SAS® FORUM
UNITED KINGDOM 2015

FRAUD DETECTION & PREVENTION USING SOCIAL NETWORK ANALYSIS

BY Lekan Omodara

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sas THE POWER TO KNOW.

Agenda

- Introduction
- Financial cost of fraud in the UK
- SAS Fraud Framework components
- FCM & SNA
- Steps in FCM & SNA
- Prevention and Detection in Financial sector

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Introduction

What is Fraud?

Fraud is a criminal activity and is defined as Abuse of position, or false representation or prejudicing someone‘s right for personal gain

Simply: Fraud is an act of deception intended for personal gain or cause a loss to another party

-*SFO, UK*

There is always a Financial Implication to every fraud attempts in any organisation

- If it is successful, the company will lose money
- If it is not successful, the company may spend money to investigate or redeem their image

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Financial Implication

The UK economy lost £52bn from fraud, according to the 2013 report by the National Fraud Authority.
The financial and insurance only experience fraud activities of £5.4bn.

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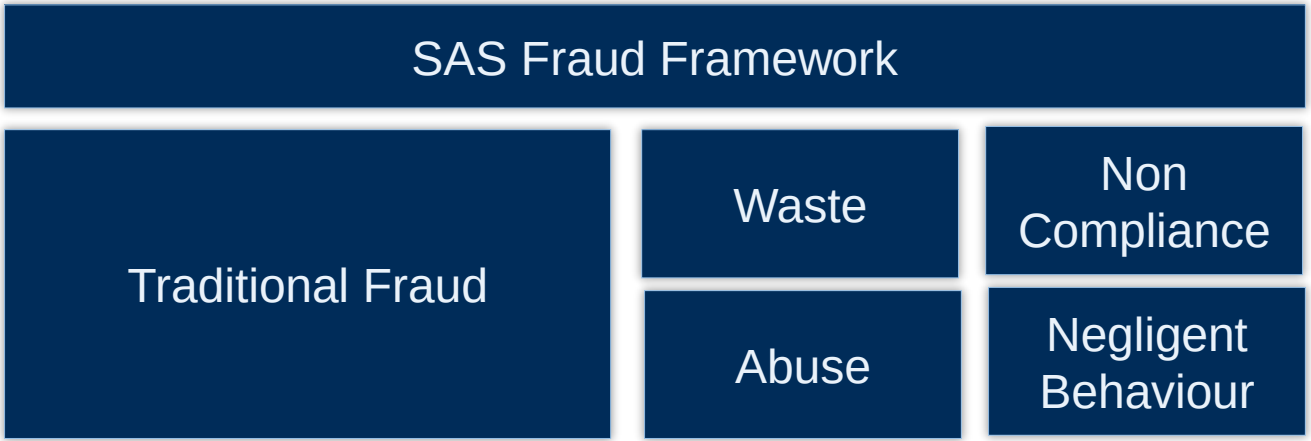
SAS Fraud Framework

Fraud Framework consists of software products designed to detect and prevent fraud, waste, and abuse for organisation in banking, government, health care, and insurance



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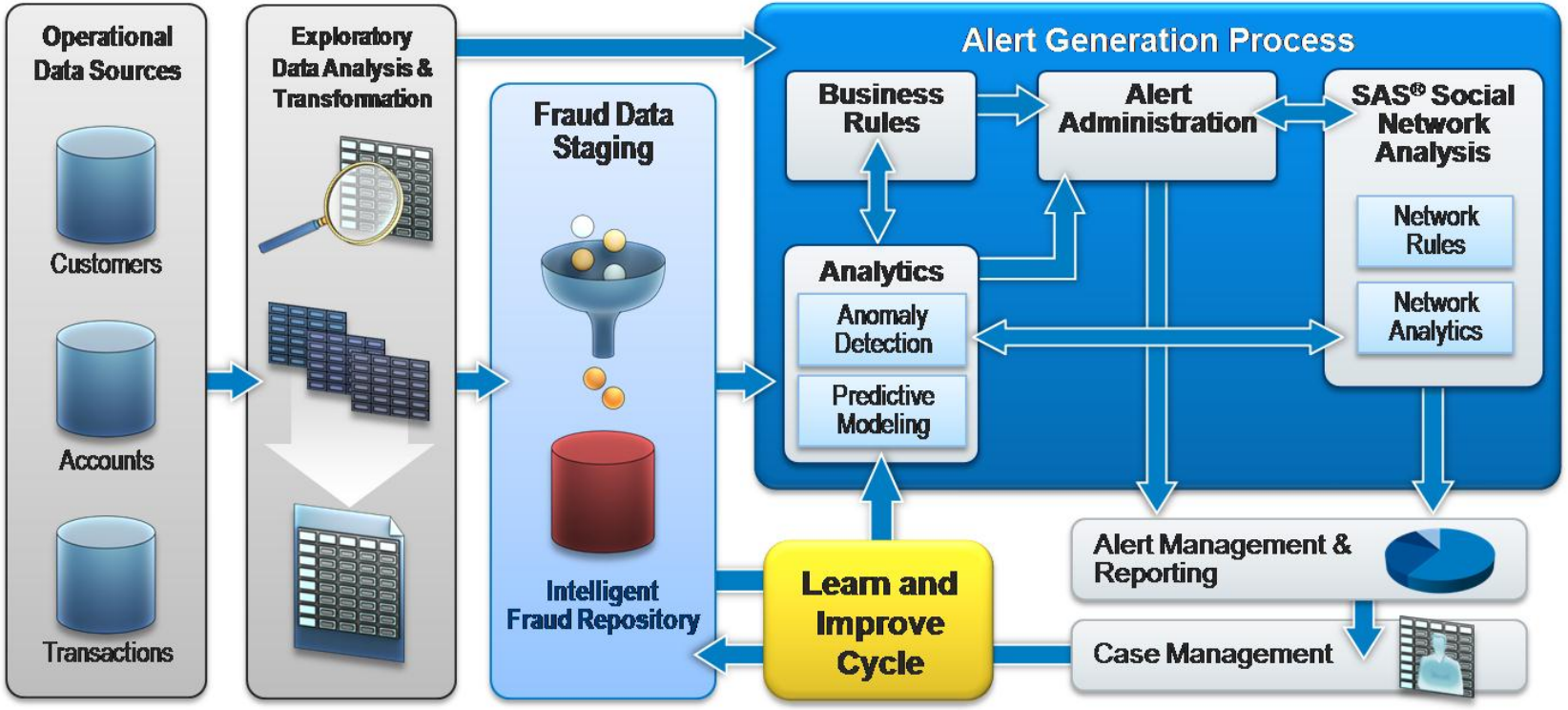
SAS Fraud Framework



