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Revenue Assurance: Using SAS® to Identify Revenue Leakages

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ABSTRACT

Would you be able to convince your executive management that all revenue and cost streams are free of monetary leaks? That all people, processes and systems are designed and executed correctly and that design oversights, system defects, and human mistakes fail to make their way into the organization? In a customer oriented industry, ramifications of allowing such anomalies, unchecked, could result in uncaptured revenue, strained relationships with vendors, and a poor customer experience. With increasing complexity and several components interacting in a large organization, issues are inevitable. In such settings, SAS becomes an invaluable tool for any Revenue Assurance team to begin to identify, quantify and address some of these anomalies.

INTRODUCTION

Proactively addressing revenue and customer affecting anomalies that result from several components interacting in a large organization is vital. Introducing the additional responsibility of tackling these issues to individual departments is not without challenges. Many departments may lack visibility or open communication streams to other groups; they may not know or have access to key individuals from different teams whose input may be necessary. Plus, individual departments are straddled by deadlines that relate to their core functions.

DIRECTV took the initiative to address these issues and established a dedicated Revenue Assurance department to seek out anomalies across the enterprise and take the lead in correcting them. A dedicated department would have an established presence within the organization for the role of protecting the revenue and cost streams throughout the company. With a wide array of skillsets and contacts throughout the organization, the Revenue Assurance department can take an objective approach to situations that arise. The Revenue Assurance department, given near unfettered access to various sources of data, can leverage these skills and contacts to deliver significant results to the bottom line.

REVENUE ASSURANCE TO THE RESCUE

Breakage scenarios are identified and prioritized by potential impact. Impact is determined based on both customer impact and the estimated revenue lost, keeping in mind potential downstream implications. DIRECTV's Revenue Assurance department, primarily focused on billing accuracy, is continually expanding the number of scenarios it explores, quantifies, and tracks. In order to do this most efficiently, the department follows a Discovery, Recovery, and Monitoring methodology.

- Discovery: The discovery process helps frame the potential problem at hand. It establishes an understanding of the problem - if the customer is being over or under billed. Business rules are captured from stakeholders and subject matter experts. Data sources and relevant data are identified – usually varying from system to system and department to department.

The next step is to programmatically recreate the business rules to derive the expected end state. Data is then "Tested" where it is passed into the recreated scenario. The output is then compared against the actual data within the organization. Anomalies are collected and grouped together as an "Error Set." The Error Set is analyzed for Customer and Financial Impact. Further analysis is conducted on the Error Set to determine root cause. In some cases, there may be multiple root causes responsible for an Error Set.

The following scenario demonstrates a basic example of how customer accounts could be under billed or over billed:

DIRECTV offers several core programming package offerings. Each customer is required to select one core programming package on their account (see Figure 1).

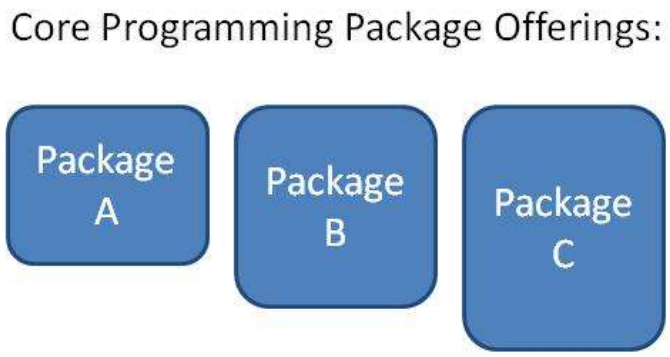

Figure 1: Example core programming package offerings.

Given a confluence of promotions, various systems, and automated processes, errors can occur.

- Over Bill: Customer 1 is incorrectly setup as the account contains two core programming packages. The customer is being unfairly billed an extra package and would be furious to discover such an error (see Figure 2).

