIN **WITH** ADMIN **OPTION**;
GRANT RDS_PA_DATA_ADMIN **TO** RDS_PPM_PA_ADMIN **WITH** ADMIN **OPTION**;
GRANT RDS_PPM_PA_BI_ADMIN **TO** RDS_PPM_PA_ADMIN **WITH** ADMIN **OPTION**;
GRANT SELECT ON SCHEMA SAP_RDS_PA_PPM **TO** _SYS_REPO **WITH GRANT OPTION**;

e) **Banking (Industry)**

CREATE SCHEMA SAP_RDS_PA_BANK;
GRANT CREATE ANY, ALTER, DROP, EXECUTE, SELECT, INSERT, UPDATE, DELETE, INDEX ON SCHEMA SAP_RDS_PA_BANK TO _SYS_REPO WITH GRANT OPTION;

```
--PA Content Admin
CREATE ROLE RDS_PA_CONTENT_ADMIN;
GRANT IMPORT, EXPORT, CONTENT_ADMIN, MODELING to RDS_PA_CONTENT_ADMIN WITH
ADMIN OPTION;

--PA Pal Admin
CREATE ROLE RDS_PA_PAL_ADMIN;

-- Grant afl execute to PAL Admin
GRANT AFL__SYS_AFL_AFLPAL_EXECUTE TO RDS_PA_PAL_ADMIN WITH ADMIN OPTION;
GRANT AFL__SYS_AFL_AFLBFL_EXECUTE TO RDS_PA_PAL_ADMIN WITH ADMIN OPTION;
GRANT CREATE R SCRIPT TO RDS_PA_PAL_ADMIN WITH ADMIN OPTION;

-- Role for setting up algorithm using PA tool
CREATE ROLE RDS_PA_DATA_ADMIN;
GRANT DATA ADMIN to RDS_PA_DATA_ADMIN WITH ADMIN OPTION;

-- Role for setting up hana content modeling
CREATE ROLE RDS_BANK_PA_BI_ADMIN;
GRANT RDS_PA_CONTENT_ADMIN to RDS_BANK_PA_BI_ADMIN WITH ADMIN OPTION;
GRANT SELECT ON SCHEMA SAP_RDS_PA_BANK TO RDS_BANK_PA_BI_ADMIN WITH GRANT
OPTION;

-- Role for setting up algorithm using PA tool
CREATE ROLE RDS_BANK_PA_ADMIN;
GRANT RDS_PA_PAL_ADMIN TO RDS_BANK_PA_ADMIN WITH ADMIN OPTION;
GRANT RDS_PA_DATA_ADMIN TO RDS_BANK_PA_ADMIN WITH ADMIN OPTION;
GRANT RDS_BANK_PA_BI_ADMIN TO RDS_BANK_PA_ADMIN WITH ADMIN OPTION;
GRANT SELECT ON SCHEMA SAP_RDS_PA_BANK TO _SYS_REPO WITH GRANT OPTION;
```

f) **Consumer Products (Industry)**

```
CREATE SCHEMA SAP_RDS_PA_CPG;
GRANT CREATE ANY, ALTER, DROP, EXECUTE, SELECT, INSERT, UPDATE, DELETE, INDEX ON
SCHEMA SAP_RDS_PA_CPG TO _SYS_REPO WITH GRANT OPTION;
GRANT SELECT ON SCHEMA <DSIM_DOMAIN> TO _SYS_REPO WITH GRANT OPTION;

--PA Content Admin
CREATE ROLE RDS_PA_CONTENT_ADMIN;
GRANT IMPORT, EXPORT, CONTENT_ADMIN, MODELING to RDS_PA_CONTENT_ADMIN WITH
ADMIN OPTION;

--PA Pal Admin
CREATE ROLE RDS_PA_PAL_ADMIN;

-- Grant afl execute to PAL Admin
GRANT AFL__SYS_AFL_AFLPAL_EXECUTE TO RDS_PA_PAL_ADMIN WITH ADMIN OPTION;
GRANT AFL__SYS_AFL_AFLBFL_EXECUTE TO RDS_PA_PAL_ADMIN WITH ADMIN OPTION;
GRANT CREATE R SCRIPT TO RDS_PA_PAL_ADMIN WITH ADMIN OPTION;

-- Role for setting up algorithm using PA tool
CREATE ROLE RDS_PA_DATA_ADMIN;
GRANT DATA ADMIN to RDS_PA_DATA_ADMIN WITH ADMIN OPTION;
```

-- Role for setting up SAP HANA content modeling
CREATE ROLE RDS_CPG_PA_BI_ADMIN;
GRANT RDS_PA_CONTENT_ADMIN to RDS_CPG_PA_BI_ADMIN WITH ADMIN OPTION;
GRANT SELECT ON SCHEMA <CPG_DOMAIN> TO RDS_CPG_PA_BI_ADMIN WITH GRANT OPTION;
GRANT SELECT ON SCHEMA <DSIM_DOMAIN> TO RDS_CPG_PA_BI_ADMIN WITH GRANT

-- Role for setting up algorithm using PA tool
CREATE ROLE RDS_CPG_PA_ADMIN;
GRANT RDS_PA_PAL_ADMIN **TO** RDS_CPG_PA_ADMIN **WITH** ADMIN **OPTION**;
GRANT RDS_PA_DATA_ADMIN **TO** RDS_CPG_PA_ADMIN **WITH** ADMIN **OPTION**;
GRANT RDS_CPG_PA_BI_ADMIN **TO** RDS_CPG_PA_ADMIN **WITH** ADMIN **OPTION**;
GRANT SELECT ON SCHEMA <CPG_DOMAIN> **TO** _SYS_REPO **WITH GRANT OPTION**;

g) **Retail (Industry)**

CREATE SCHEMA SAP_RDS_PA_RETAIL;

