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Ai.Fraud

Fraud Platform ¤ SimBox Detection ¤ & Usage threshold/black list monitoring

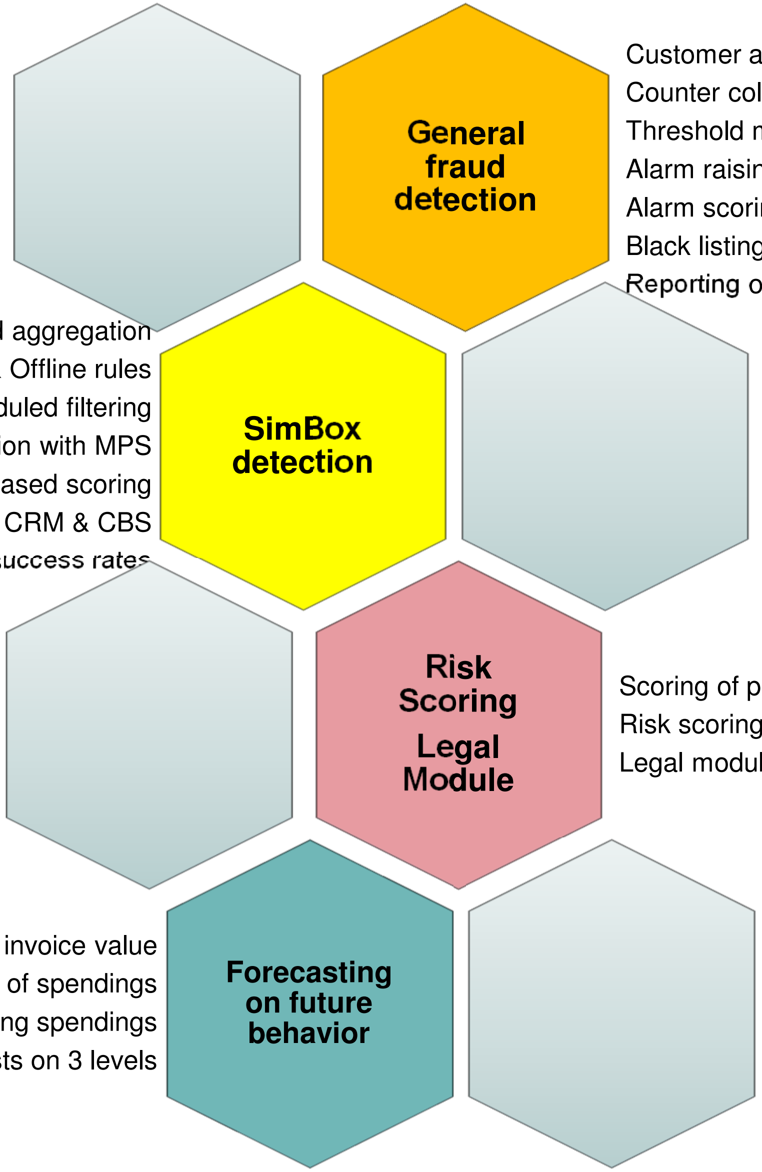
2012-06-11

Definitions

- Fraud prevention is the **process** of methodically **analyzing** customer **behavior** and systematically detecting any out-of-ordinary **patterns** that could be a potential **loss** to the operator revenue.

- In criminal law, a fraud is an **intentional deception** made for personal gain or to damage another entity.

Ai.Fraud Functionalities



General fraud detection

- Customer aggregation
- Counter collection and management
- Threshold management on 3 levels
- Alarm raising and resolving
- Alarm scoring
- Black listing
- Reporting on various aspects

SimBox detection

- SIM card data collection and aggregation
- Online & Offline rules
- Real-time and scheduled filtering
- Integration with MPS
- Rule based scoring
- Integration with CRM & CBS
- Reporting on agent success rates

Risk Scoring

Legal Module

- Scoring of postpaids based on paid amount history
- Risk scoring of new postpaids (TBD)
- Legal module for police enquires

Forecasting on future behavior

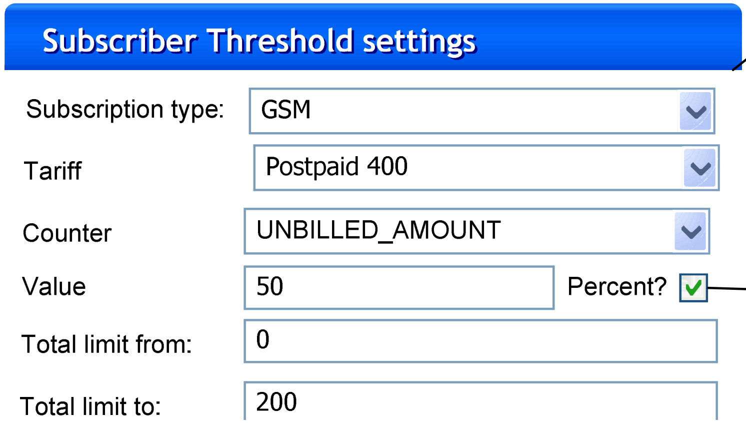
- Next invoice value
- Next 30 days of spendings
- Next 30 days of roaming spendings
- Forecasts on 3 levels

General fraud detection

General fraud detection

- Based on two types of convergent counters (spanning GSM, fix, internet & digital TV)
  - Daily counters – one profile for every day
  - Monthly counters – one profile for every month
- Counters cover spending, GSM & Internet data usage, on-net, national, international roaming traffic usage and spending, VAS service activations, monthly bill, refills, etc.
- Counters are managed on three levels, subscriber, customer and fraud customer group (same company, but registered as distinct customers)
- Agent can define thresholds on any of the three levels with filtering options based on tariff, counter, billing limit info, subscription type etc.
- Agent can define “user defined rules” – complex expressions spanning mix of daily and monthly counters, simple comparison and complex statistical operations

Subscription Type	Tariff	Counter	Threshold	Total limit from	Total limit to	
GSM	Postpaid 400	UNBILLED_AMOUNT	200	0	400	DEL EDIT
GSM	Postpaid 700	UNBILLED_AMOUNT	250	0	300	
GSM	iBusiness 1000	UNBILLED_AMOUNT	400	0	500	



Subscriber Threshold settings

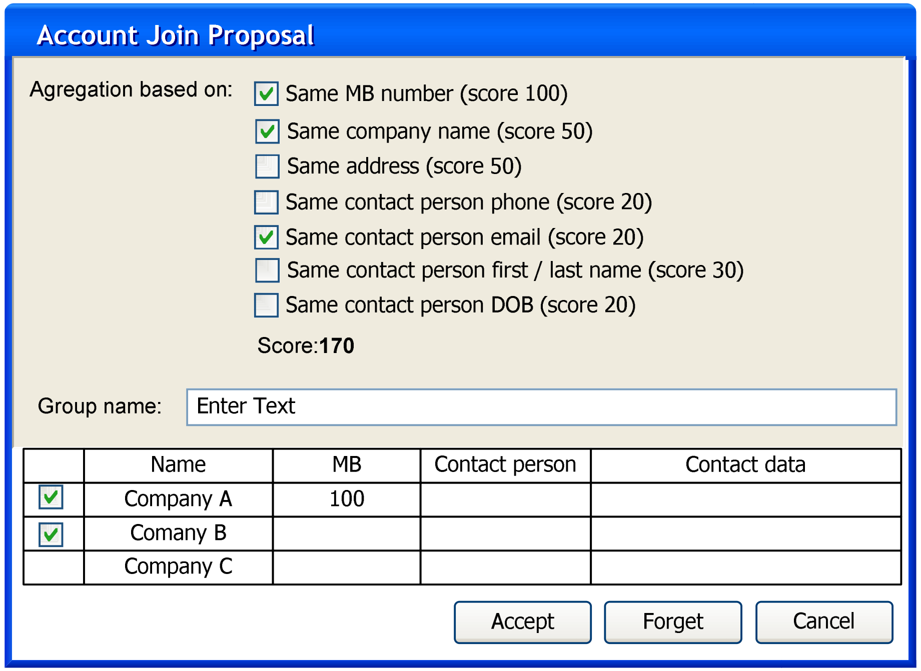
Subscription type:	GSM
Tariff	Postpaid 400
Counter	UNBILLED_AMOUNT
Value	50 Percent? ☑
Total limit from:	0
Total limit to:	200