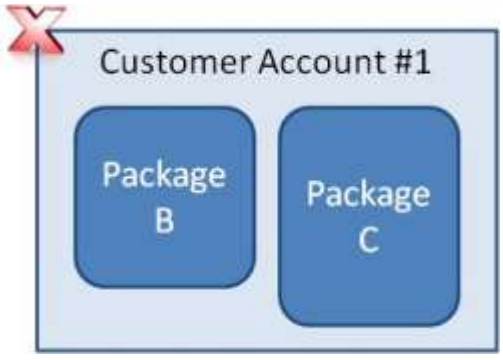

Figure 2: An example of an account in error for having overlapping services.

- Under Bill: Customer 2 is also incorrectly setup with no core programming package. Not only is Customer 2 missing out on core programming, but DIRECTV is also losing out on revenue from the required core programming package (see Figure 3).

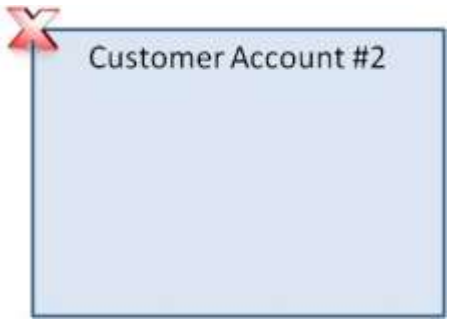

Figure 3: An example of an account in error for missing services.

- Customer 3 is correctly setup with one core programming package (see Figure 4).

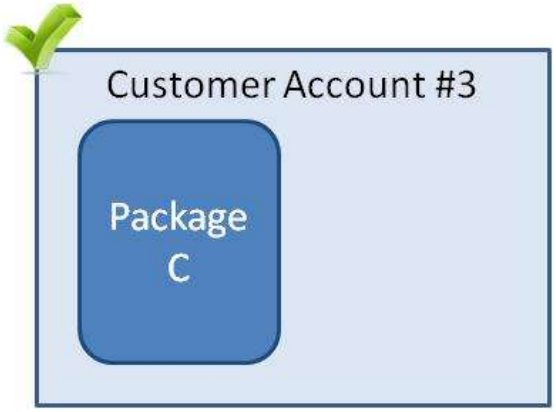

Figure 4: An example of a correctly configured account.

- Recovery: Based on the analysis from the Discovery phase, discussion takes place about how to best proceed with correcting the Error Set. Further analysis is performed to assess the impact to all parties. What types of customers are impacted? How much is the organization impacted? What are the ramifications for performing a correction? Does the customer need to be notified, and if so, how should they be notified? What cross-functional team approvals are needed?

  Sometimes it is determined that a batch "Correction" needs to be completed. The batch correction includes applying specific changes to customer accounts and applying the appropriate charges or credits. This way we ensure the appropriate services and correct charges are on our customers accounts with minimal customer impact, preempting a phone call and time spent with customer service agents. Post correction analysis is performed and all corrected accounts are maintained in a historical table to be able to reference correction history at any time. In addition, the Revenue Assurance team can leverage text mining analysis

which is completed by other groups on call center agent comments. The team can then assess the impact a correction may have had on the call centers or the general sentiment of callers.

- Monitoring: Monitoring utilizes efforts and existing scripts from the discovery phase. Having completed a model of the business process, monitoring takes that one step further by automating and running the model on a recurring basis to keep track of Error Sets from identified scenarios. Similar to a human antibody, Monitoring can quickly identify known anomalies should they reoccur in the future. The key benefit of Monitoring allows a team to track spikes and dips and observe long term trends. For example, one interval of monitoring could show a spike for a scenario which could be later investigated and attributed to a new promotion where as a dip in another may be a systematic fix deployed into production. This allows the team to identify more easily the effectiveness of the fix, or alert us for the need to dig in further. The benefit of being able to track on a continuing basis is to catch problems earlier rather than later. Monitoring may also feed into problem ticketing systems where corrections could be applied daily versus allowing a backlog of errors which need to be corrected through a batch process.