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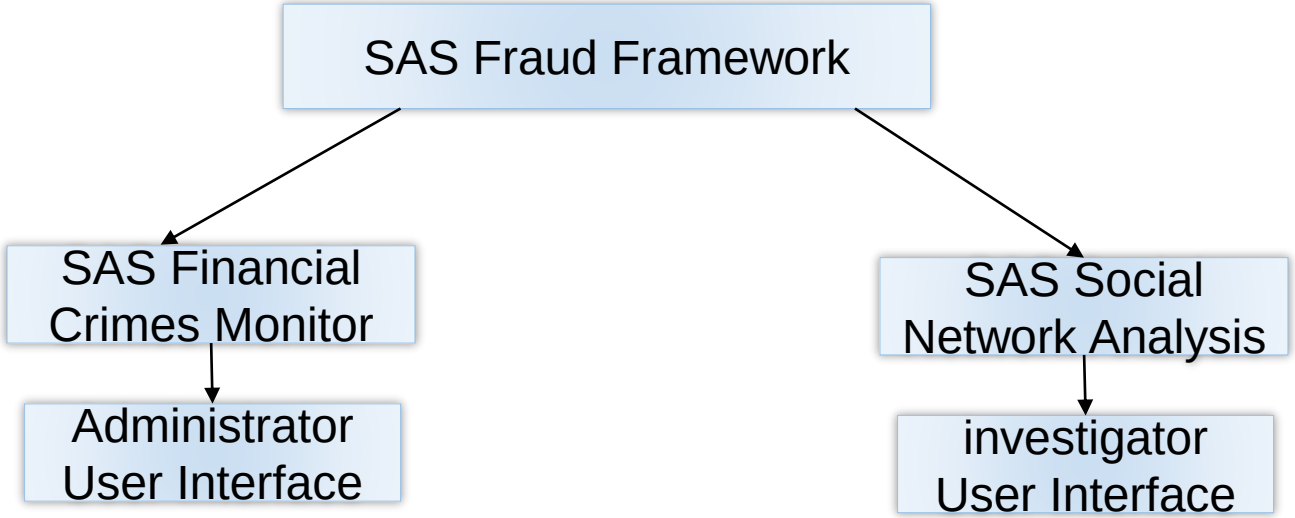
SAS Software Product – Fraud Specific

The Fraud Framework also contains the following two fraud-specific products:

- SAS Financial Crime Monitor (FCM)
- SAS Social Network Analysis Server (SNA)



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SAS Fraud Framework Users

User	SAS Products
Platform Administrator	SAS Management Console
Database Administrator	SAS Data Integration Studio
Fraud Administrator	SAS Financial Crime Monitor
Fraud Analyst	SAS Financial Crime Monitor SAS Enterprise Miner SAS Text Miner
Fraud Investigator	SAS Social Network Analysis Server SAS Web Report Studio
Management	SAS Information Delivery Portal SAS BI Dashboard

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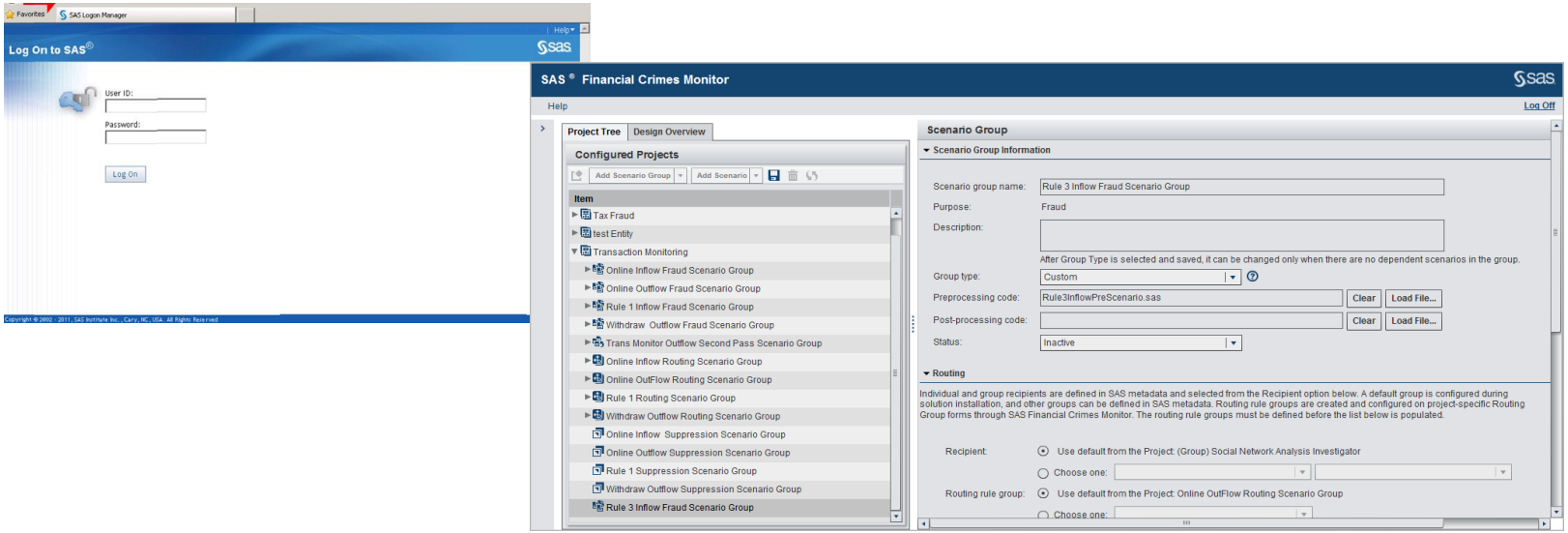
Financial Crime Monitor (FCM)