From the Limit To value, 50 % equal to 1000

General fraud detection – Customer Aggregation

General fraud detection

- The aggregation of the customer accounts is process of joining two or more customers into a single entity, one the fraud system it's called fraud customer group. The purpose of the aggregation is to track more than one customer as a single customer.
  - Aggregate based on MB and TAX NUMBER
  - Aggregate based on the personal or company contact data
  - Aggregate based on the company data
  - Manual aggregation by fraud agent
- The platform scores all the matches and creates so called "Account Join Proposal" list
- By joining two or more contracts the fraud group is created. All the counters are also maintained for the group just as for subscriber and individual company customer



Account Join Proposal

Agregation based on:

☑ Same MB number (score 100)
☑ Same company name (score 50)
☐ Same address (score 50)
☐ Same contact person phone (score 20)
☑ Same contact person email (score 20)
☐ Same contact person first / last name (score 30)
☐ Same contact person DOB (score 20)

Score:**170**

Group name: Enter Text

	Name	MB	Contact person	Contact data
☑	Company A	100		
☑	Comany B			
	Company C			

General fraud detection – Thresholds and UDRs

General fraud detection

- Thresholds and User Defined Rules are evaluated online, together with data integration step. With every file imported (charging transactions, call detail records, refill records) all thresholds and rules are executed.
- If threshold or rule is evaluated positively the alarm is raised.
- Fraud agent has the freedom to define their own alarm types
- Alarm is delivered directly to CRM as a pop-up, e-mail or SMS (by configuration)
- Raised alarms are grouped based on the subscription, customer or fraud group instance level.
- Before alarm resolving, agent can execute additional set of rules and then decide to what to do with alarm.

General
fraud
detection

General fraud detection – Black listing

- Fraud platform supports various black lists, such as:
  - Black listed IMEI numbers
  - Black listed Cells and BSS stations
  - Black listed destination numbers and patterns
  - Black listed Point Of Sales
  - Black listed A party numbers and patterns
  - Black listed geographical locations
  - Black listed address patterns
- When subscriber profile attribute is found alarm is risen automaticaly

General Fraud Detection – Alarm resolving

- When alarm is risen, the agent must resolve it, one has following options:
  - Ignore alarm until specific date
  - Ask system to remind agent after specific date
  - Automatically inform subscriber / customer KAM about risen alarm
  - Set new credit limit in the billing system
  - Suspend subscriber / customer services
  - Deactivate subscriber / customer account
- All agent actions and every data changed by the agent is logged by the system
- All agent actions are enabled via GUI
- Agent privileges are granted based on the role and rights system

SimBox detection

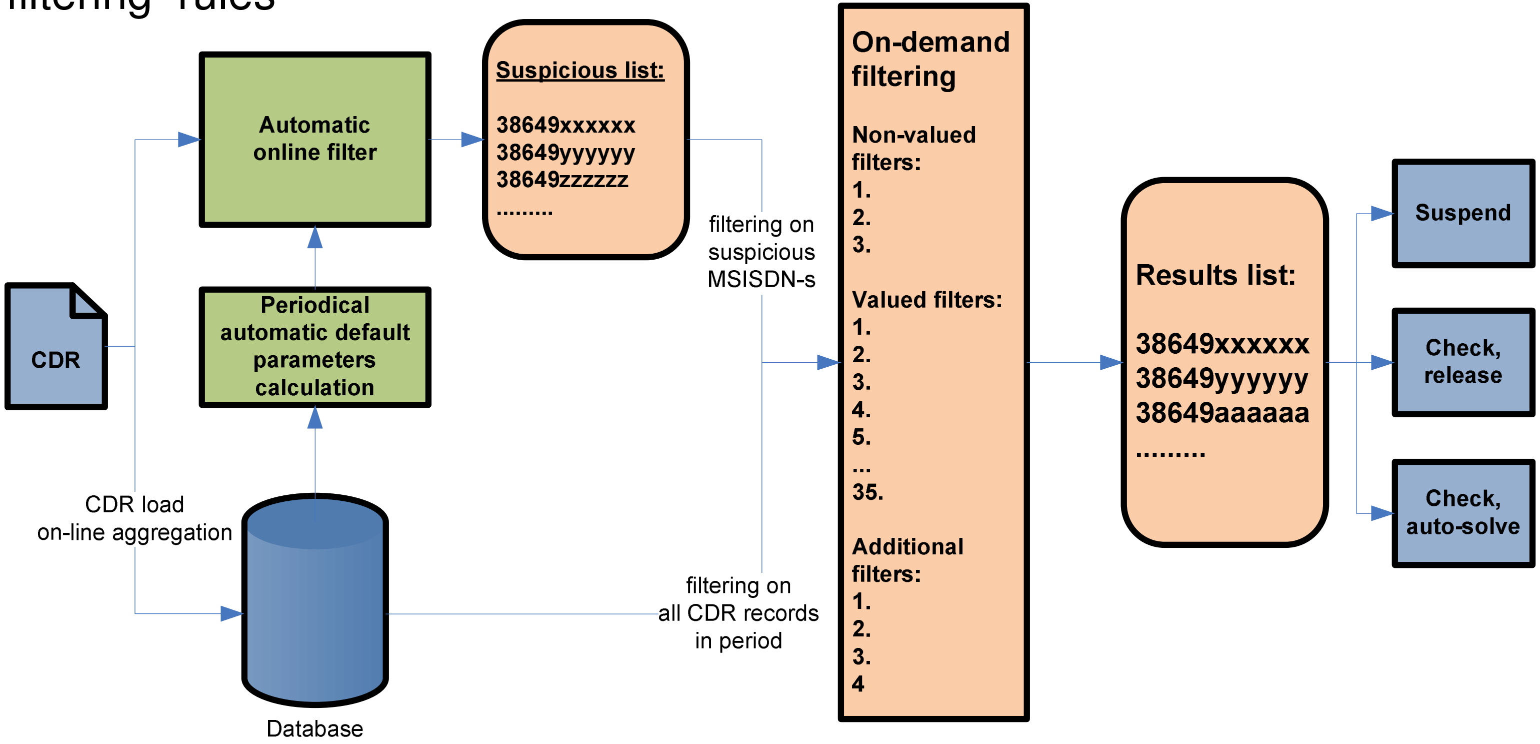
SimBox Detection

- According to different sources the total damage done by the commercial SIM boxes is around 5% of the total revenue of telecoms. If we break down negative effects by category it becomes clear why damage is so high:
  - Revenue loss due to call redirection – roaming calls are intercepted, redirected and terminated as if they are done in home network
  - Revenue loss due to service inaccessibility – due to the poor line quality there is a high rate of dropped calls
  - Revenue loss through missing callbacks – the call redirection is done with strange or missing call line identifier making it impossible for the called party to return call later
  - Image loss due to bad quality
  - The interconnection between carriers and local SIM boxes are done using highly compressed IP connection resulting in loss of voice quality and call setup is extended.