Figure 5 below is a hypothetical Weekly Monitoring report. Scripts for scenarios A, B, C, and D are written to find the number of errors within the past week. The report is run on a weekly basis to provide a snapshot of errors. Errors for Scenario A have been trending upward, while Errors for Scenario B have been trending downward. Red colors identify negative trends while green identifies positive trends both of which span across multiple weeks. These reports rely heavily on PROC REPORT and ODS Tagsets, as will be discussed later, for minimizing manual effort.

Scenario	Revenue Impact/ Error	Week 1	Week 2	Week 3	Week 4	Week 5	Annual Revenue Impact
A	$10	7,000	7,000	7,500	8,000	10,000	$1,200,000
B	$20	250	250	200	180	160	$38,400
C	$40	500	525	515	520	520	$249,600
D	($40)	300	295	300	305	304	($145,920)

Figure 5: Sample hypothetical weekly error set trending for monitoring.

COMPLEXITY OF DIRECTV'S BUSINESS

DIRECTV's business contains various systems and vendors interacting, constantly exchanging large amounts of data.

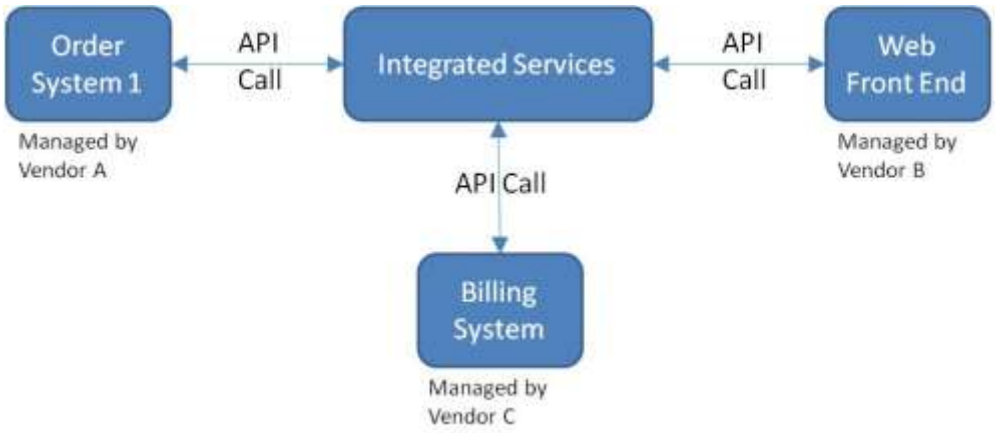

Figure 6: Various systems may be interacting and sharing data.

Data that is exchanged between these systems may include:

- Customer Account Data
- Customer Account Services
- Customer Account Transactions
- Customer Orders
- Customer Equipment
- Service Calls
- Credits/Telco Partner Bundling
- Special Offers
- Core Programming Packages & A La Carte Programming Services
- Customer Escalations
- Dealer Sales

Given the variety of data, systems and parties involved, a flexible solution that can handle various types of data and its flow is required. In addition, having the capability to integrate the tasks of the Discovery, Recovery, and Monitoring, reusing particular process flows or SAS scripts, is crucial for allowing the Revenue Assurance team to tackle as many scenarios as possible.

REVENUE ASSURANCE, MEET SAS

WHAT IS SAS TO US?

With all the complexities that large enterprises deal with, a versatile tool is crucial for traversing data sources and data types. SAS provides just that for a Revenue Assurance team with the know-how to exploit the resources available. A variety of different features are used in following through on the Revenue Assurance process.

For the DIRECTV Revenue Assurance team, SAS serves as both a datamart and a means through which we can access other data sources throughout the company to run analysis. The SAS scripts and flows composed by members of the group are readily available to everyone else within the team to leverage existing data pulls or process build outs.