GRANT CREATE ANY, ALTER, DROP, EXECUTE, SELECT, INSERT, UPDATE, DELETE, INDEX ON SCHEMA SAP_RDS_PA_RETAIL TO _SYS_REPO WITH GRANT OPTION;

--PA Content Admin
CREATE ROLE RDS_PA_CONTENT_ADMIN;
GRANT IMPORT, **EXPORT**, CONTENT_ADMIN, MODELING **to** RDS_PA_CONTENT_ADMIN **WITH** ADMIN **OPTION**;

--PA Pal Admin
CREATE ROLE RDS_PA_PAL_ADMIN;

-- Grant afl execute to PAL Admin
GRANT AFL__SYS_AFL_AFLPAL_EXECUTE **TO** RDS_PA_PAL_ADMIN **WITH** ADMIN **OPTION**;
GRANT AFL__SYS_AFL_AFLBFL_EXECUTE **TO** RDS_PA_PAL_ADMIN **WITH** ADMIN **OPTION**;
GRANT CREATE R SCRIPT **TO** RDS_PA_PAL_ADMIN **WITH** ADMIN **OPTION**;

--- PAL Parameter Controller Role
CREATE ROLE RDS_RETAIL_PAL_PARAMETER_CONTROLLER;
GRANT SELECT, UPDATE, DELETE ON SCHEMA SAP_RDS_PA_RETAIL TO RDS_RETAIL_PAL_PARAMETER_CONTROLLER WITH GRANT OPTION;

-- Role for setting up algorithm using PA tool
CREATE ROLE RDS_PA_DATA_ADMIN;
GRANT DATA ADMIN **to** RDS_PA_DATA_ADMIN **WITH** ADMIN **OPTION**;

-- Role for setting up hana content modeling
CREATE ROLE RDS_RETAIL_PA_BI_ADMIN;
GRANT RDS_PA_CONTENT_ADMIN to RDS_RETAIL_PA_BI_ADMIN WITH ADMIN OPTION;
GRANT SELECT ON SCHEMA <RETAIL_DOMAIN> TO RDS_RETAIL_PA_BI_ADMIN WITH GRANT OPTION;

-- Role for setting up algorithm using PA tool
CREATE ROLE RDS_RETAIL_PA_ADMIN;
GRANT RDS_PA_PAL_ADMIN **TO** RDS_RETAIL_PA_ADMIN **WITH** ADMIN **OPTION**;
GRANT RDS_PA_DATA_ADMIN **TO** RDS_RETAIL_PA_ADMIN **WITH** ADMIN **OPTION**;
GRANT RDS_RETAIL_PA_BI_ADMIN **TO** RDS_RETAIL_PA_ADMIN **WITH** ADMIN **OPTION**;
GRANT SELECT ON SCHEMA <RETAIL_DOMAIN> **TO** _SYS_REPO **WITH GRANT OPTION**;

GRANT **SAP_CAR_SELECT_USER** TO RDS_RETAIL_PA_BI_ADMIN WITH ADMIN OPTION;
GRANT RDS_PA_PAL_ADMIN TO RDS_RETAIL_PA_BI_ADMIN WITH ADMIN OPTION;

h) **Telco (Industry)**

CREATE SCHEMA SAP_RDS_PA_TELCO;
GRANT CREATE ANY, ALTER, DROP, EXECUTE, SELECT, INSERT, UPDATE, DELETE, INDEX ON SCHEMA SAP_RDS_PA_TELCO TO _SYS_REPO WITH GRANT OPTION;

--PA Content Admin
CREATE ROLE RDS_PA_CONTENT_ADMIN;
GRANT IMPORT, **EXPORT**, CONTENT_ADMIN, MODELING **to** RDS_PA_CONTENT_ADMIN **WITH** ADMIN **OPTION**;

--PA Pal Admin
CREATE ROLE RDS_PA_PAL_ADMIN;

-- Grant afl execute to PAL Admin
GRANT AFL__SYS_AFL_AFLPAL_EXECUTE **TO** RDS_PA_PAL_ADMIN **WITH** ADMIN **OPTION**;
GRANT AFL__SYS_AFL_AFLBFL_EXECUTE **TO** RDS_PA_PAL_ADMIN **WITH** ADMIN **OPTION**;
GRANT CREATE R SCRIPT **TO** RDS_PA_PAL_ADMIN **WITH** ADMIN **OPTION**;

-- Role for setting up algorithm using PA tool
CREATE ROLE RDS_PA_DATA_ADMIN;
GRANT DATA ADMIN **to** RDS_PA_DATA_ADMIN **WITH** ADMIN **OPTION**;

-- Role for setting up SAP HANA content modeling
CREATE ROLE RDS_TELCO_PA_BI_ADMIN;
GRANT RDS_PA_CONTENT_ADMIN to RDS_TELCO_PA_BI_ADMIN WITH ADMIN OPTION;
GRANT SELECT ON SCHEMA SAP_RDS_PA_TELCO TO RDS_TELCO_PA_BI_ADMIN WITH GRANT OPTION;

-- Role for setting up algorithm using PA tool
CREATE ROLE RDS_TELCO_PA_ADMIN;
GRANT RDS_PA_PAL_ADMIN **TO** RDS_TELCO_PA_ADMIN **WITH** ADMIN **OPTION**;
GRANT RDS_PA_DATA_ADMIN **TO** RDS_TELCO_PA_ADMIN **WITH** ADMIN **OPTION**;
GRANT RDS_TELCO_PA_BI_ADMIN **TO** RDS_TELCO_PA_ADMIN **WITH** ADMIN **OPTION**;