SimBox detection

SimBox Detection – How it works?

The detection of SimBox Sim cards is based on behavior pattern detection.
The detection logic is encapsulated by the automatic online and on demand filtering rules



- Filters are configured by the fraud agents based on their experience and recommendation by the system. The output of the filtering module is scored result list

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SimBox Detection – Filters

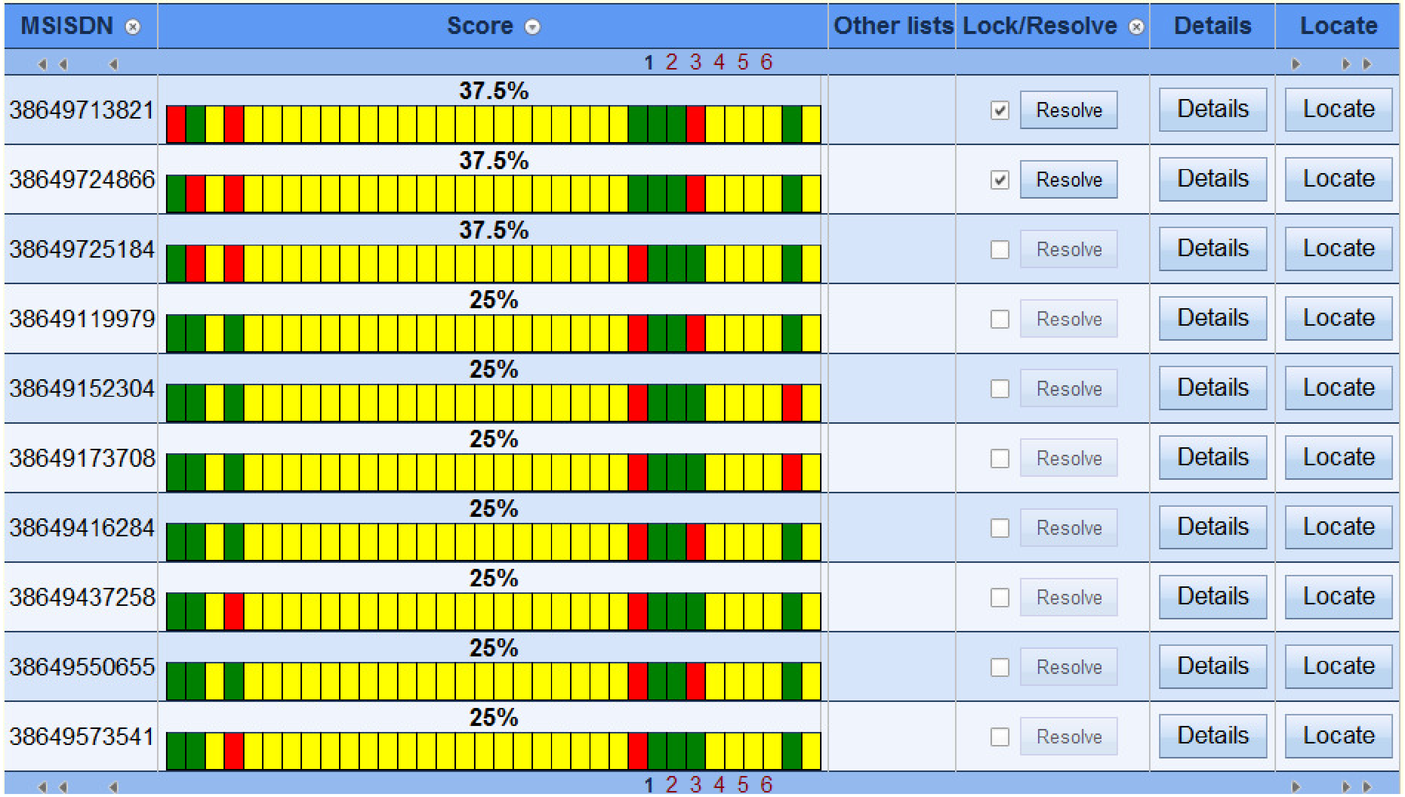
SimBox detection

- The detection is performed by running more than 45 detection filters on every subscriber SIM profile.
- Example filters are:
  - First call destination and duration
  - Where scratch cards are bought (geographicaly) and their value
  - Ratio of MO and MT calls and duration
  - When was the SIM card installed
  - When and how the tariff is changed
  - Number of consecutive calls without MT
  - Number of distinct parties called
  - Ratio between onnet and national calls
  - Money transfer statistics
  - Whether SIM card properties are black listed (cell, bss, imei, geography)
  - etc.

SimBox detection

SimBox Detection - Scoring

- For every SIM card profile the is being analyzed system is creating so called “Scored result list”. Every MSISDN gets it’s semaphore showing which filters passed (green) and which have failed (red).
- Based on the score, the agent can quickly decide what to do with suspicious profile.



MSISDN	Score	Other lists	Lock/Resolve	Details	Locate
◀◀ ◀	1 2 3 4 5 6				▶ ▶▶
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38649724866	37.5% 🟩🟥🟨🟥🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟩🟩🟩🟥🟨🟨🟨🟨🟩🟨		☑ Resolve	Details	Locate
38649725184	37.5% 🟩🟥🟨🟥🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟥🟩🟩🟩🟨🟨🟨🟨🟩🟨		☐ Resolve	Details	Locate
38649119979	25% 🟩🟩🟨🟩🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟥🟩🟩🟥🟨🟨🟨🟨🟩🟨		☐ Resolve	Details	Locate
38649152304	25% 🟩🟩🟨🟩🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟥🟩🟩🟩🟨🟨🟨🟨🟥🟨		☐ Resolve	Details	Locate
38649173708	25% 🟩🟩🟨🟩🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟥🟩🟩🟩🟨🟨🟨🟨🟥🟨		☐ Resolve	Details	Locate
38649416284	25% 🟩🟩🟨🟩🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟥🟩🟩🟥🟨🟨🟨🟨🟩🟨		☐ Resolve	Details	Locate
38649437258	25% 🟩🟩🟨🟥🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟥🟩🟩🟩🟨🟨🟨🟨🟩🟨		☐ Resolve	Details	Locate
38649550655	25% 🟩🟩🟨🟩🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟥🟩🟩🟥🟨🟨🟨🟨🟩🟨		☐ Resolve	Details	Locate
38649573541	25% 🟩🟩🟨🟥🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟨🟥🟩🟩🟩🟨🟨🟨🟨🟩🟨		☐ Resolve	Details	Locate
◀◀ ◀	1 2 3 4 5 6				▶ ▶▶