SAS Financial Crimes Monitor is an administrator interface responsible for the generation and administration of alerts



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Business Rules & Scenario

- Unusual low cumulative lodgment
- Unusual quick succession of Online Outflow
- Inflow with uncorrelated amount (Sudden lodgement)
- Count of outflow in a day greater than the count of outflow in the last 3 months
- Non active account with un-usual inflow
- KYC – account with similar details
- Accident with Around Same area
- Claims with Same doctor or GP
- Claims around same postcode

Alternate can also be generated through the enterprise miner model.(Analytics)

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Tasks and Processing

There are four main tasks and processing that need to be perform during the implementation of the FCM

Task	Processing
Pre-Tasks	Create and register Prep and enrichment tables Create and register an alert table template Write SAS programs (scenarios, processing, enrichment, routing, and so on) Create the structure of RDB tables using scripts
Interface Tasks	Enter project information (Fraud detection/Risk, second pass/score, suppression and Routing)

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Task & Processing

Tasks	Processing
Post-Tasks	Modify the FCM_JOB_CALENDAR table Schedule the Alert Generation Process in an application that is not SAS application
Alert Generation Process	FCMMain.sas with AutoExec.sas is sbmitted

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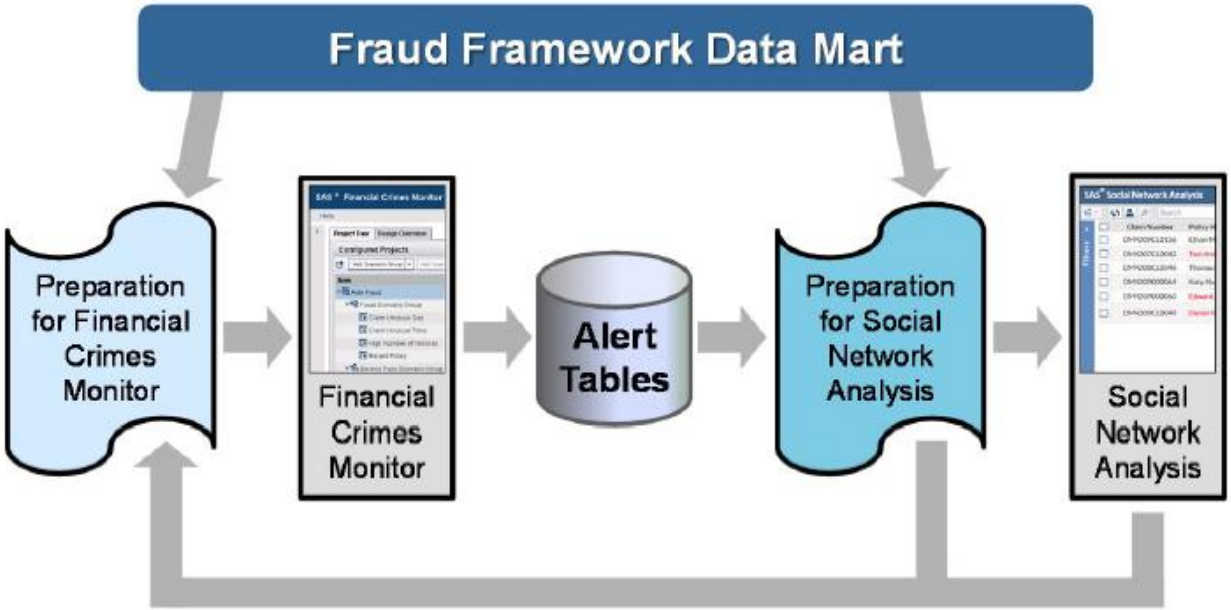
Alert Generation Process AGP

Data Makes everything clearer? – Do you agree with this?



An Alert is a potential indicator of Fraud - SAS

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Alert Generation Process consists of 6 steps

- Fraud Detection and Risk Scenario :
  - First pass Auto type fraud detection and Risk scenario are executed, with respect to a specific table sorted to variable
  - First pass custom type fraud detection and risk scenario are executed

- Second pass scenario :
  - Second pass scenario are executed, if defined against the data from the first pass based on the run order specified at the second pass group level

- Enrichment : Alerts are enriched if enrichment code is specified

- Scoring :
  - Data is further processed. Current fraud detection and risk alerts are combined with active historical fraud detection and risk alerts
  - The combined alerts are scored

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Alert Generation Process

- The process of reduction is initiated on the current–day risk alert
  - Any risk alert whose entity exists with a current-day fraud detection
  - If the overall actionable entity score for an entity not currently win a fraud alert exceeds the specified threshold, then those alerts are retained, A new record is created in the current-day alert table for that entity.
  - The remaining risk alerts are dropped because they do not have an entry with a current-day fraud alert and they do not exceed the specified threshold

- Suppression : Alerts are supressed based on suppression scenario and run order specified, if defined
- Routing : Alerts are routed based on routing scenarios and run order specified, if defined

