

Keeping Hope Afloat: How to Prevent Financial Loss amongst a Sea of Online Pirates

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ABSTRACT

Gone are the days when the only method of receiving a loan was by visiting your local branch and working with a loan officer. In today's economy, financial institutions are increasingly relying on online channels to interact with their customers. The anonymity that is inherent in this channel makes it a prime target for fraudsters. The solution is to profile the behavior of Internet banking in real time and risk-assess each transaction as it is processed in order to prevent financial loss before it occurs. SAS® Visual Scenario Designer enables you to create rules, scenarios, and models, test their impact, and inject them into real-time transaction processing using SAS® Event Stream Processing.

INTRODUCTION

The financial services industry is currently undergoing a dramatic shift toward digitalization as it tries to both reduce costs and satisfy increasingly tech-savvy customers who demand instant, online, and remote access to banking services. The expansion of Internet banking has led to many new fraud and cyber-crime challenges as online fraudsters discover and exploit weak defenses in these new channels. In addition, organizations struggle to keep up with the demands for data analysis due to increasing volumes of online transactions and the need for real-time decisioning.

With such challenges at hand, you must use a sophisticated analytical system, capable of effectively analyzing large data volumes, to prevent financial loss. Traditional anti-fraud systems are not able to keep up with the changing demands of online banking system for the following reasons:

- It is difficult to introduce new profiles and metrics, which might hold the key to uncovering new patterns of fraud.
- Fraudsters can adapt quickly, out-pacing the long lead times that are typically associated with introducing new models.
- Ineffective models or ones that produce a high percentage of false positives lead to bad customer experiences or high operational costs.

SAS is making analytics approachable, providing you with insights into data and allowing you to constantly discover new patterns of fraud and then use the findings in your operational systems. SAS® Visual Scenario Designer enables you to structure data for analytics and then create rules and models that detect anomalous behavior associated with fraud. In addition, SAS Visual Scenario Designer uses SAS® LASR™ Analytic Server to enable fast and distributed analysis of the large volumes of online transactions. SAS® Event Stream Processing takes the rules and models developed in SAS Visual Scenario Designer and inserts them into the online transaction stream delivering real-time decisioning. The combination of SAS Visual Scenario Designer and SAS Event Stream Processing addresses all of shortcomings of traditional anti-fraud systems mentioned above.

This paper examines how you can combat online fraud and the benefits that SAS Visual Scenario Designer brings to your organization in that effort.

ONLINE TRANSACTIONS

The examples in this paper are derived from data collected during thousands of online banking sessions where users performed various activities, the majority of which are normal. A very small percentage of these transactions is associated with online fraud, and our goal is to stop future transactions that share similar patterns with fraudulent ones. The data is described in Table 1. Online Transaction Example Data:

Field name	Type	Role
TRANSACTION_ID	CHARACTER	Key
TRANS_TYPE	CHARACTER	
PRODUCT_TYPE	CHARACTER	
PAYEE_CUST_ID	CHARACTER	Profile Group By
PAYEE_ACCOUNT_NUMBER	CHARACTER	
AMOUNT	NUMERIC	Measure
BENEFICIARY_ACCOUNT_NUMBER	CHARACTER	Profile Group By
IP_ADDRESS	CHARACTER	Profile Group By
SESSION_ID	NUMERIC	
TRANSACTION_DATETIME	DATETIME	Time
NEW_BENEFICIARY	BOOLEAN	
COUNTRY_CODE	CHARACTER	
COUNTRY_NAME	CHARACTER	
TRANSACTION_ORIGIN	CHARACTER	
CONFIRMED_FRAUD	BOOLEAN	Target
ACCOUNT_STATUS	CHARACTER	
BROWSER	CHARACTER	

Table 1. Online Transaction Example Data

METHODOLOGY

In order to prepare the data for predictive analytics and what-if hypothesis testing, you must first create profiles or aggregations across elements of interest. For the online transactional data described above, create three profiles outlined in Table 2. Example Profiles:

Profile	Group By	Events / Metrics collected
Customer profile	PAYEE_CUST_ID	Number of transactions Number of beneficiaries Number of logons Number of foreign logons
IP profile	IP_ADDRESS	Number of customers Number of transactions Number of fraudulent transactions
Beneficiary profile	BENEFICIARY_ACCOUNT_NUMBER	Number of customers Number of transactions Number of fraudulent transactions

Table 2. Profiles

Next, combine the transactional data with the profile results as illustrated in Figure 1:

Transaction ID	Customer ID	Transaction Date/Time	Amount	IP Address	Beneficiary	Total Txns	Recent bens paid	Logons from abroad	IP Customers	IP Txns	IP Fraud Txns	Total Txns	Frauds
1	123	01SEP2014	\$1234	123.234.345.456	12345	15	2	5	15	22	5	10	2

Customer profile IP profile Beneficiary profile

Figure 1 Combine Profile and Transactional Data

Now, you can identify patterns like the following that match the business hypothesis:

- first time this customer has logged on from abroad and attempted a high-value transaction
- recently paid, multiple beneficiaries from an IP that has had previous fraudulent transactions

You can also use machine-learning techniques to identify the likelihood of future fraud.

SAS VISUAL SCENARIO DESIGNER

SAS Visual Scenario Designer enables you to create data-driven scenarios that accurately identify events or detect patterns of interest. To aid pattern discovery and to write rules against the patterns, the application uses SAS LASR Analytic Server input to aggregate specified data fields.

In this section, we illustrate how you can use SAS Visual Scenario Designer to create the profiles outlined in Table 2, and then combine them with the original transaction data.

Starting with the data described in Table 1. Online Transaction Example Data, create a new aggregate window for customer profile as illustrated in Displays 1-2:

New Window

Name:

Data source:

Group-by columns:

123 AMOUNT

Account_Status

123 Confirmed_fraud

IP_Address

payee_cust_id

Transaction date:

Transaction time unit:

Output level:

End date:

[Add data sources...](#)

Create **Cancel**

Display 1. Create a Customer Profile Window

Then, add new computed columns to profile the behavior of the customer up to the point of the transaction. You can start with the columns outlined in Table 3. Example Customer Profile Columns:

Column	Metric	Conditions
CUST_TOTAL_TRANSACTIONS	Count	None
CUST_INTERNATIONAL_TRANSACTIONS	Count	TRANSACTION_ORIGN="INTERNATIONAL"
CUST_FRAUD_TRANSACTIONS	Count	CONFIRMED_FRAUD="1"
CUST_TOTAL_TXN_AMT	Sum of AMOUNT	None
CUST_TXN_AV_AMT	Average of AMOUNT	None
CUST_TXN_STD_AMT	Standard Deviation of AMOUNT	None