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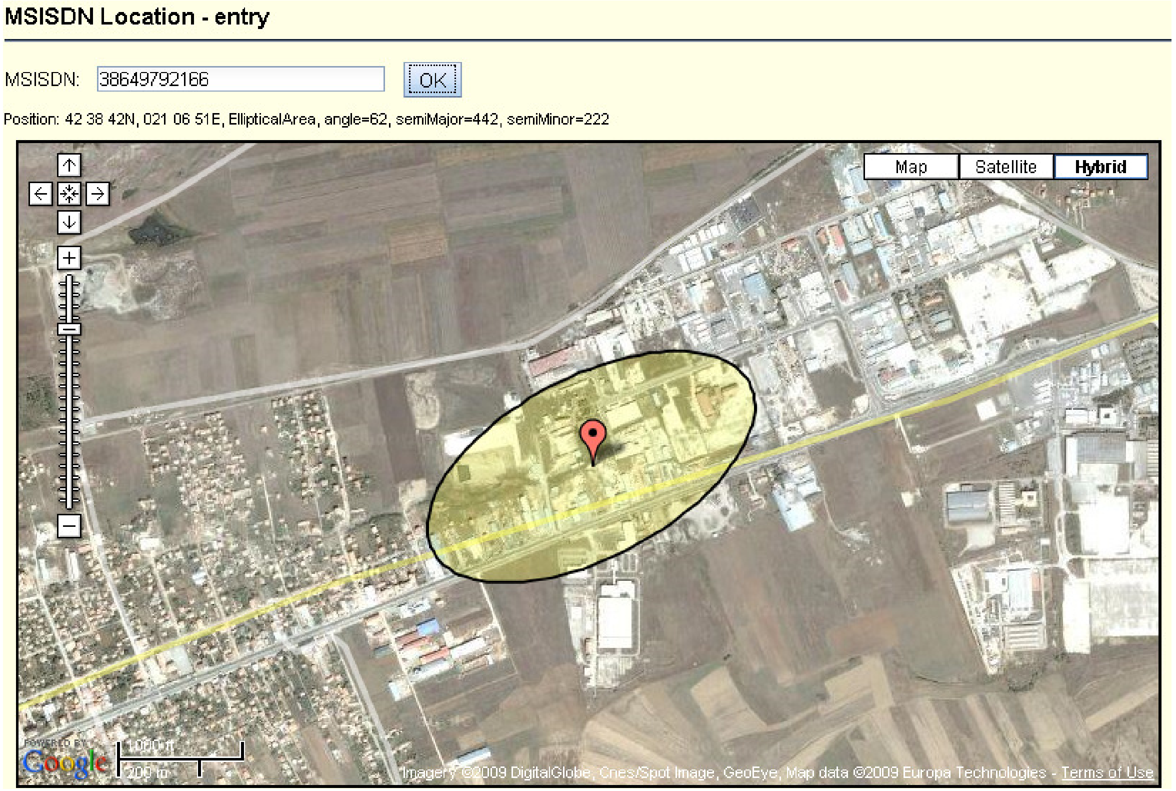
SimBox Detection - Resolving

- When fraud agents get scored result list he can decide what to do with profile:
  - Ignore the number for specific period (used for operator test numbers, operator own employees, VIP’s, business numbers, etc.
  - Set reminder to check the profile later on.
  - Suspend the services
  - Terminate the SIM card
- All agent actions and every data changed by the agent is logged by the system
- All agent actions are enabled via GUI
- Agent privileges are granted based on the role and rights system

SimBox Detection – Geo searching

- When agent finds a single SIM card that is installed in the SimBox device he can initiate automatic search for rest of the SIM cards. The search is radius based.
- The system will automatically filter all found SIM cards in the vicinity with the same filtering rules.
- With this functionality agents can be extremely successful in detecting SimBox “devices” and can put whole site out of operation.



MSISDN Location - entry

MSISDN: 38649792166 OK

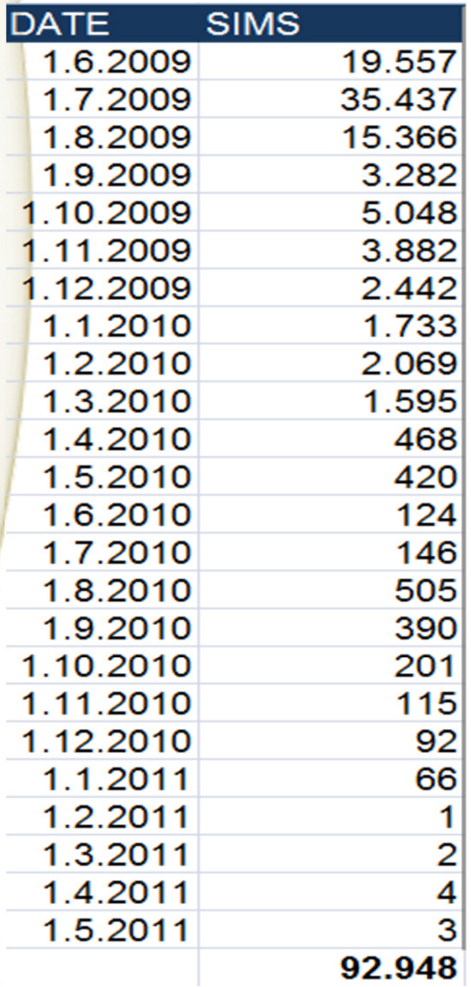
Position: 42 38 42N, 021 06 51E, EllipticalArea, angle=62, semiMajor=442, semiMinor=222

Map
Satellite
Hybrid
Google
1000 ft
200 m
Imagery ©2009 DigitalGlobe, Cnes/Spot Image, GeoEye, Map data ©2009 Europa Technologies - Terms of Use