BUILDING OUT PROCESSES

There are countless scenarios in which the risk of revenue leakage can be assessed. The risk is amplified when processes are complex, when there is exchange of data or when manual procedures are involved.

In order to identify areas of breakage, a proper understanding of the business rules is vital. Building out a SAS process or script to mimic the business rules allows the user to confirm the integrity of a particular process or business rule.

At a high level, this means simply looking at customer accounts and ensuring they are configured properly. As an example, if business rules dictate that a customer must maintain a certain level of programming, the script would delve into the data looking for customers that do not meet this particular requirement. On the flip side, it could also mean looking at customers bills to make sure they are not charged for services their hardware cannot support.

The processes and business rules, however, could become far more complex. This is particularly true for situations that require hand-offs between different systems or even 3rd parties, especially with the added step of possible eligibility checks. For instance, the reader can imagine a situation where 3rd party partners are providing customer leads in a variety of formats which subsequently are loaded into the appropriate systems for eligibility validations and billing set ups. At a more granular level, account information may be uploaded in text format, which in turn is loaded from an FTP into a database that is subsequently used to determine what each customer's bill should contain. The SAS process flow must follow the same process, and identify where, if any, potential leaks exist. The toolsets that enable this centralized, systematic traversal of different applications and data sources is what is unique and most useful.

SAS FEATURES

Depending on the complexity of the scenario and the different processes involved, different SAS features come into play.

Below is a non-exhaustive list of various SAS features that are crucial to achieving our aims in the Revenue Assurance team:

***Interface to Teradata, Oracle**:* Large organizations will invariably have data stored in different types of databases. Interfacing features of SAS are incredibly useful for culling relevant data from the necessary databases. This is especially true when certain scenarios require the use of historical data which is often stored in separate data warehouses.

LIBNAME statements allow a connection to Teradata and other types of SQL databases, and added options like FASTLOAD, MULTILOAD and BULKLOAD allow for efficient transfer of data between SAS and the chosen database.

In addition to the LIBNAME statement, SQL Pass-Throughs allow the user to submit a query which will run on the target database prior to returning the data to SAS, making for a more efficient process, especially when working with very large tables. Using a DATA or PROC step with a LIBNAME reference to an external table would result in SAS importing all the data in the table prior to completing the step, resulting in unnecessary burden on the servers.

***FILENAME Statement**:* In addition to allowing access to a specific file or directory on the SAS server, the FILENAME Statement's FTP functionality is important for accessing source data. A number of processes may involve raw files available on an internal or external FTP server. Using the FILENAME Statement enables the user to access individual files or retrieve the listing of files in a particular FTP directory. These files can then be imported into the SAS datamart in a DATA step. Depending on the context, these files are generally of the same format. Barring this, however, there are papers available on dynamically determining the format of the file and importing it accordingly.