Table 3. Example Customer Profile Columns

The screenshot displays the SAS Visual Scenario Designer interface for a 'Customer Profile' window. The left sidebar contains configuration options: Name (ONLINE_CUST_PROFILE), Description, Primary data source (ONLINE_FRAUD_DATA_FIR), Additional data sources (No data source specified), Default numeric aggregation (Sum), Default lookback period (1), Include missing values for 'group by' keys and 'distinct count' aggregation, Group-by columns (payee_cust_id), Output type, Output level (Group), Transaction time unit (Days), and Transaction date (TransactionDate). The main area shows a data table with columns: payee_cust_id, cust_total_tra..., cust_international..., cust_fraud_transac..., cust_total_txn_amt, cust_txn_av_amt, cust_txn_stddev, cust_txn_stddevs_from_mean, current_amount, and cust_beneficiaries... The table is filtered by 'payee_cust_id' and shows 100 rows of data. The bottom status bar indicates 'Input records: 190,279 / Output records: 190,279'.

Display 2. Customer Profile Window

Next, create a new aggregate window for IP Profile as illustrated in Displays 3-4:

The 'New Window' dialog box is shown with the following configuration:

- Name:** ONLINE_IP_PROFILE
- Data source:** ONLINE_FRAUD_DATA_FIN
- Group-by columns:**
 - AMOUNT
 - Account_Status
 - Confirmed_fraud
 - Payee_account_number
- Transaction date:** TransactionDate
- Transaction time unit:** DAYS
- Output level:** Group
- End date:** 08/28/2014 23:59:59

At the bottom right, there is a link 'Add data sources...' and two buttons: 'Create' (circled in red) and 'Cancel'.

Display 3. Create an IP Profile Window

Then, add new computed columns to profile the transactions coming from the same IP address up to the point of the transaction. You can start with the columns outlined in Table 4. Example IP Profile Columns:

COLUMN	Metric	Conditions
IP_TOTAL_CUSTOMERS	Distinct Count of PAYEE_CUST_ID	None
IP_TOTAL_TRANSACTIONS	Count	None
IP_TXN_AMOUNT	Sum of AMOUNT	None
IP_TXN_AVERAGE	Average of AMOUNT	None
IP_EXTERNALBANK_TRANSACTIONS	Count	TRANS_TYPE = "EXTERNAL BANK"
IP_EXTERNALBANK_TXN_AMOUNT	Sum of AMOUNT	TRANS_TYPE = "EXTERNAL BANK"
IP_FRAUD_TRANSACTIONS	Count	CONFIRMED_FRAUD="1"

Table 4. Example IP Profile Columns

SAS® Visual Scenario Designer

Main > Window: ONLINE_IP_PROFILE

End date: 08/28/2014 23:59:59

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

IP_Address	IP_Total_Customers	IP_Total_Transactions	IP_Txn_Amount	IP_Txn_Average	IP_ExternalBank_Transactions	IP_ExternalBank_Txn_Amount	IP_Previous_Frauds	IP_Previous_Fraud_Flag
10.124.186.	1	8	\$5,600.00	\$700.00	1		0	0
10.126.94.87	2	27	\$16,488.43	\$607.87	20	\$11,587.08	0	0
10.132.99.2.	1	8	\$18,727.14	\$3,960.89	1		0	0
10.150.159.	1	16	\$3,489.94	\$218.08	16	\$3,489.94	0	0
10.17.231.2.	1	4	\$33,281.75	\$8,320.44	4	\$33,281.75	0	0
10.178.219.	4	28	\$7,340.35	\$262.16	5	\$169.51	0	0
10.182.124.	1	7	\$132.65	\$18.95	7	\$132.65	0	0
10.187.197.	1	33	\$6,494.69	\$196.81	1		0	0
10.200.215.	1	8	\$13,451.64	\$1,681.45	8	\$13,451.64	0	0
10.208.254.	8	45	\$29,118.69	\$647.08	13	\$5,065.92	0	0
10.217.108.	2	12	\$12,190.65	\$1,015.89	1		0	0
10.229.243.	1	12	\$619.25	\$51.60	9	\$379.50	0	0
10.235.186.	2	16	\$29,542.22	\$1,846.39	13	\$13,929.54	0	0
10.245.196.	1	4	\$1,047.49	\$261.87	4	\$1,047.49	0	0
10.247.53.2.	1	27	\$5,862.37	\$217.12	25	\$5,515.64	0	0
10.36.90.126	1	32	\$3,340.84	\$101.28	1		0	0
10.43.229.1.	1	4	\$1,407.76	\$351.94	1		0	0
10.56.64.220	2	20	\$4,446.24	\$222.31	1		0	0
10.77.110.2.	1	8	\$4,578.55	\$572.32	8	\$4,578.55	0	0
10.78.142.1.	1	16	\$4,856.30	\$303.52	16	\$4,856.30	0	0
10.84.68.237	1	16	\$8,510.36	\$531.90	1		0	0
10.85.253.65	1	12	\$4,653.83	\$387.82	1		0	0
10.97.112.48	1	4	\$1,608.13	\$402.78	1		0	0
100.104.95.	2	33	\$17,873.08	\$541.61	1		0	0
100.1163.1.	1	15	\$2,114.60	\$140.97	15	\$2,114.60	0	0
100.122.185.	2	56	\$12,487.54	\$222.99	9	\$481.17	0	0
100.123.237.	1	19	\$2,890.55	\$152.24	16	\$548.67	0	0
100.134.206.	5	112	\$19,692.84	\$175.83	20	\$1,942.16	0	0
100.138.28.	2	41	\$13,227.52	\$322.62	1		0	0

100 Input records: 190,279 / Output records: 6,440 Go to page 1 Show rows: 100 1-100 of 100

Display 4. IP Profile Window

Next, create a new aggregate window for Beneficiary Profile as illustrated in Displays 5-6:

New window

Name: ONLINE_BEN_PROFILE

Data source: ONLINE_FRAUD_DATA_FIN

Group-by columns:

- 123 AMOUNT
- Account_Status
- 123 Confirmed_fraud
- IP_Address

Transaction date: TransactionDate

Transaction time unit: DAYS

Output level: Group

End date: 08/28/2014 23:59:59

Add data sources...