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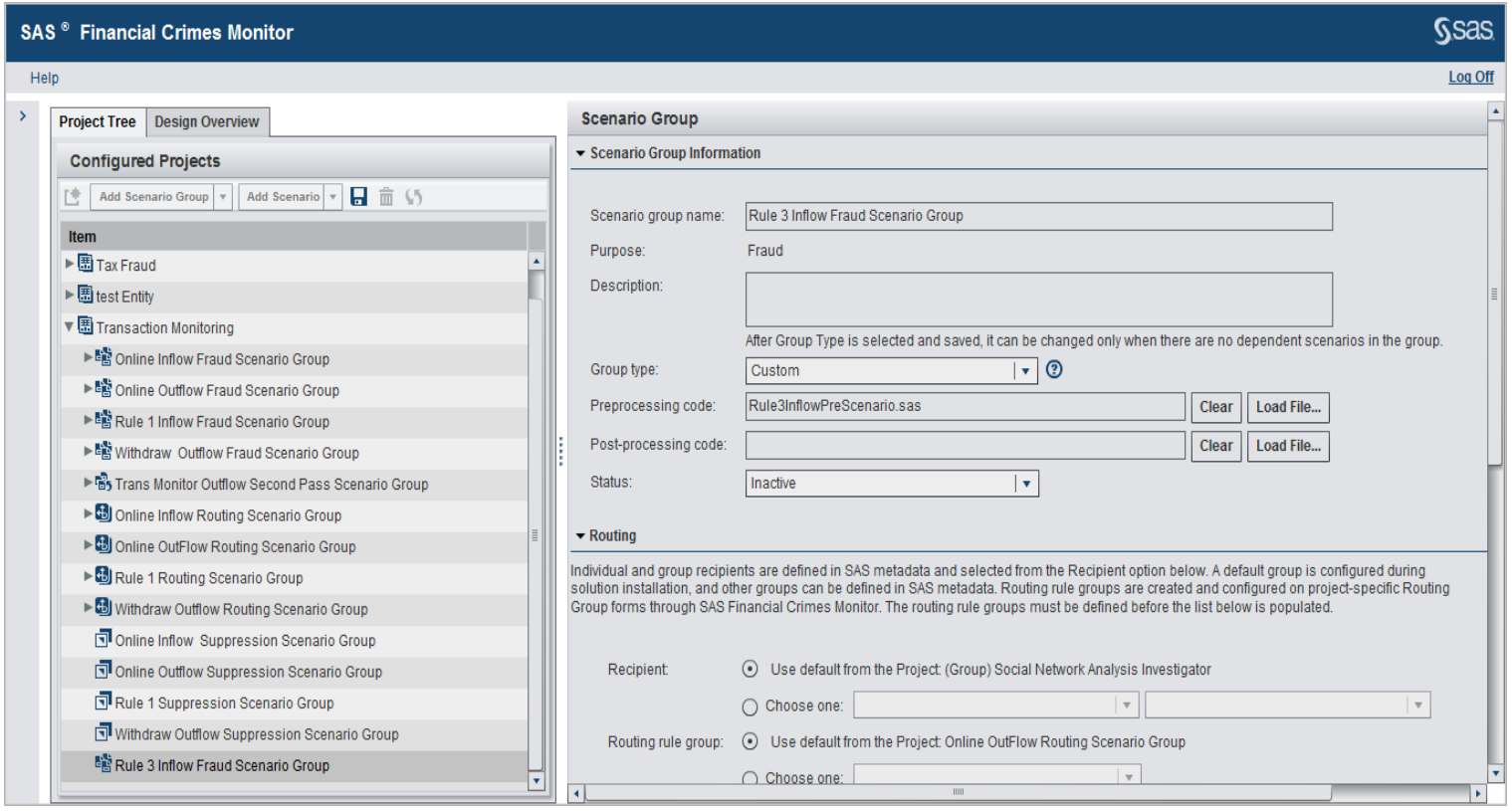
Financial Crime Monitor



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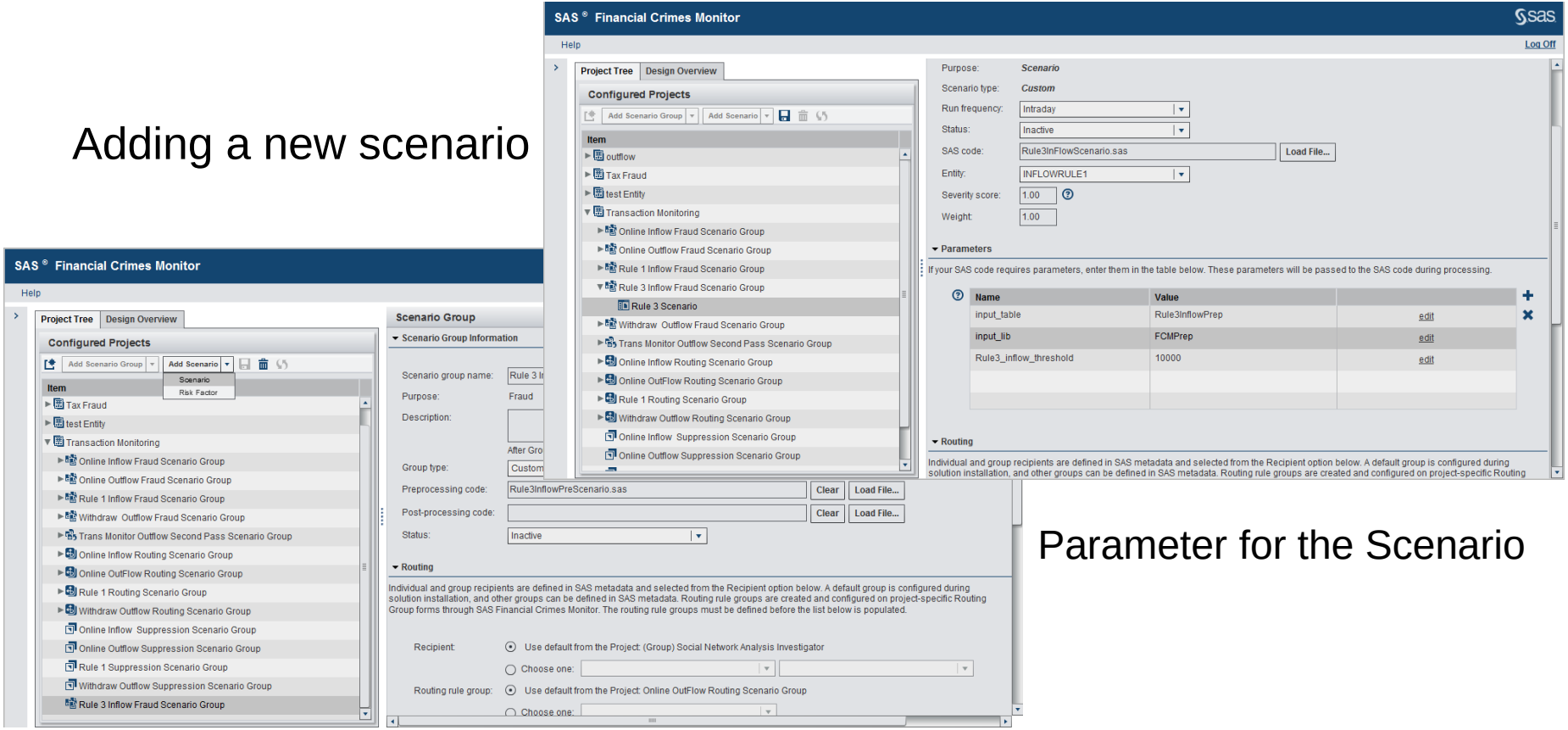
Financial Crime Monitor