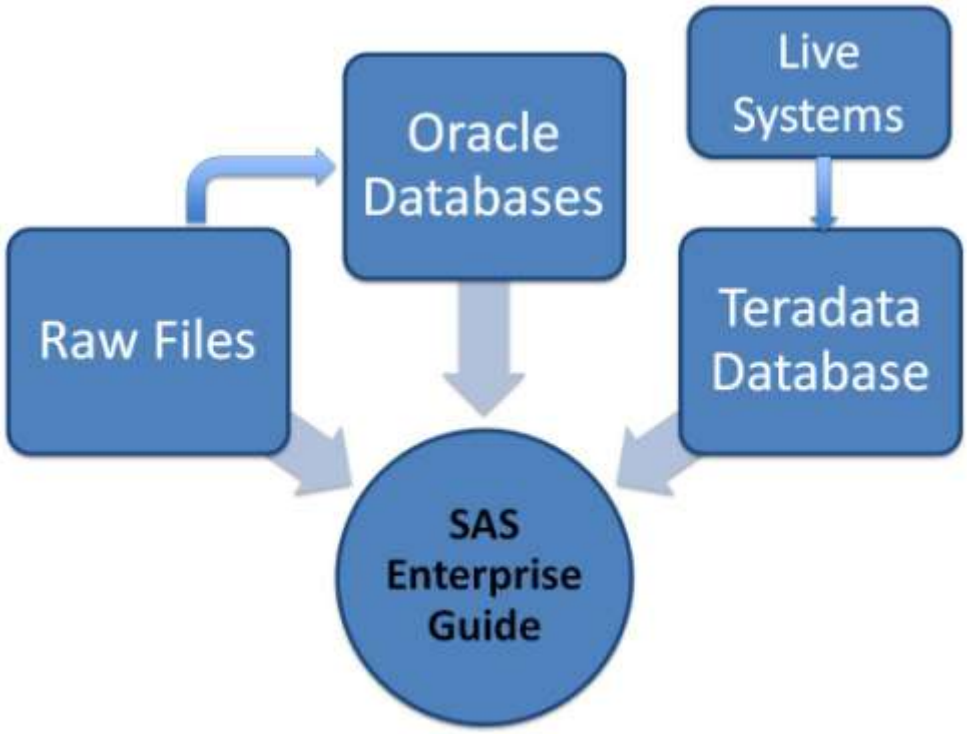

Figure 7: SAS can be used to access and leverage a variety of data sources.

PROC SQL: The flexibility to use SQL code within SAS is invaluable. The ability to use both SAS and SQL allows the user to write less cumbersome scripts that are easier to understand, and are potentially more efficient depending on the tasks at hand. Plus, a new SAS user with SQL experience can hit the ground running from within SAS while his or her knowledge of DATA and PROC steps is expanded.

MACRO: For Revenue Assurance purposes, many data manipulation steps are often repeated with slight variations. In the example of importing raw files for analysis, MACROs are crucial for making the process dynamic – allowing the process flow to handle a fluctuating number of files with names that change depending on the date the flow is run.

In addition to full MACRO steps, MACRO variables are also effective in automating monitoring procedures that involve changing dates and changing table names. They are also useful for allowing different people to run process flows using their own identification information that is assigned to a global MACRO variable.

PROC REPORT: When scenarios enter the Monitoring stage, tracking the data involved is important. Being able to effectively visualize this data and the monitoring results is equally important. The expanding versatility of PROC REPORT allows for effective and visually appealing outputs in a useful format. Plus, the ability to compute certain columns or rows enables conditional formatting, allowing the output to automatically highlight areas of concern.

ODS: The ODS Targets further allow a SAS programmer to make the PROC REPORT results more visually appealing and available in different output formats. The ability to format and show the data clearly while making it available across different software tools is a big benefit of using ODS Targets.

CONCLUSION

SAS effectively enables DIRECTV's Revenue Assurance team to hone in on the leakages related to the numerous complexities germane to any large service provider. Several features of SAS make data not only very accessible, but easy to manipulate and mimic the processes which the live production systems follow.

Of course, depending on the reader's organization, many limitations may exist. Access to source or backup data may not be readily available. In most cases, direct access to source data allows for the most effective Revenue Assurance analysis. This does away with any potential for data sync issues that may sully back up data and result in false positives.

Aside from data limitations, it is crucial to build strong cross-functional relationships throughout the organization. The ability to leverage knowledge across a company allows for more effective Revenue Assurance functions. With executive support, a Revenue Assurance team with a strong business and technical skillset can use SAS and other tools to confidently quantify and elucidate potential breakages, hereby giving strong insight into the enforcement of business rules and health of processes.

Despite best efforts, leakage is inevitable. The key is to have a process in place for addressing these leakages. At a time when companies are attempting to control costs, collect revenues due, and ensure a positive customer experience, the capability to effectively identify, correct and monitor potential breakages is crucial.

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