Create Cancel

Display 5. Create a Beneficiary Profile Window

Then, add new computed columns to profile the transactions targeting the same beneficiary up to the point of the transaction. You can start with the columns outlined in Table 5. Example Beneficiary Profile Columns:

Column	Metric	Conditions
BEN_TOTAL_TRANSACTIONS	Count	None
BEN_INTERNATIONAL_TRANSACTIONS	Count	TRANSACTION_ORIGN="INTERNATIONAL"
BEN_FRAUD_TRANSACTIONS	Count	CONFIRMED_FRAUD="1"
BEN_TOTAL_TXN_AMT	Sum of AMOUNT	None
BEN_TXN_AV_AMT	Average of AMOUNT	None

Table 5. Example Beneficiary Profile Columns

SAS® Visual Scenario Designer

Main > Window: ONLINE_BEN_PROFILE

Configuration Panel (Left):

- Name: ONLINE_BEN_PROFILE
- Description:
- Primary data source: ONLINE_FRAUD_DATA_FIN
- Additional data sources: (No data source specified)
- Default numeric aggregation: Sum
- Default lookback period: 1
- Include missing values for 'group by' keys and 'distinct count' aggregation: ☐
- Group-by columns: beneficiary_account_number
- Output type:
- Output level: Group
- Transaction time unit: DAYS
- Transaction date: TransactionDate

Data Table:

beneficiary_account_number	ben_total_transactions	ben_international_transactions	ben_fraud_transactions	ben_total_txn_amt	ben_txn_av_amt
A0047999	1	0	0	\$146.21	\$146.21
A0063874	1	0	0	\$1,330.52	\$1,330.52
A0063874	2	0	0	\$11,331.16	\$5,665.58
A0063874	3	0	0	\$11,427.55	\$3,809.18
A0063874	4	0	0	\$11,491.29	\$2,872.82
A0087615	1	0	0	\$568.51	\$568.51
A0126889	1	1	0	\$103.73	\$103.73
A0126889	2	2	0	\$598.42	\$299.21
A0248927	1	1	0	\$296.67	\$296.67
A0331668	1	0	0	\$606.97	\$606.97
A0331668	2	0	0	\$1,884.07	\$942.03
A0331668	3	0	0	\$2,539.83	\$846.61
A0331668	4	0	0	\$2,740.32	\$685.08
A0331668	5	0	0	\$3,113.51	\$622.70
A0331668	6	0	0	\$3,251.98	\$542.00
A0331668	7	0	0	\$4,373.20	\$624.74
A0453337	1	0	0	\$28,605.43	\$28,605.43
A0460144	1	0	0	\$1,460.32	\$1,460.32
A0460144	2	0	0	\$1,794.33	\$897.16
A0460144	3	0	0	\$4,092.93	\$1,364.31
A0460144	4	0	0	\$6,654.46	\$1,663.62
A0460144	5	0	0	\$7,196.78	\$1,439.36
A0460144	6	0	0	\$8,800.48	\$1,466.75
A0460144	7	0	0	\$8,825.85	\$1,260.84
A0460144	8	0	0	\$8,862.07	\$1,107.76
A0460144	9	0	0	\$10,596.41	\$1,177.38
A0460144	10	0	0	\$10,999.45	\$1,099.95
A0460144	11	0	0	\$11,233.48	\$1,021.23
A0460144	12	0	0	\$11,271.70	\$939.31
A0460144	13	0	0	\$11,481.19	\$883.17
A0460144	14	0	0	\$11,527.45	\$823.35
A0460144	15	0	0	\$12,842.39	\$856.16
A0460144	16	0	0	\$13,112.86	\$819.55
A0460144	17	0	0	\$13,134.81	\$772.64

100 Input records: 190,279 / Output records: 190,279 Go to page 1 Show rows: 100 1-100 of 100

Display 6. Beneficiary Profile Window

Finally, create a transformation window that joins the three profile windows you created with the original transactional data as illustrated in Displays 7-8

New Window

Name:

ONLINE_ANALYTICAL_VIEW

Data source:

ONLINE_FRAUD_DATA_FIN

Group-by columns:

123 AMOUNT

A Account_Status

123 Confirmed_fraud

A IP_Address

➔

➡

➡

➡

⬆

⬇

Add data sources...

Data sources:

ONLINE_FRAUD_DATA_FIN

payee_cust_id

=

ONLINE_CUST_PROFILE

payee_cust_id

ONLINE_FRAUD_DATA_FIN

IP_Address

=

ONLINE_IP_PROFILE

IP_Address

ONLINE_FRAUD_DATA_FIN

beneficiary_account_number

=

ONLINE_BEN_PROFILE

beneficiary_account_number

+

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Display 7. Create a Combined Window

SAS® Visual Scenario Designer

Menu: 3 Windows: ONLINE_ANALYTICAL_VIEW

Data | Scenarios | Properties

Name: ONLINE_ANALYTICAL_VIEW

Description:

Primary data source: ONLINE_FRAUD_DATA_FILE

Additional data sources:

- IS ONLINE_BEN_PROFILE
- IS ONLINE_CUST_PROFILE
- IS ONLINE_IP_PROFILE

Add data source

Output type: Transformation

Transaction key: Transaction_ID

Output level: Transformation

Account_Status	Beneficiary_account_number	Branch	Country_code	Country_name	IP_Address	Payee_account_number	payee_cust_id	Product_Type	Trans_Type	Transaction_Id**	Transaction_pedge	AMOUNT	Confirmed_Fraud	new_beneficiary
ACTIVE	A95108	Mosley/L...	GB	United Kingdom	119.25.75.1...	A000040096	C11630	CURRENT ACC.	EXTERNAL...	T002932793	DOMESTIC	129.8	0	0
ACTIVE	A375897	Mosley/L...	GB	United Kingdom	201.91.226...	A000038886	C11612	CURRENT ACC.	EXTERNAL...	T0029395781	DOMESTIC	76.43	0	0
ACTIVE	A1478182	Mosley/S...	GB	Antigua and B...	179.225.64...	A001467275	C11608	CURRENT ACC.	INTERNAL B...	T002935399	INTERNATIONAL	14.84	0	1
ACTIVE	A1477913	Mosley/S...	GB	United Kingdom	248.200.175...	A000041919	C11615	CURRENT ACC.	EXTERNAL...	T002897985	DOMESTIC	13.18	0	0
ACTIVE	A6247623	Mosley/L...	GB	United Kingdom	127.207.197...	A001511509	C11596	CURRENT ACC.	EXTERNAL...	T002885064	DOMESTIC	11.18	0	0
ACTIVE	A1176308	Mosley/L...	GB	United Kingdom	167.195.111...	A000090147	C11599	CURRENT ACC.	INTERNAL B...	T002836465	DOMESTIC	444.89	0	0
ACTIVE	A1097011	Mosley/L...	GB	United Kingdom	109.111.191...	A000042934	C11613	CURRENT ACC.	EXTERNAL...	T002839943	DOMESTIC	179.97	0	0
ACTIVE	A468002	Mosley/L...	GB	United Kingdom	109.228.110...	A000894897	C11618	CURRENT ACC.	EXTERNAL...	T002788909	DOMESTIC	16.19	0	0
ACTIVE	A405911	Mosley/S...	GB	United Kingdom	111.206.204...	A000040457	C11610	CURRENT ACC.	EXTERNAL...	T002739951	DOMESTIC	69.44	0	1
ACTIVE	A1054917	Mosley/S...	GB	United Kingdom	92.222.239...	A000089124	C11606	CURRENT ACC.	EXTERNAL...	T002712664	DOMESTIC	5542.67	0	0
ACTIVE	A1198259	Mosley/L...	GB	United Kingdom	80.100.88.2...	A000099146	C11605	CURRENT ACC.	EXTERNAL...	T002690383	DOMESTIC	114.31	0	0
ACTIVE	A1476263	Mosley/S...	GB	United Kingdom	174.191.184...	A000808769	C11624	CURRENT ACC.	INTERNAL B...	T002657684	DOMESTIC	36.13	0	1
ACTIVE	A1476182	Mosley/L...	GB	Antigua and B...	179.225.64...	A001467275	C11608	CURRENT ACC.	INTERNAL B...	T002639951	INTERNATIONAL	548.26	0	1
ACTIVE	A1476825	Mosley/S...	GB	United Kingdom	74.26.175.95	A001467188	C11609	CURRENT ACC.	INTERNAL B...	T002597955	DOMESTIC	57.53	0	1
ACTIVE	A1176838	Mosley/L...	GB	United Kingdom	149.69.124.3	A000045285	C11599	CURRENT ACC.	EXTERNAL...	T002594979	DOMESTIC	32.02.95	0	1
ACTIVE	A1030100	Mosley/L...	GB	United Kingdom	100.134.268...	A000842695	C11590	CURRENT ACC.	EXTERNAL...	T002590261	DOMESTIC	14.79	0	0
ACTIVE	A951208	Mosley/S...	GB	United Kingdom	119.25.75.1...	A000040096	C11610	CURRENT ACC.	EXTERNAL...	T002501232	DOMESTIC	115.86	0	1
ACTIVE	A104922	Mosley/L...	GB	United Kingdom	201.91.226...	A000038886	C11612	CURRENT ACC.	EXTERNAL...	T002488128	DOMESTIC	428.74	0	1
ACTIVE	A1049887	Mosley/L...	GB	United Kingdom	171.118.281...	A000044481	C11600	CURRENT ACC.	EXTERNAL...	T002424307	DOMESTIC	611	0	1
ACTIVE	A1477913	Mosley/S...	GB	United Kingdom	248.200.175...	A000847229	C11615	CURRENT ACC.	INTERNAL B...	T002403054	DOMESTIC	206.26	0	1
ACTIVE	A1477913	Mosley/S...	GB	United Kingdom	148.200.175...	A000041919	C11615	CURRENT ACC.	EXTERNAL...	T002389367	DOMESTIC	5.72	0	0
ACTIVE	A1240466	Mosley/L...	GB	United Kingdom	78.86.12.244	A000041446	C11596	CURRENT ACC.	INTERNAL B...	T002362854	DOMESTIC	6.27	0	0
ACTIVE	A1099593	Mosley/S...	GB	United Kingdom	103.7.90.55	A001476089	C11602	CURRENT ACC.	EXTERNAL...	T002354389	DOMESTIC	94.82	0	0
ACTIVE	A1476182	Mosley/S...	GB	Antigua and B...	179.225.64...	A001467275	C11608	CURRENT ACC.	INTERNAL B...	T002295399	INTERNATIONAL	34.47	0	0
ACTIVE	A1195148	Mosley/S...	GB	United Kingdom	234.41.150...	A000118913	C11627	CURRENT ACC.	EXTERNAL...	T002235187	DOMESTIC	778.94	0	0
ACTIVE	A1476107	Mosley/L...	GB	United Kingdom	74.26.175.95	A001467188	C11609	CURRENT ACC.	STANDING...	T002226272	DOMESTIC	61.93	0	0
ACTIVE	A951208	Mosley/L...	GB	United Kingdom	111.206.204...	A000040457	C11610	CURRENT ACC.	EXTERNAL...	T002212268	DOMESTIC	9.12	0	1
ACTIVE	A137453	Mosley/S...	GB	United Kingdom	232.148.226...	A000064396	C11622	CURRENT ACC.	EXTERNAL...	T002198072	DOMESTIC	15.77	0	1
ACTIVE	A1198259	Mosley/S...	GB	United Kingdom	80.100.88.2...	A000039248	C11605	CURRENT ACC.	UTILITY BILL	T002178962	DOMESTIC	670.05	0	1
ACTIVE	A1476107	Mosley/S...	GB	United Kingdom	174.191.184...	A000808769	C11624	CURRENT ACC.	INTERNAL B...	T002143965	DOMESTIC	78.72	0	1
ACTIVE	A468002	Mosley/L...	GB	United Kingdom	109.228.110...	A000894897	C11618	CURRENT ACC.	STANDING...	T002139853	DOMESTIC	28.05	0	0
ACTIVE	A109943	Mosley/L...	GB	United Kingdom	228.19.171...	A000010993	C11614	CURRENT ACC.	EXTERNAL...	T002110269	DOMESTIC	7.93	0	1
DORMANT	A951108	Mosley/S...	GB	United Kingdom	119.25.75.1...	A000040096	C11610	CURRENT ACC.	EXTERNAL...	T002055265	DOMESTIC	28.92	0	0

Input records: 190,279 / Output records: 190,279

Go to page: 1 Show rows: 100 of 5,100 of 100

42 Columns

Display 8. Analytical View Window

USING A DECISION TABLE

SAS Visual Scenario Designer comes with powerful scenario authoring techniques that enables you to explore thresholds for combinations of conditions and actions. Decision tables enable you to model complicated business logic that involve a variety of conditions and their interrelationships. Each row in the table defines a single rule. Each column within a row defines the conditions or actions (decisions) of the rule. If a condition is met, the assigned action is performed.

We illustrate how you can use the decision table functionality to create rules based on an understanding of how certain metrics have historically impacted fraud.

From the Online Analytical View window, create a new decision table scenario, and then move IP_PREVIOUS_FRAUD column from the Window Output Columns list to the Conditions column in the work area. Next, move the CONFIRMED_FRAUD column from the Window Output Columns list to the Target column in the work area. Now, you can see the impact of previously identified fraudulent transaction, with the same IP address, on future fraud.