Adding a new scenario



Parameter for the Scenario

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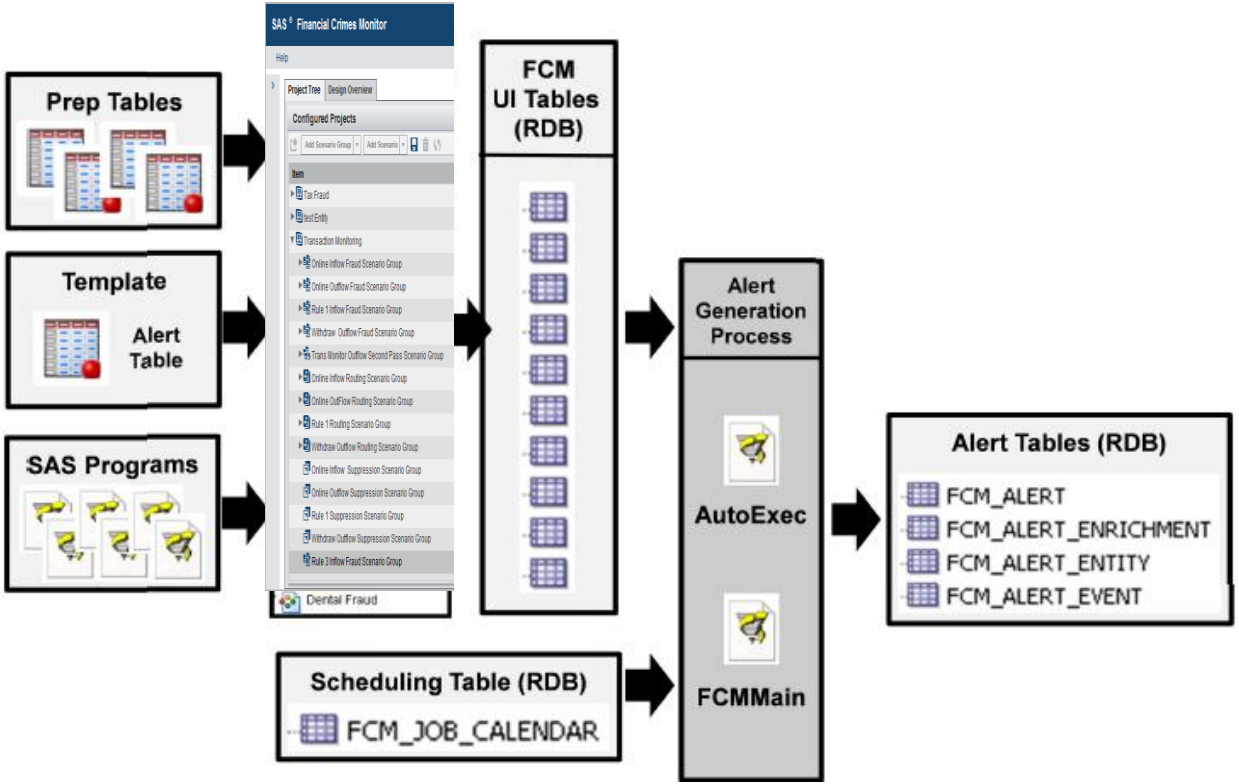
Summary Implementation steps

This shows the end to end processes for FCM Alert generation



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Social Network Analysis

The SAS Social Network Analysis Server is an investigator interface responsible for viewing and managing alerts

It is made up 3 major parts, they Alert Window, Detail tab and SNA tab

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ALERT WINDOW

Alert Window : The alert windows has the alert pane and filter pane. The alert pane displays the entities for which the alert is generated from the search window. The filter pane enable investigator to subset the current alert in the pane

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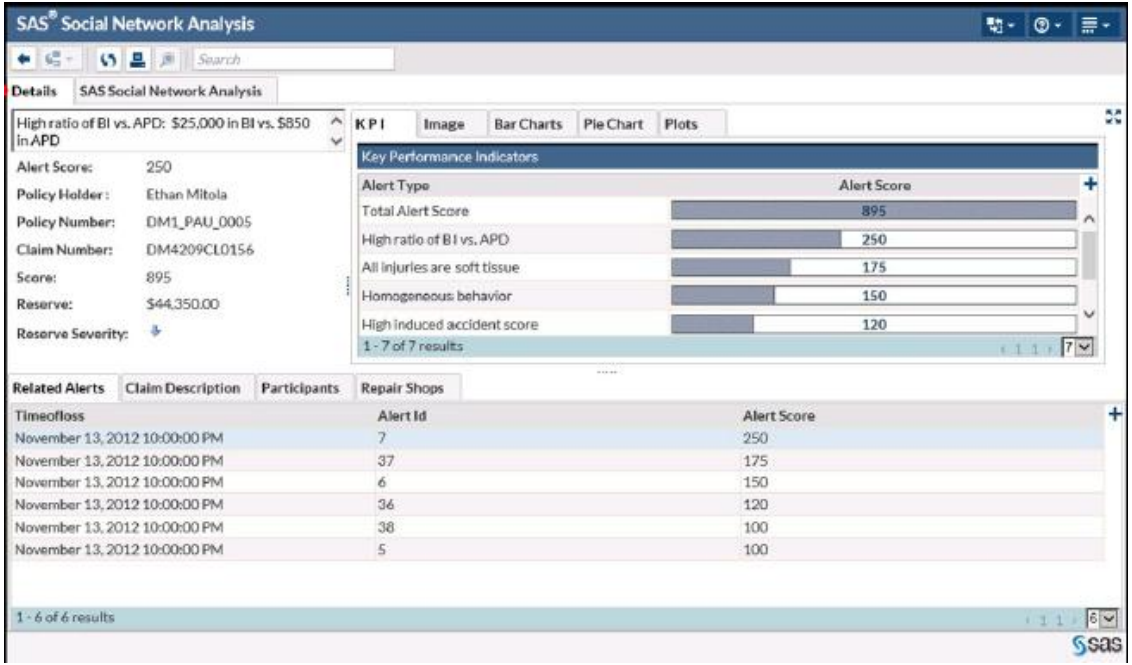
DETAIL TAB

The details tab is displayed after you click on an alert row in the alert pane.



