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Integrated Marketing with SAS® in the Age of Real Time

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ABSTRACT

Real-time, integrated marketing solutions are a necessity for maintaining your competitive advantage. This paper provides a brief overview of three SAS solutions (SAS® Marketing Automation, SAS® Real-Time Decision Manager, and SAS® Event Stream Processing) that form a basis for building a modern, real-time, interactive marketing platform.

- It presents typical (and also possible) use cases that you can implement with a comprehensive real-time interactive marketing solution, in major industries like finance (banking), telco, and retail.
- It demonstrates typical functional architectures that need to be implemented to support business cases (how solution components collaborate with customer's IT landscape and with each other).
- And it provides examples of our experience in implementing these solutions—do's and don'ts, best practices, and what to expect from an implementation project.

INTRODUCTION

Database driven marketing – also known as campaign management – appeared as a result of the changing technologies in the 1980s. The revolutionary shift from direct marketing to a two-way-dialogue with greater usage of data and analytics happened because specialized tools that could record responses became available to the marketers.

Throughout the years, the concept of database driven marketing has evolved responding to the technological innovations. Customer communication has become more and more integrated as marketers gain access to new sources of consumer and business data, channels and means of decision making.

At the moment, database driven marketing is perceived as an indispensable part of any marketing business process, especially if a company possesses a lot of transactional customer data.

However, wide spread use of campaign management solutions makes it difficult to differentiate one's business since most businesses approach marketing process in a similar way. Modern marketers strive to gain advantage in the highly competitive environment and win the battle for the customers who often become extremely demanding and set high expectations.

In order to build an effective dialogue with customers, the most advanced marketing specialists focus on a number of topics setting the pace for the development of campaign management technologies.

- They are preoccupied with finding the right ways to utilize modeling and analytics. Mathematical tools can provide many variations to the segmentation process. The key challenge is to identify the right business case as well as to design a steadily operating mathematical model.
- Omni channel is a hot topic for many marketers. Ubiquity of smartphones, wide usage of social networks as well as increasing share of e-channel all serve as a colorful illustration of the changing behavioral pattern of the modern customers. Marketing specialists cannot ignore such a disruption in the way people engage with a brand.
- A marketer wants timely use of omni channel marketing and analytics. Real-time actionable insights enable them to deliver the most relevant offers at the right time through the right channel and create contextually aware marketing interaction.

Therefore, it is crucial to design a structured system that can help marketers build an integrated marketing approach employing analytics, omni channel marketing and real time insights. This paper

describes how SAS solutions address these demands and transform campaign management into an interactive platform.

AUDIENCE

This paper is intended both for

- Business Users (marketers) who drive the demand and requirements for innovative database driven marketing solutions.
- IT specialists (architects, consultants, developers) who build and maintain technical and data architecture and implement such solutions.

It is assumed that the reader is well aware of the basics for database driven marketing (campaign management) and traditional campaign management solutions (like SAS® Marketing Automation).

SAS SOLUTIONS THAT AUTOMATE REAL-TIME MARKETING

SAS offers a variety of products that can help organizations reach the highest standards of database driven marketing and build an integrated marketing platform.

Businesses are currently facing a number of challenges while automating their marketing process:

- Customers expect a brand to interact with them across multiple channels in real time
- Customers expect consistency across all the channels in terms of offerings as well as business logic
- Marketers are puzzled to understand how to monetize data using analytical tools.

In order to address the key challenges that companies are facing while trying to interact with their customers, SAS introduced the SAS Customer Decision Hub concept (also called SAS Customer Intelligence family of solutions). It focuses on four main aspects:

- **Activities:** All the marketing activities are automated and the system tracks and records customer responses.
- **Insights:** Enables combining transactional customer data and real-time insights in order to build predictions useful for current marketing strategies.
- **Rules:** The system provides a structured repository that unifies all the rules applicable to the multiple channels integrated with the system.
- **Decisions:** The system responds to customers according to the logic that can operate in real time.

The SAS® Customer Decision Hub encompasses the following set of SAS Solutions (Products), of which in this paper we will focus on the first two.

- **SAS Marketing Automation** (sometimes shortened SAS MA): Solution helps plan and execute marketing campaigns, segment customers, store offerings and track responses.
- **SAS Real-Time Decision Management** (sometimes shortened SAS RTDM): Solution that utilizes real-time customer insights in order to make the right offer through the right channel enabling real-time contextually aware marketing interaction.
- **SAS Marketing Optimization** (sometimes shortened SAS MO): A satellite solution to SAS Marketing Automation which uses a sophisticated mathematical optimization engine and analytic models to maximize ROI across multiple overlapping campaigns while staying under per-customer and aggregate constraints, and enforcing contact strategy rules; Also allows performing what-if scenario based analysis;

Additionally, there is another SAS product which is sometimes used in conjunction with more business oriented SAS Customer Intelligence solutions. It is called the **SAS Event Stream Processing** (ESP) and is capable of very performant real-time analysis of high volume event streams. It helps to form a comprehensive and fully capable event-driven marketing solution that takes into consideration high volumes of real-time data.

Last but not least, real-time interaction requires equally fast tools for analytics as well as for reporting, and SAS has the right product for that: **SAS Visual Analytics®**. Marketers not only get a powerful real time interaction tool but also can make sense of complex data using advanced BI tools.