Decision Table Information

Conditions		Actions	Target: Confirmed_fraud		Metrics
Min(-)	Max(+)		0	1	Population %
≤ 0			167915 (100.00%)		167,915 (87.99%)
> 1			21639 (94.23%)	1329 (5.77%)	22,964 (12.07%)

2 rules

Related Rows

Account_Status	beneficiary_account_number	browser	country_code	country_name	IP_Address	Payee_account_number	payee_cust_id	product_type	trans_type	transaction_id	Transaction_origin	AMOUNT
ACTIVE	A1151310	Mozilla/5.	GB	United Kingdom	197.181.148.	A001129108	C23045	CURRENT ACC.	INTERNAL B.	T002961276	DOMESTIC	88.67
ACTIVE	A1130379	Mozilla/4.	GB	United Kingdom	75.243.110.	A001129081	C23058	CURRENT ACC.	INTERNAL B.	T002952145	DOMESTIC	21.77
ACTIVE	A5399851	Mozilla/4.	GB	United Kingdom	170.80.202.	A000536680	C23029	CURRENT ACC.	EXTERNAL...	T002908198	DOMESTIC	1896.9
ACTIVE	A5338910	Mozilla/5.	GB	United Kingdom	4.27.182.53	A000536670	C23027	CURRENT ACC.	EXTERNAL...	T002899340	DOMESTIC	192.58
ACTIVE	A5226803	Mozilla/4.	GB	United Kingdom	211.169.150.	A000532680	C23033	CURRENT ACC.	EXTERNAL...	T002894131	DOMESTIC	86.13

100 loaded of 167315 records Go to page 1 Show rows 100 1-100 of 300

Display 9. Impact of IP Previous Fraud

Changing the condition value for the IP_PREVIOUS_FRAUD allows you to find the appropriate threshold. Add the IP_TOTAL_CUSTOMERS to the decision table to test the interaction between both the two columns and their impact on fraud. Adding an action variable such as ALERT completes the process of creating a scenario.

Decision Table Information

Conditions		Actions	Target: Confirmed_fraud		Metrics
Min(-)	Max(+)		0	1	Population %
2	5	False	12586 (94.77%)	694 (5.23%)	13,280 (6.98%)
5	8	False	2517 (95.59%)	116 (4.41%)	2,633 (1.38%)
>= 8		True	79 (83.16%)	16 (16.84%)	95 (0.05%)

3 rules

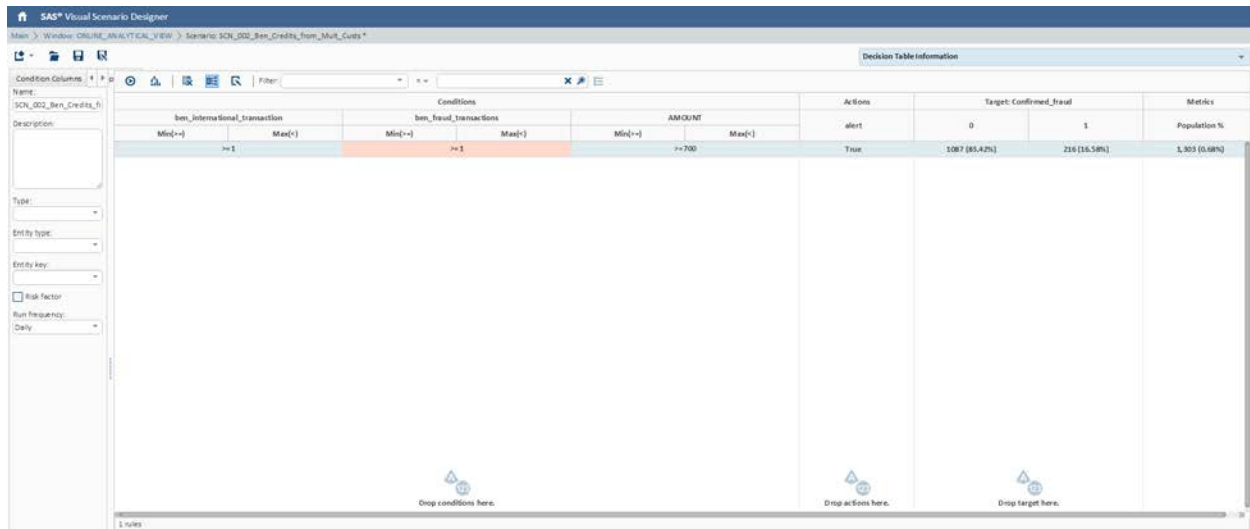
Related Rows

Account_Status	beneficiary_account_number	browser	country_code	country_name	IP_Address	Payee_account_number	payee_cust_id	product_type	trans_type	transaction_id	Transaction_origin	AMOUNT
ACTIVE	A1052992	Mozilla/5.	AE	United Arab Em...	84.47.162.1.	A000039635	C23006	CURRENT ACC.	EXTERNAL...	T002960210	INTERNATIONAL	2038.19
ACTIVE	A1186786	Mozilla/5.	AE	United Arab Em...	84.47.162.1.	A001385207	C23017	SAVINGS ACC.	INTERNAL B.	T002897590	INTERNATIONAL	42.94
ACTIVE	A1407532	Mozilla/5.	UA	Ukraine	134.249.71.	A001241572	C19724	CURRENT ACC.	INTERNAL B.	T002838114	INTERNATIONAL	234.93
ACTIVE	A855785	Mozilla/4.	UA	Ukraine	134.249.71.	A001522876	C14615	CURRENT ACC.	EXTERNAL...	T002782851	INTERNATIONAL	398.99
ACTIVE	A852837	Mozilla/4.	UA	Ukraine	134.249.71.	A001522876	C14615	CURRENT ACC.	EXTERNAL...	T002782838	INTERNATIONAL	489.27

100 loaded of 95 records Go to page 1 Show rows 100 1-95 of 95

Display 10. Create IP-Related Fraud Scenario

Repeat the same process creating a scenario with BEN_INTERNATIONAL_TRANSACTIONS and BEN_FRAUD_TRANSACTIONS as conditions columns.