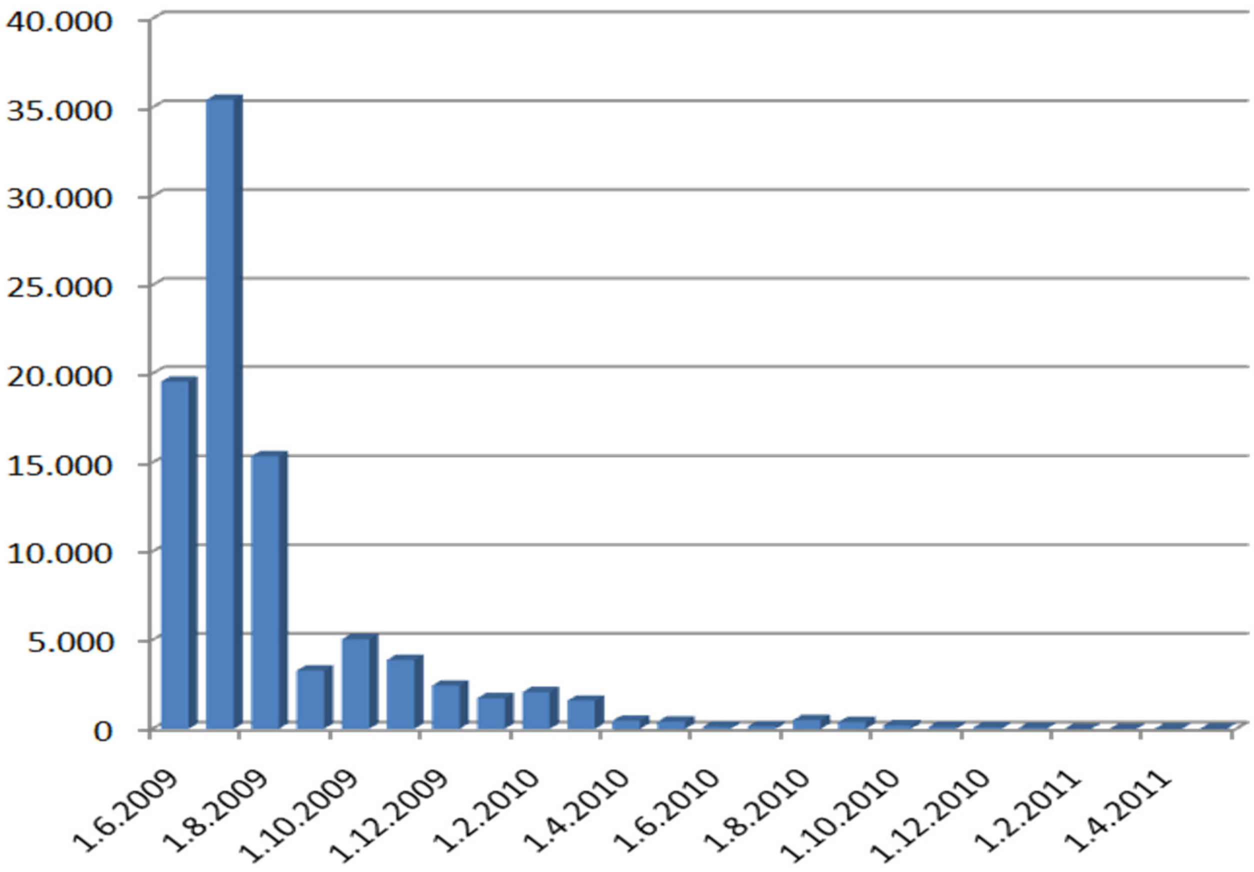
SimBox detection

SimBox Detection – Success Factors

- The following statistics is accurate data about the number of terminated SIM cards by fraud agents in period of 24 months.



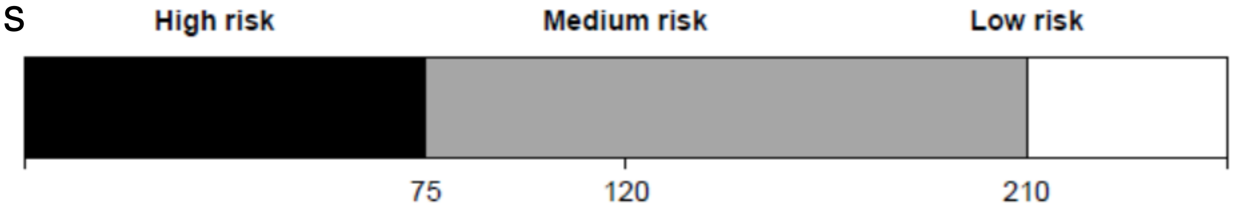
DATE	SIMS
1.6.2009	19.557
1.7.2009	35.437
1.8.2009	15.366
1.9.2009	3.282
1.10.2009	5.048
1.11.2009	3.882
1.12.2009	2.442
1.1.2010	1.733
1.2.2010	2.069
1.3.2010	1.595
1.4.2010	468
1.5.2010	420
1.6.2010	124
1.7.2010	146
1.8.2010	505
1.9.2010	390
1.10.2010	201
1.11.2010	115
1.12.2010	92
1.1.2011	66
1.2.2011	1
1.3.2011	2
1.4.2011	4
1.5.2011	3
	92.948



Risk Scoring
Legal
Module

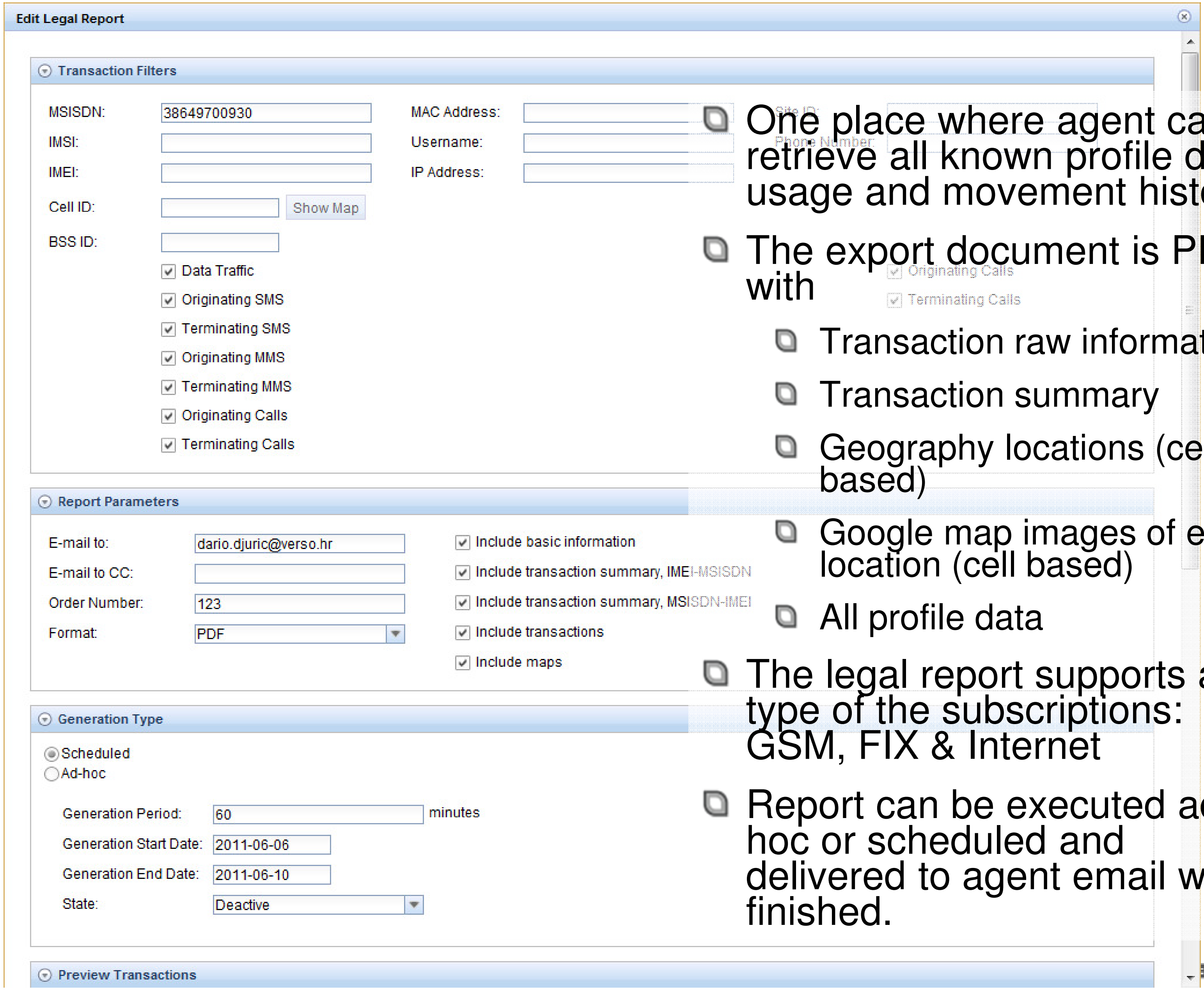
Risk Scoring

- Risk Scoring is statistical model based on invoiced and paid amount history. The model goal is to quantify risk attached to postpaid subscriber of becoming bad payer.
- Model rules are based on the:
  - Deltas between invoiced and last payment
  - Dunning actions (scheduled or performed)
  - Risk score of other contracts of the same customer
  - etc.
- Model can be combined with external info (e.g. Bank credit profile like FICO).
- For new postpaid customers the Risk scoring depends on:
  - Whether person has employment
  - Whether he is returner
  - Geography area
  - Marital status
  - Age
  - etc