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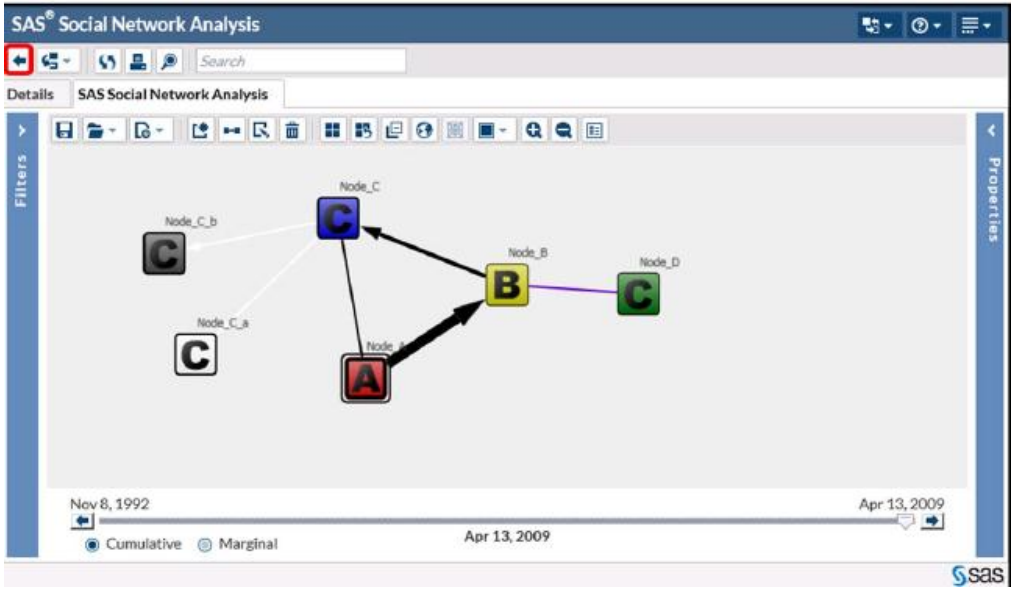
SNA TAB

SNA Tab : Contains a network diagram for the alert selected from the alerts window



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Implementation Task

Pre-tasks

- Create input data tables
- Create configuration RDB
- Update general property values in the configuration manager

Alert Windows

- Implement the get actionableEntities stored process

Details Tab

- Implement the getSubAlerts stored process
- Implement the getAlertTransactions stored process
- Implement the getChartSeries stored process

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Implementation Tasks cont....

Social Network Analysis

- Create nodes and links tables with the %sfs_net_main_link_macros macro
- Implement the getSocialNetwork stored process
- Implement the getSocialNetworkNodesDetails stored process
- Implement the growSocialNetworkNode stored process

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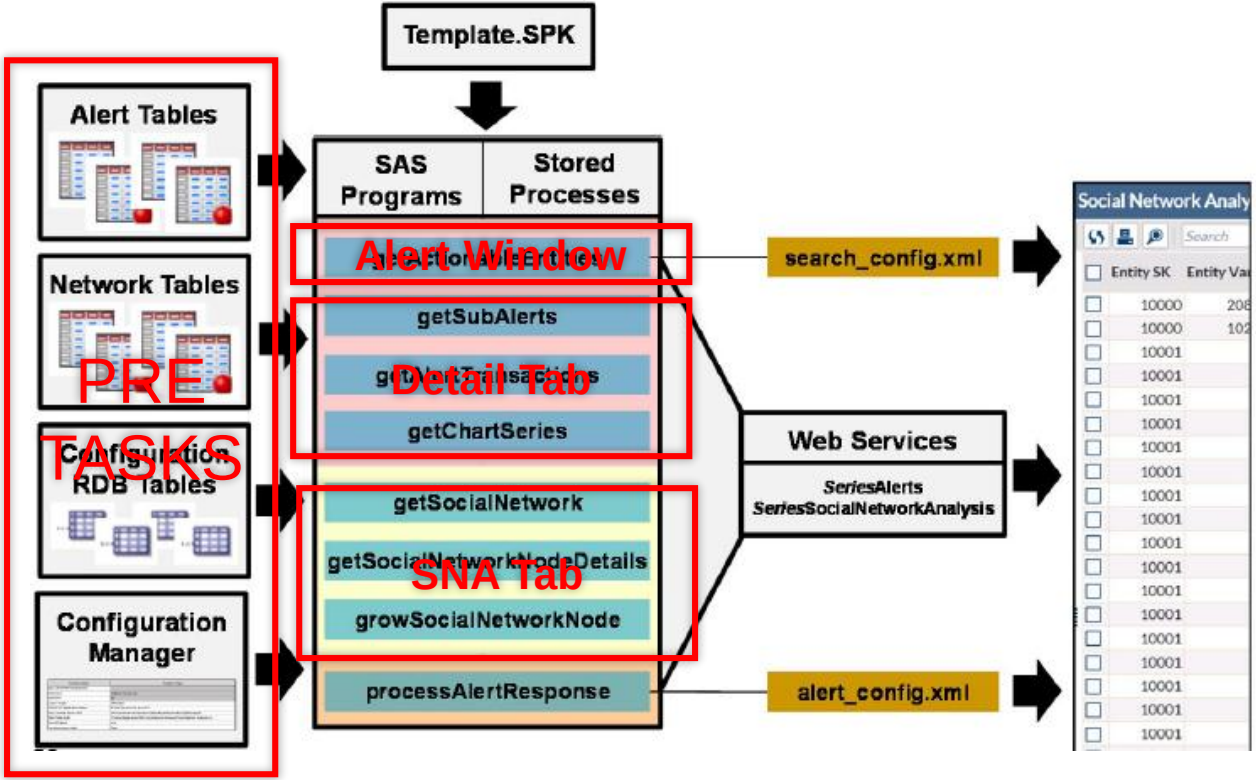
Implementation Tasks cont ...