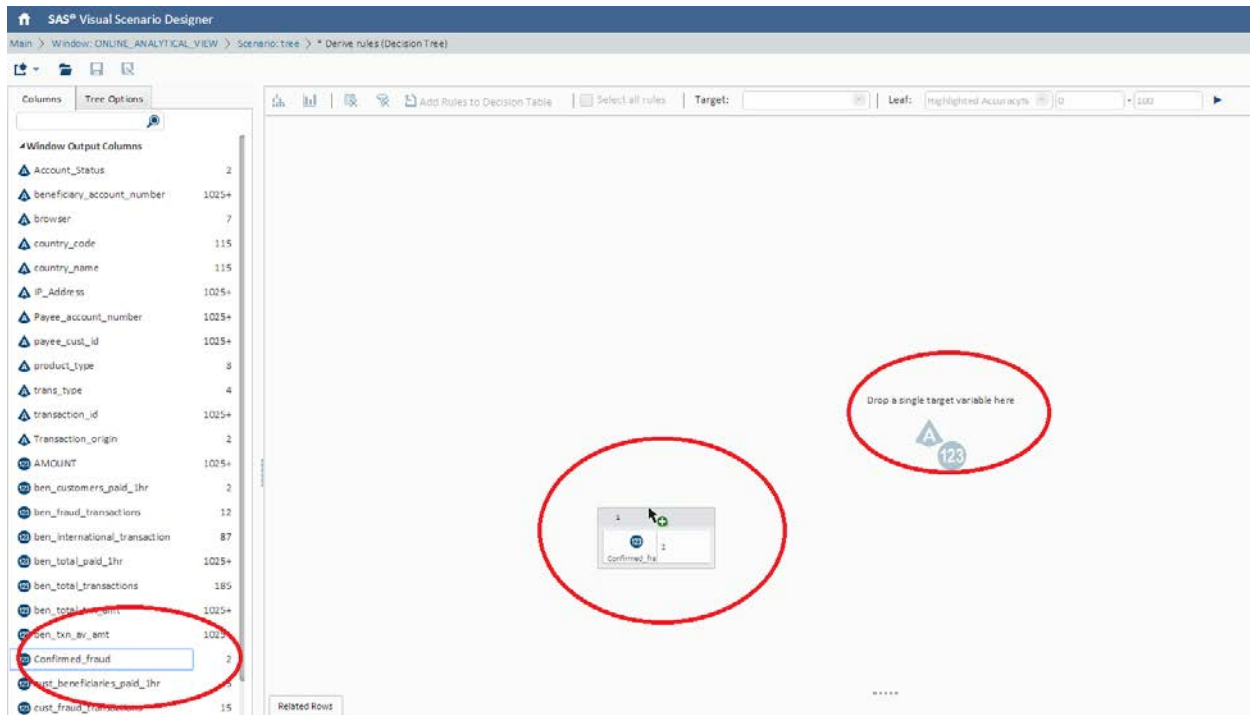


Display 11. Create International Beneficiaries Scenario

USING A DECISION TREE

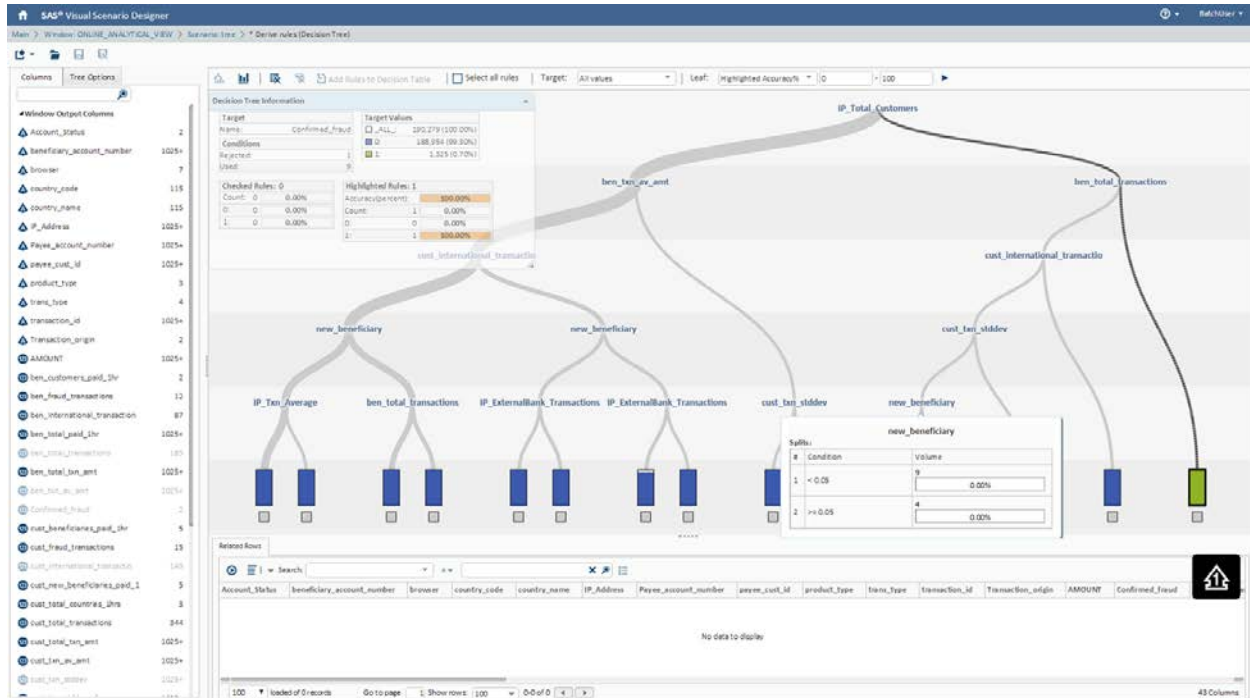
SAS Visual Scenario Designer has a built-in decision tree capability that enables you to use a target variable to produce rules that can be imported into a scenario. The purpose of a decision tree is to evaluate the overall effectiveness of any set of conditions in predicting a certain outcome.

From the Online Analytical View window, create a new decision table scenario, and then click the Decision Tree icon to get an empty work area. Select the CONFIRMED_FRAUD column as target variable.