Risk Scoring
Legal Module

Legal Report



Edit Legal Report

Transaction Filters

MSISDN:	38649700930	MAC Address:	
IMSI:		Username:	
IMEI:		IP Address:	
Cell ID:			
BSS ID:			

Site ID:
Phone Number:

☑ Data Traffic
☑ Originating SMS
☑ Terminating SMS
☑ Originating MMS
☑ Terminating MMS
☑ Originating Calls
☑ Terminating Calls

☑ Originating Calls
☑ Terminating Calls

Report Parameters

E-mail to:	dario.djuric@verso.hr
E-mail to CC:	
Order Number:	123
Format:	PDF

☑ Include basic information
☑ Include transaction summary, IMEI-MSISDN
☑ Include transaction summary, MSISDN-IMEI
☑ Include transactions
☑ Include maps

Generation Type

● Scheduled
○ Ad-hoc

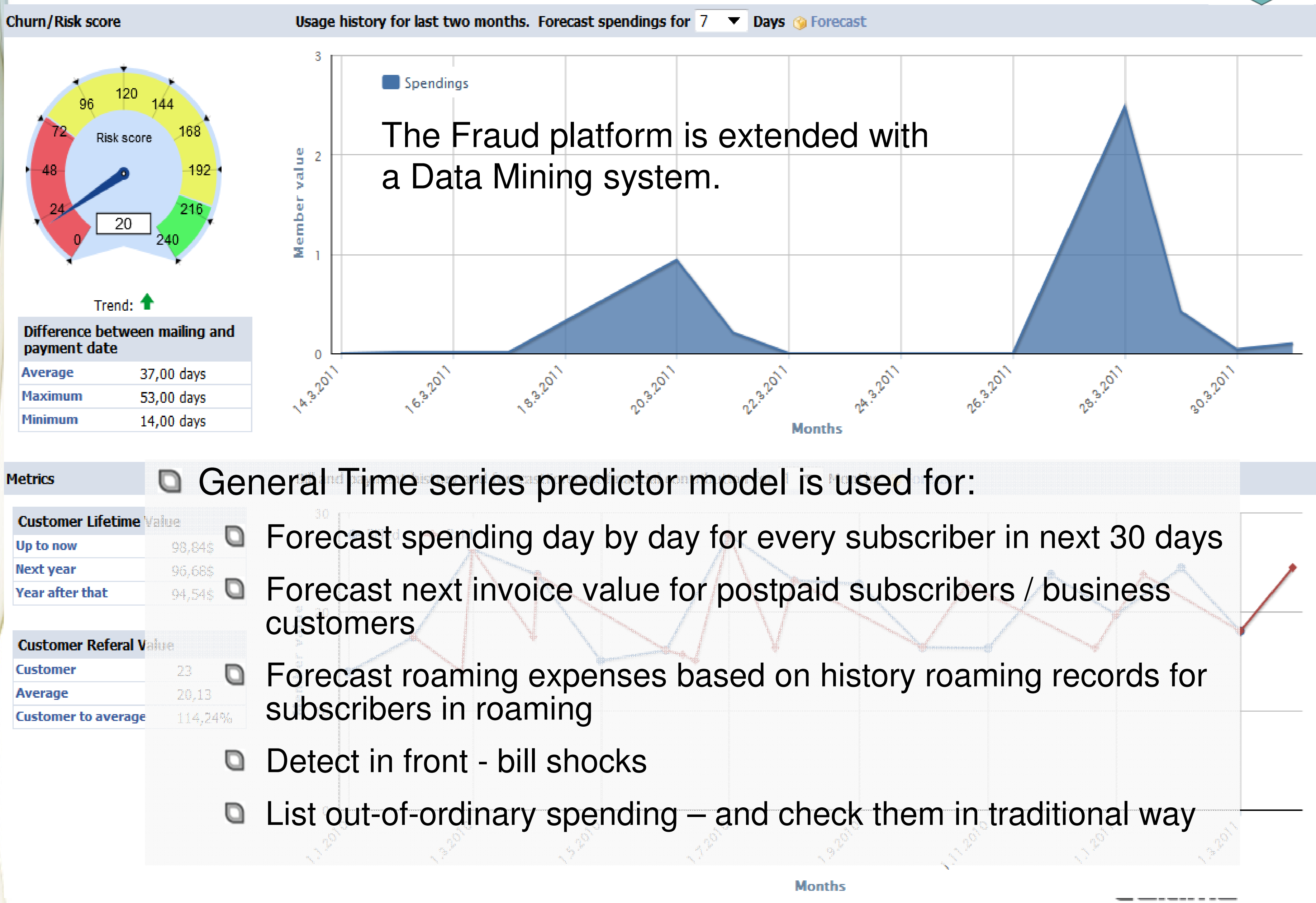
Generation Period:	60 minutes
Generation Start Date:	2011-06-06
Generation End Date:	2011-06-10
State:	Deactive

Preview Transactions

- One place where agent can retrieve all known profile data, usage and movement history.
- The export document is PDF with
  - Transaction raw information
  - Transaction summary
  - Geography locations (cell based)
  - Google map images of every location (cell based)
  - All profile data
- The legal report supports all type of the subscriptions: GSM, FIX & Internet
- Report can be executed ad-hoc or scheduled and delivered to agent email when finished.

Forecasting

Forecasting on future behavior



Usage history for last two months. Forecast spendings for 7 ▼ Days Forecast

Difference between mailing and payment date	
Average	37,00 days
Maximum	53,00 days
Minimum	14,00 days

Metrics

Customer Lifetime Value	
Up to now	98,84$
Next year	96,68$
Year after that	94,54$

Customer Referal Value	
Customer	23
Average	20,13
Customer to average	114,24%

The Fraud platform is extended with a Data Mining system.