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Best practice for SNA input Data

A best practice is to create input data tables with all the needed information before you need the data in the Social Network Analysis interface

- The data should be in desired row order (Sorted)
- The data should be in desired column order
- All dates, times, and datetimes should be unformatted numeric values
- Column values are displayed with stored case
- Sometimes, column names are case sensitive

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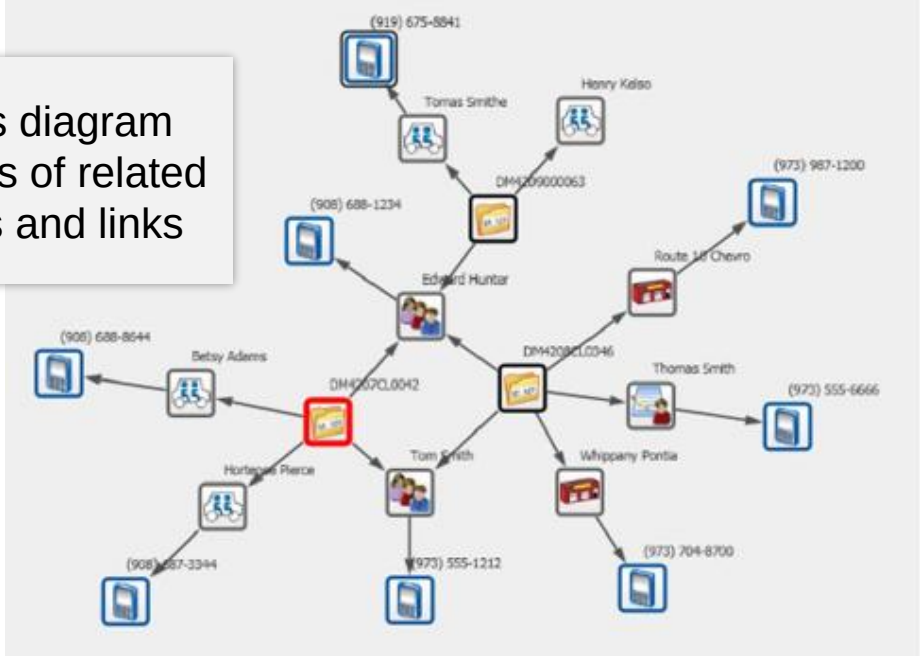
SNA Diagram

One of the main features SNA is the ability to displays relationship between selected alert and any other related alerts through the link and nodes.

Alerts diagram consists of related nodes and links



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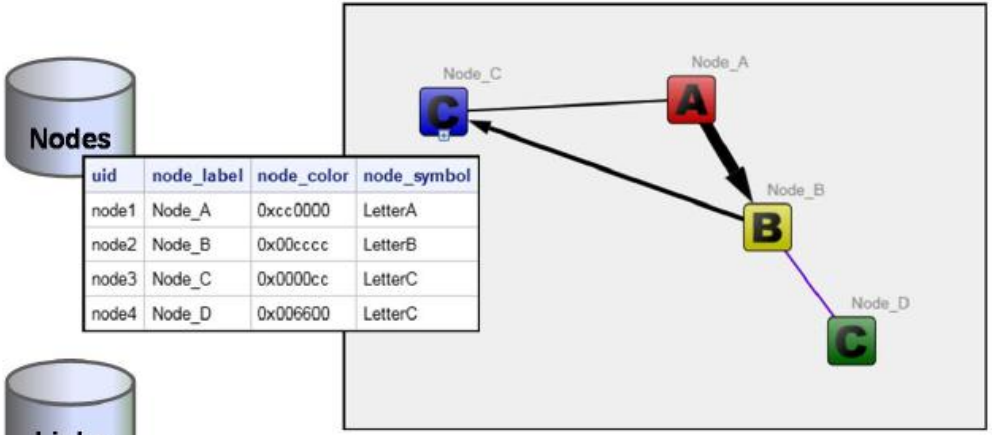
Building SNA Diagram

At a minimum, two data sources are needed to create a Social network analysis diagram



Nodes

uid	node_label	node_color	node_symbol
node1	Node_A	0xcc0000	LetterA
node2	Node_B	0x00cccc	LetterB
node3	Node_C	0x0000cc	LetterC
node4	Node_D	0x006600	LetterC

Links

cluster_id	uid	from_node_id	to_node_id	link_type	link_color	link_label	link_width
clust	link1	node1	node2	VECTOR	0x000000	AtoB	4
clust	link2	node2	node3	VECTOR	0x000000	BtoC	2
clust	link3	node3	node1	LINK	0x000000	CtoA	1
clust	link4	node4	node2	LINK	0x6600cc	DtoB	1

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Macro input Data Sets

The transactional data set contains the data in which the relationships are to determined

Claim_Number	Name	Role	DateOfLoss	Phone
DM4207CL0042	Betsy Adams	Passenger	19173	(908) 688-8644
DM4207CL0042	Edward Hunter	Passenger	19173	(908) 688-1234
DM4207CL0042	Hortense Pierce	Passenger	19173	(908) 687-3344
DM4207CL0042	Tom			
DM4208CL0346	Edw			
DM4208CL0346	Thon			
DM4208CL0346	Tom			
DM4208CL0346	Rout			
DM4208CL0346	Whip			
DM4209000063	Edward Hunter	PolicyHolder	19205	(908) 688-1234
DM4209000063	Henry Kelso	Passenger	19205	
DM4209000063	Tomas Smithe	Passenger	19205	(919) 675-8841
DM4209000064	Jason Marks	Passenger	18992	
DM4209000064	Katy Hunter	PolicyHolder	18992	(773) 561-0976

table_name	var_name	attribute_of	begin_date	end_date	to_cluster	to_display
NetworkData	Claim_Number		DateOfLoss		1	1
NetworkData	Name	Claim_Number	DateOfLoss		1	1
NetworkData	Phone	Name	DateOfLoss		1	1

Metadata

Network Data

Attribute_of – From Node
Var_Name - To Node

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Methods of creating Nodes and Link

- User-defined logic
- The OPTGRAPH
- The **%SFS_NET_MAIN_MACROS** macro

The SNA make use of the Macro, this is a compiled macro and another macro that synchronise the names and types of variables.