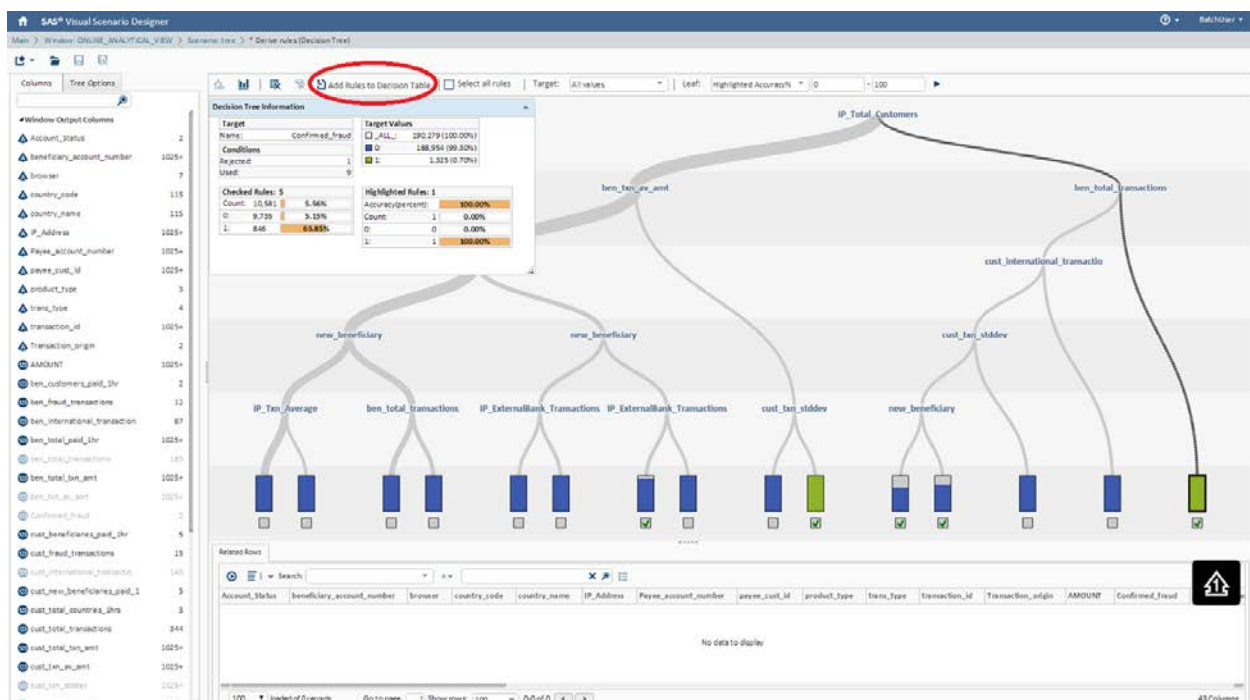
Display 12. Create New Decision Tree

Move the columns that might be useful in determining fraud from the Window Output Columns list on the Columns tab into the work area. These are your predictor columns. As you move columns into the work area, your tree is built based on the columns that have the biggest impact on fraud. If a predictor column does not contribute to the predictive accuracy of the tree, then it does not appear in the tree.



Display 13. Add Columns

Decide which rules you want to add to your decision table by clicking on the check box below each applicable leaf node. Next, add these rules to the Decision Table as illustrated in Display 14.



Display 14. Select Branches

Now you have a decision tree built scenario and you can add ALERT as an action variable.

SAS Visual Scenario Designer

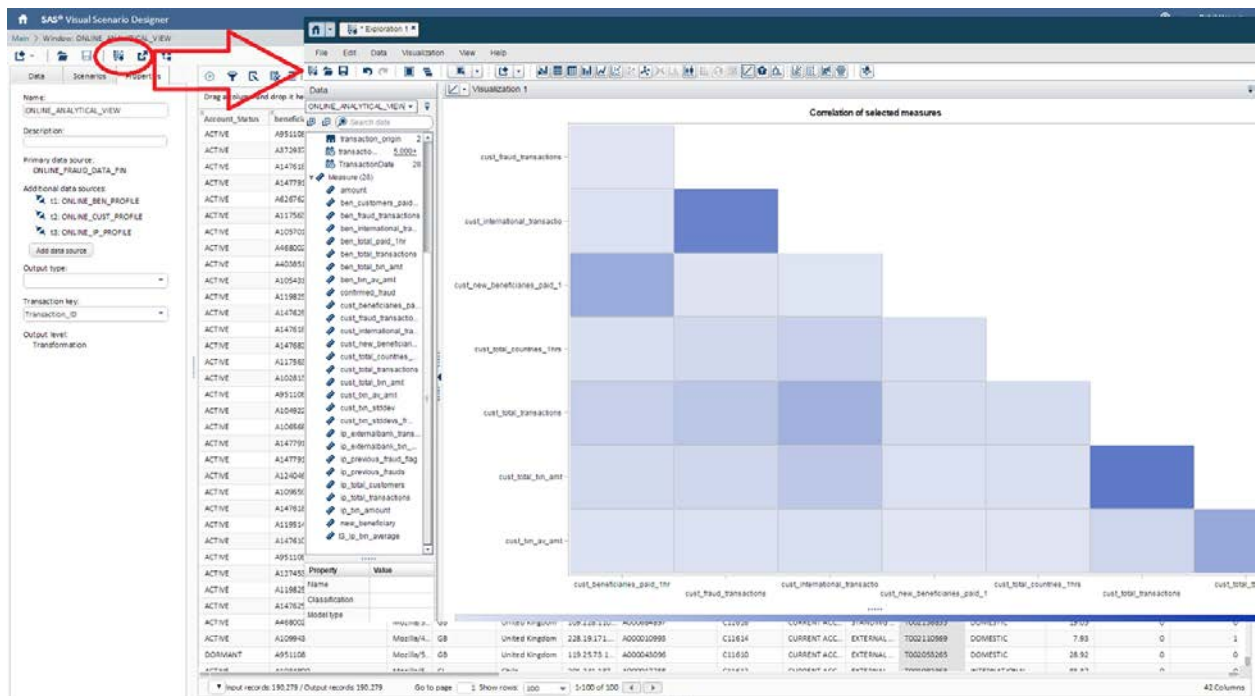
Scenario: tree *

Decision Table Information

Conditions				Actions	Target	Metrics
new_beneficiary	IP_externalBank_transactions	cust_ten_middle	ben_total_transactions	alert		Population %
Min(+)	Max(-)	Min(+)	Max(-)			
>= 0.05	< 126			True		10.556 (5.33%)
		>= 1526.8599152567992		True		1 (0.00%)
< 0.05		< 1526.8599152567992	< 20	True		9 (0.00%)
>= 0.05		< 1526.8599152567992	< 20	True		4 (0.00%)
			>= 20	True		1 (0.00%)
>= 0.05	= is missing =			True		0 (0.00%)
		>= 1526.8599152567992		True		0 (0.00%)
= is missing =		= is missing =	= is missing =	True		0 (0.00%)
>= 0.05		= is missing =	= is missing =	True		0 (0.00%)