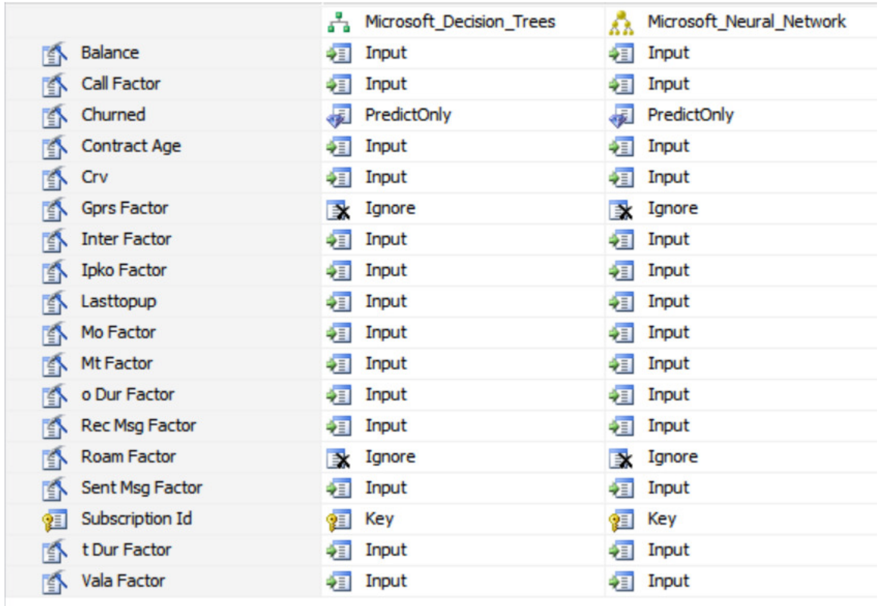
- General Time series predictor model is used for:
  - Forecast spending day by day for every subscriber in next 30 days
  - Forecast next invoice value for postpaid subscribers / business customers
  - Forecast roaming expenses based on history roaming records for subscribers in roaming
  - Detect in front - bill shocks
  - List out-of-ordinary spending – and check them in traditional way

Forecasting
on future
behavior

SimBox Detecting

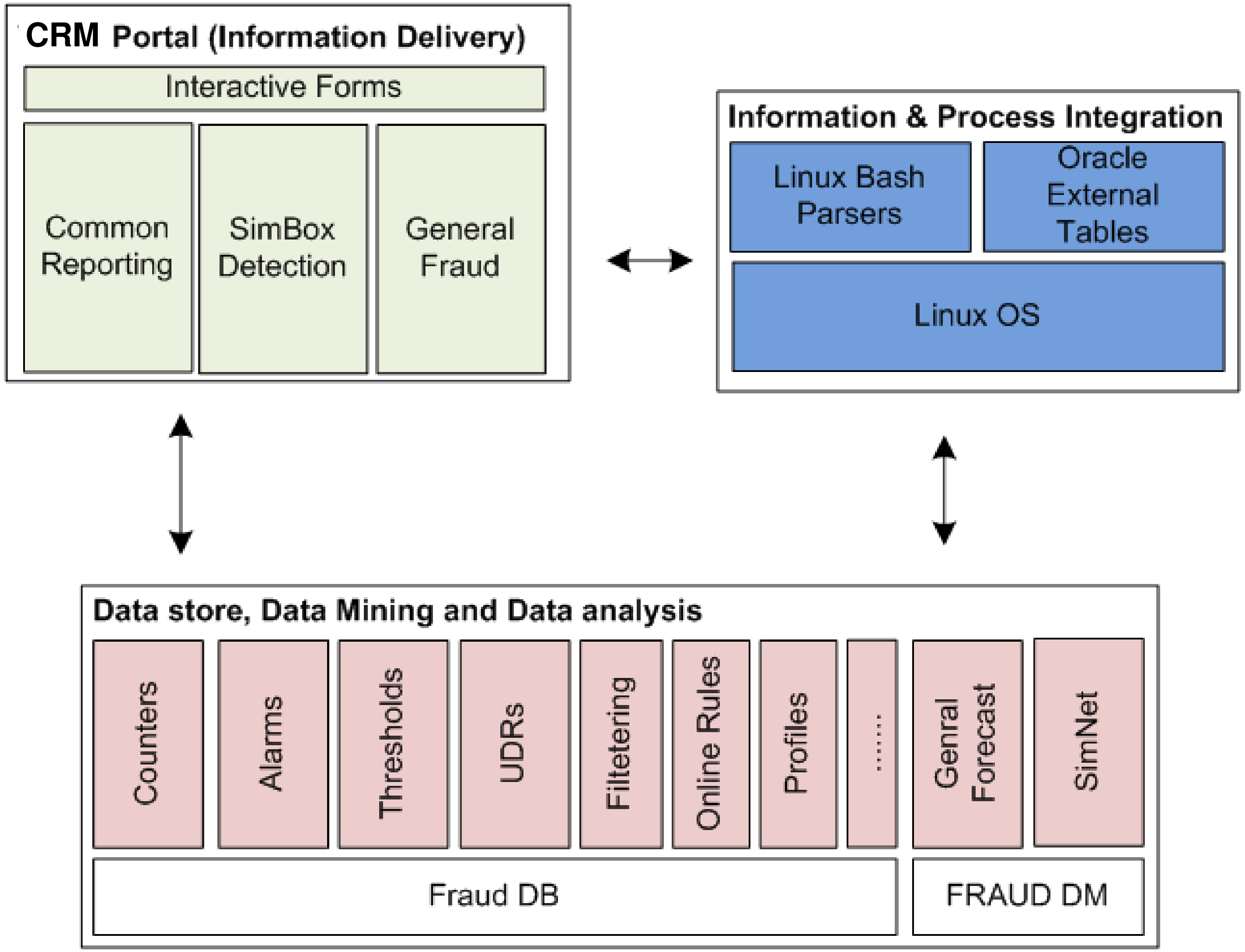
- SimBox detection Neural Network:
  - Based on 40+ filters best explaining profile variables
  - Trained neural network and decision tree model
  - The output of the model checked by the agents in traditional way
  - Very early detection of “potential” SimBox profiles, event before their behavior is checked in traditional way.

- Attributes:
  - MO/MT ratio, SMS/Call ration, International/National ratio, CLIR indicator, any attribute on black list, average duration between top-up, ratio of distinct calls, average duration of MO and MT calls, call pattern tolerance, money transfer value, etc.



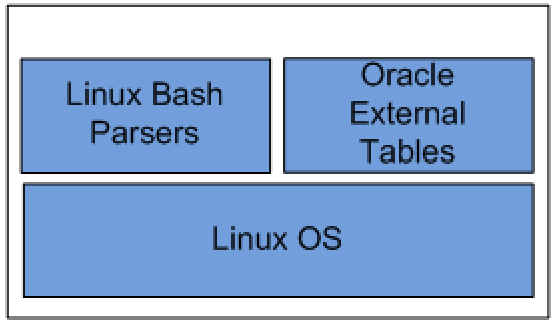
	Microsoft_Decision_Trees	Microsoft_Neural_Network
Balance	Input	Input
Call Factor	Input	Input
Churned	PredictOnly	PredictOnly
Contract Age	Input	Input
Crv	Input	Input
Gprs Factor	Ignore	Ignore
Inter Factor	Input	Input
Ipko Factor	Input	Input
Lasttopup	Input	Input
Mo Factor	Input	Input
Mt Factor	Input	Input
o Dur Factor	Input	Input
Rec Msg Factor	Input	Input
Roam Factor	Ignore	Ignore
Sent Msg Factor	Input	Input
Subscription Id	Key	Key
t Dur Factor	Input	Input
Vala Factor	Input	Input

Fraud Architecture



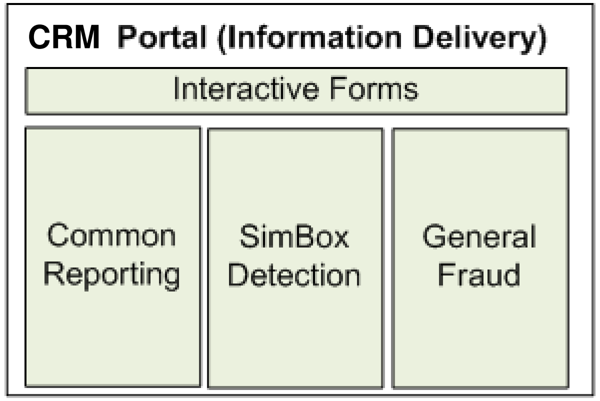
Fraud Architecture – Data integration

- The collection of source data is done via:
  - Bash scripts and Oracle External data table definitions + Oracle SqlPlus
  - DB Links with source databases
- Every source data set has it’s own stage table where data is cleaned and transformed before moving into fraud data tables.