%SFS_NET_SYNC_NAMES_TYPES macro

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%SFS_NET_MAIN_MACROS macro

The main macro call other 4 macros they are:

- Sfs_net_create_graph_data
- Sfs_net_find_conn_comp
- Sfs_net_init_link_macro
- Sfs_net_link_one_table

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Calling the Macros

The macro contains five positional parameters

```
%SFS_NET_MAIN_LINK_MACRO(libref,
                         metadata,
                         nodes,
                         link,
                         clustersummary)
```

The macro has four keyword parameter

```
%SFS_NET_SYNC_NAME_TYPES(nodesin=data-sets,
                          linksin = data-sets,
                          nodesout = data-sets,
                          linksout=data-sets)
```


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Macro Output Data Sets

node_label	node_id	num_links	cluster_id	node_type
DM4207CL0042	1	4	1	CLAIM_NUMBER
DM4208CL0346	2	5	1	CLAIM_NUMBER
DM4209000063	3	3	1	CLAIM_NUMBER
DM4209000064	4	2	2	CLAIM_NUMBER
DM4209CL0049	5	2	3	CLAIM_NUMBER
DM4209CL0156	6	3	3	CLAIM_NUMBER
Betsy Adams	7	2	1	NAME
Daniel Mitola	8	2	2	NAME

Nodes1

cluster_id	begin_date	end_date	from_node	to_node	link_id
1	29JUN12	.	1	7	-1
3	13SEP12	.	5	8	-2
1	29JUN12	.	1	9	-3
1	03MAY12	.	2	9	-4
1	31JUL12	.	3	9	-5
3	13NOV12	.	6	10	-6
1	31JUL12	.	3	11	-7
1	29JUN12	.	1	12	-8

Links1

num_clusters	max_num_nodes	min_num_nodes	avg_num_nodes
3	20	4	11.666666667

Cluster Summary

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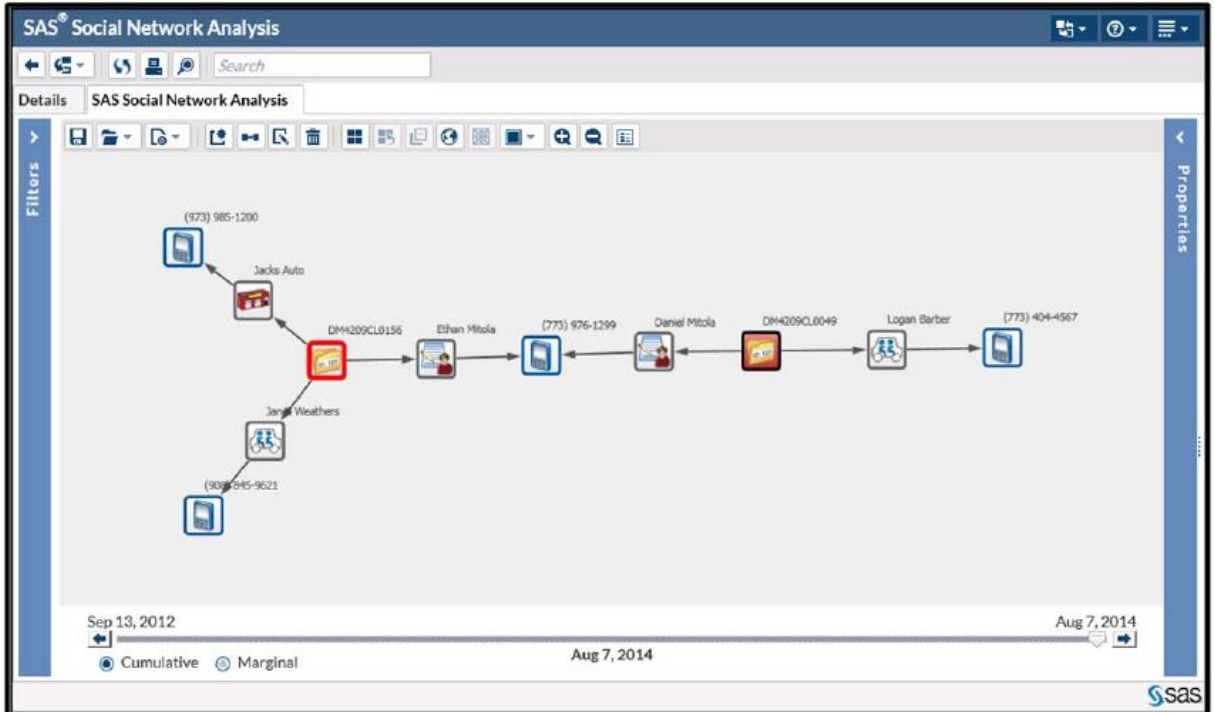
The getSocialNetwork stored process is responsible for displaying the social network in the Network Viewing pane



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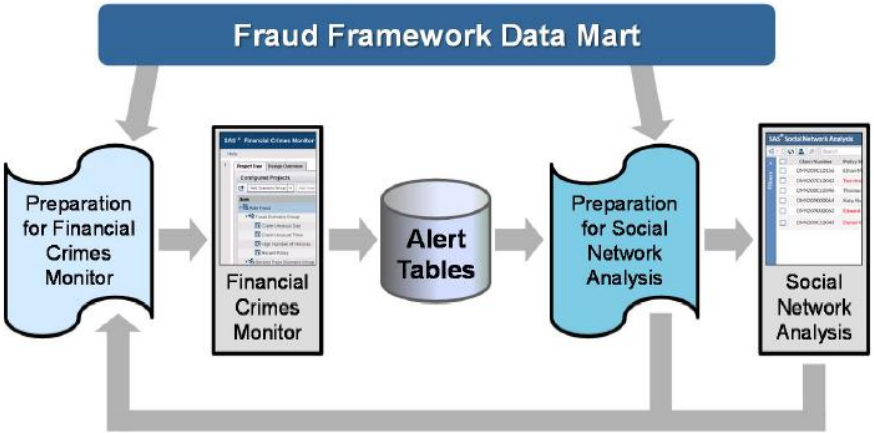
Conclusion

Fraud analysts and administrator are responsible for the process of implementing the SAS Fraud Framework



- Fraud prevention and detection is the work of everybody
- The rules needs to be evaluated at interval as the fraudster are always looking for ways
- Where model is used, it should be reviewed

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