Display 15. Create a Scenario

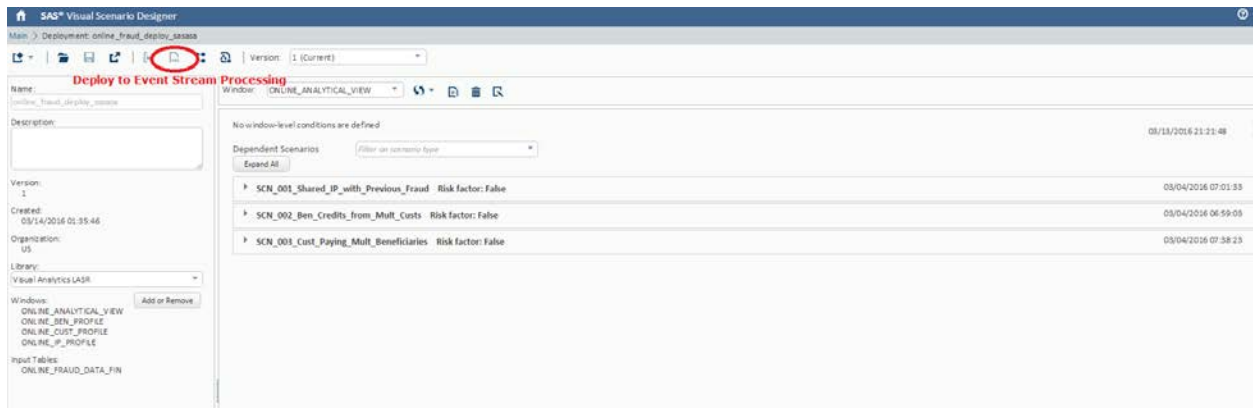
You can use SAS® Visual Analytics and SAS® Visual Statistics to create new scenarios. Launch SAS Visual Analytics Explorer from the Online Analytical View window, and then use SAS Visual Statistics, as shown in Display 16.



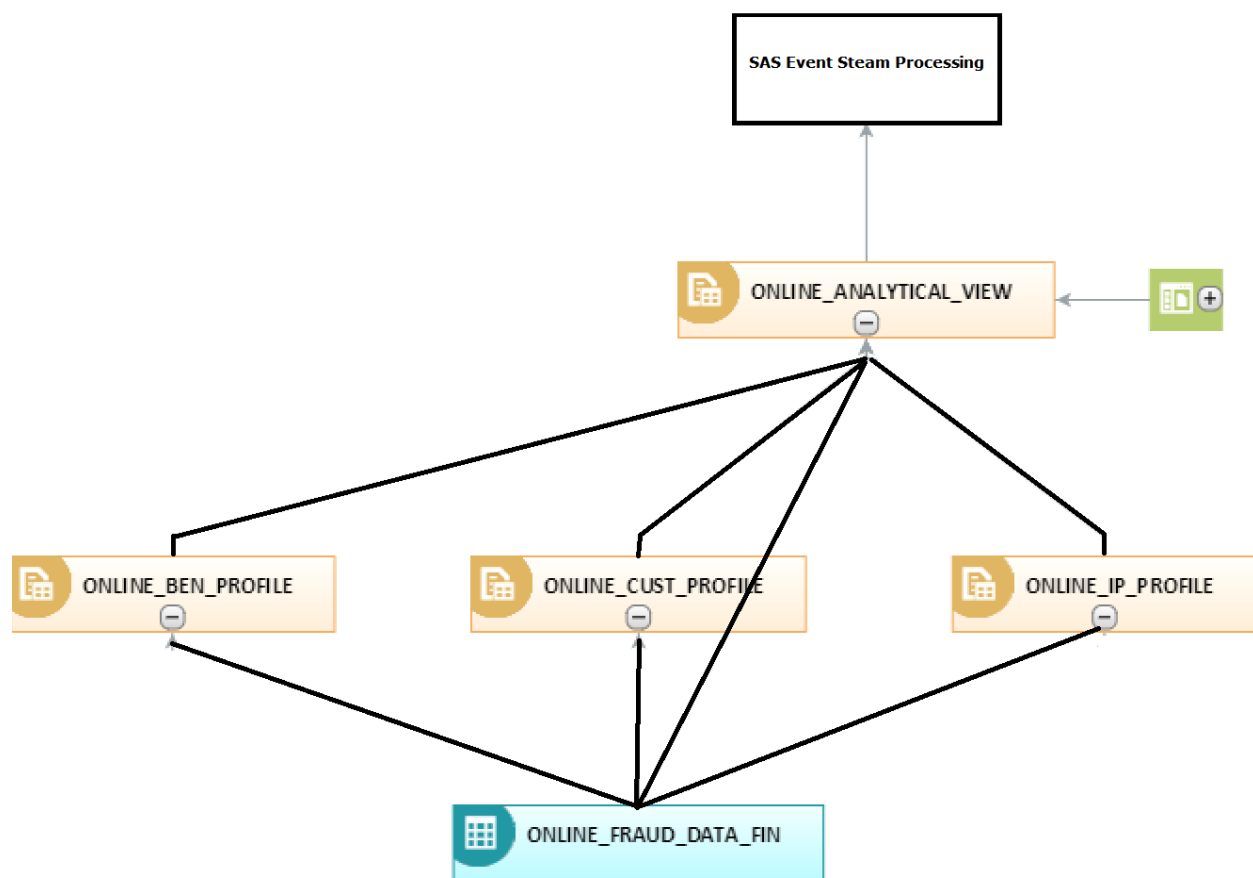
Display 16. Visual Analytics Explorer

SAS EVENT STREAM PROCESSING

SAS Event Stream Processing enables you to process and analyze a large number of continuously flowing events. Event stream processing engines can be embedded within new or existing applications to perform real-time analytics on streams of data continually as it's received. It is designed for extremely high-volume throughput and very low latency. SAS Visual Scenario Designer can deploy directly into a running SAS Event Stream Processing engine, allowing you to instantly use the profiling and aggregation, as well as rules and models, immediately in your online processing stream.



Display 17. Deploy into SAS Event Stream Processing



Display 18. SAS Visual Scenario Designer Online Fraud Flow

CONCLUSION

In this paper, we have outlined the difficulties of combating online fraud and identified techniques to empower you to structure data, detect anomalies, test hypothesis, and use sophisticated analytics to create scenarios in SAS Visual Scenario Designer, and the use them in online processing using SAS Event Stream Processing.

ACKNOWLEDGMENTS

SAS Visual Scenario Designer is the result of collaboration between developers, testers, and product managers. The authors wish to thank everyone involved in this effort.

RECOMMENDED READING

- *SAS Event Stream Processing: User's Guide*
- *SAS Visual Scenario Designer: User's Guide*

CONTACT INFORMATION

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