- All the collection procedures are scheduled either on database or OS level (Linux crontab)
- Subscriber data is collected every 15 minutes for delta, every night full sync. is occurring
- Invoices and payments are collected every 3 days and every 15 minutes respectively
- CDR’s, ISUP, Fix CDR’s and Charged transactions are collected in real time, as soon as they come from mediation
- Vouchers and refills are collected every one hour
- Transaction data from shops (sold SIM and scratch cards) are collected every 1 hour

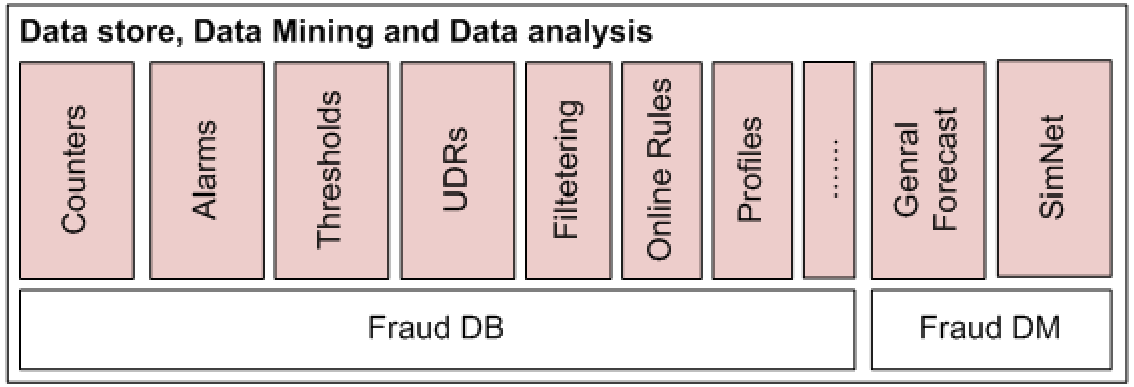
Fraud Architecture – Information Delivery



- VCCE is CRM extension solution designed in modular approach meaning that Fraud modules can operate without rest of the system (except user, role management.
- Fraud GUI developed in PHP
- VCCE is Web 2.0 application
- GUI is simple and intuitive to use

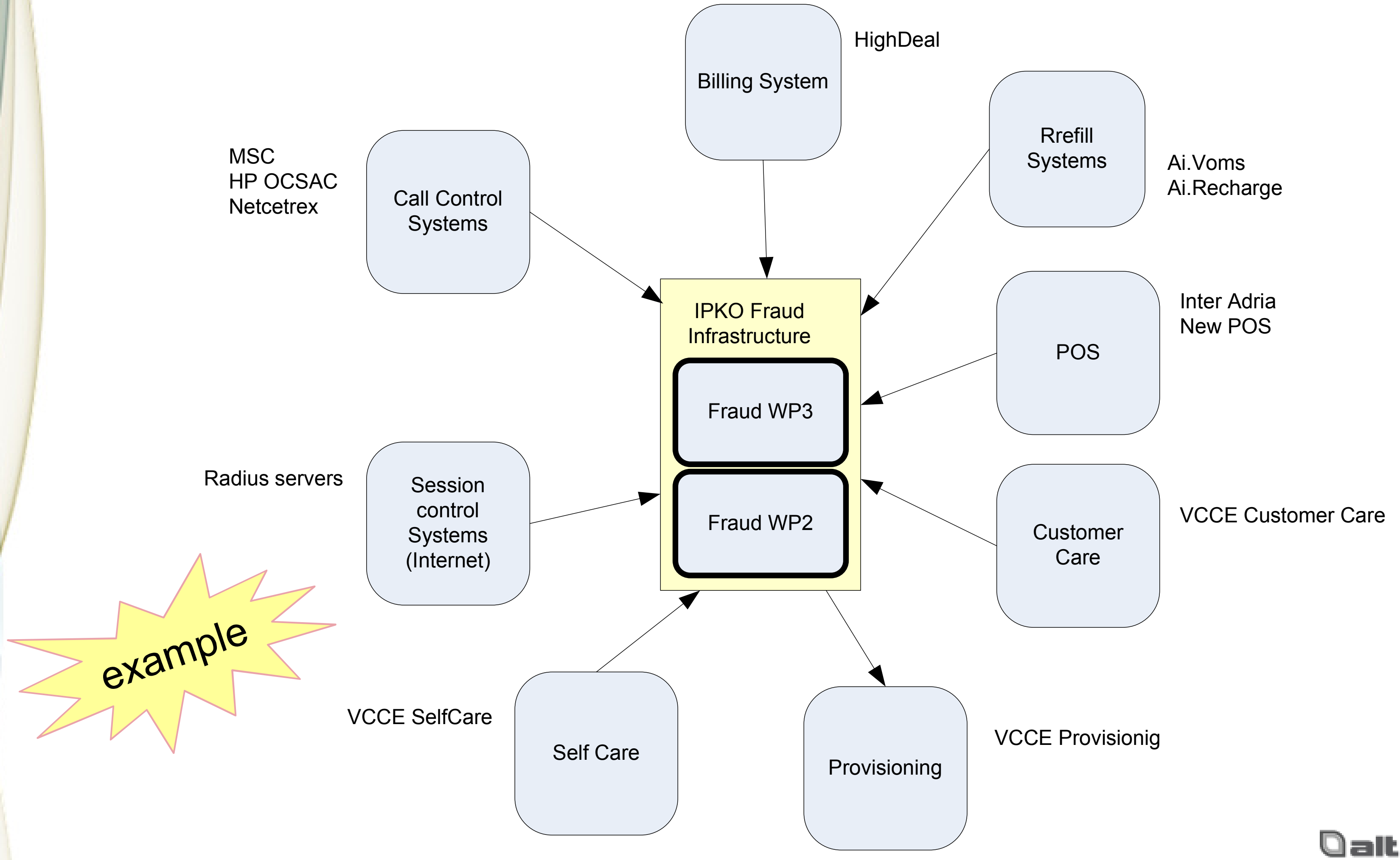
Fraud Architecture – Data store and Data mining

- Detection algorithm, rules and filters are running on the Oracle 11g database level.
- The systems stores all the transaction data for up to 6 months (even 12 months if storage and HW permits)
- Database is well documented and available to Operator development department
- Data mining models are running on separate server (Microsoft Windows Server)
- Data mining software used is Microsoft Analysis Service



Fraud Integration - Overal

- Fraud platform is integrated with every (directly or indirectly) transactional system



Ai.Fraud – What makes it different?

- Our platform is:
  - Fully convergent platform with support for all type of CSP services
  - Open – we share all the algorithms and models internals
  - Successful – proven record in SimBox detection
  - Supported – we are continuing with development, it’s not a one time project
  - Extensible – we adapt the platform to the problem not problem to the platform

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