Together, these tools form a comprehensive real time marketing (RTM) platform that enables marketers to conduct a two-way dialogue enriched with an intuitive business-friendly interface. It ensures that all campaign logic is designed in a graphical point-and-click manner and is easy to use. We will be using the "RTM solution" or "RTM platform" notion further in this paper to refer to the entire composite system, which may include and integrate SAS® Marketing Automation, SAS Real-Time Decision Manager, SAS Event Stream Processing, SAS® Visual Analytics and other related SAS solutions or products.

TRADITIONAL CAMPAIGN MANAGEMENT TO REAL-TIME MARKETING

A Real-Time Marketing platform built with the SAS solutions mentioned above does not oppose traditional (batch) Campaign Management solutions, but rather extends and compliments. The entire RTM ecosystem is centered around SAS Marketing Automation, a solution with unmatched analytical capabilities, which serves at its core – solely responsible for running traditional (batch) marketing campaigns, but also contributing a lot to the real-time capabilities of the solution, as will be shown below.

Businesses often start their customer intelligence implementation roadmap by implementing traditional batch campaign management capabilities first using SAS Marketing Automation and SAS Enterprise Miner to build predictive models, and then extend the solution to real-time capabilities.

This is not always the case however, and often real-time capabilities using SAS Real-Time Decision Manager are implemented first, even before traditional batch campaign management.

REAL-TIME MARKETING USE CASES TAXONOMY

We have already successfully implemented Real-Time Marketing platforms and solutions for multiple clients and are currently discussing similar projects with several more. The key message we hear from them is:

> *"We feel that we need to go real-time but we are not sure how exactly it can be monetized and ensure that we can increase sales as well as bring in new customers."*

Having encountered such a puzzle that our clients have been facing, we've decided to formulate our understanding of the Real-Time Marketing use case taxonomy. We don't claim to design a universal model applicable for everyone since there are always certain industrial as well as business peculiarities in place. However, the taxonomy can serve as a good initial framework that a company can use while tackling the problem of real time marketing.

The key idea is that one should clearly distinguish betwee technical "use cases" which demonstrate certain functional, processual and architectural pattern of real-time marketing logic implementation, and marketing "business cases" which describe cpecific marketing opportunity (like what and whom do we offer). Different business cases can be implemented and delivered to the customer through a number of functional real-time or batch mechanics, or use cases. And each functional mechanics or use case (also, RTM solution capability) can be leveraged to deliver many types of offers (marketing business cases) to the customers.

It is extremely important that you understood both business cases and technical use cases which need to be supported when planning to implement an RTM platform, to ensure the correct design architecture and also correctly estimate timelines and budgets for the implementation.

HIGH-LEVEL FUNCTIONAL USE CASE TAXONOMY

On a high level, we classify most technical use cases (usage patterns) for a Real-Time Marketing (RTM) solution into the following categories:

- **Traditional Campaign Management (Traditional CM).**
  - **Traditional batch campaigns**
  - **Non Real-Time Event-Based campaigns**
- **Next Best Offer on Inbound channels (Inbound NBO)**
- **Real-Time Event-Based Marketing**
  - **Real-Time Event-Based outbound offering**
  - **Real-Time offer fulfillment**
- **General omni-channel and customer dialogue automation and orchestration**

TRADITIONAL CAMPAIGN MANAGEMENT USE CASE (NON REAL-TIME)

We shouldn't discuss real-time marketing solutions without mentioning traditional, non-real-time (batch) personalized marketing functionality and use cases. Whatever advanced and polished real-time capabilities our new Real-Time Marketing platform features, there always remain a lot of business cases that have nothing to do with real-time.

But your customers are the same, and you likely want to approach the marketing process holistically. So you likely want to manage all your marketing activities in a similar way and from the single place, be it traditional batch campaigns, or novel real-time campaigns. This is why we include these non real-time use cases to the Real-Time Marketing use case taxonomy.

SAS Marketing Automation is the best-in-class tool to manage traditional batch marketing campaigns and is tightly integrated with real-time components to serve as the basis and core of the entire Real-Time Marketing platform.

Traditional batch campaigns

These are traditional one-off or monthly (weekly) recurrent marketing campaigns that target certain customer segments to communicate certain offers. Customer eligibility criteria primarily refers to basic, slowly changing and aggregate customer profile attributes. Predictive models are also often used.

Non Real-Time Event-Based campaigns

These are marketing offers and campaigns that target customers based on some event in their lifecycle, but do not require a real-time capability. A communication is typically expected on a day related to the event (same day or next day). Some examples would be:

- Notifications when a payment is due, overdue, etc.
- Customer birthday greeting, anniversary with the brand, etc.
- Offering of a new fixed-term deposit account when existing expires.

It is typical that an existing installation of SAS Marketing Automation (SAS MA) is used to implement such use cases. A campaign is designed in SAS MA and scheduled to be executed on a daily basis (sometimes even on an hourly basis) using data from a data mart which also needs to be updated daily. This way, each day we have a list of offers to communicate to the customers based on their events from the past day (sometimes even past hour).

NEXT BEST OFFER ON INBOUND CHANNELS (INBOUND NBO)

This use case implies that available inbound channels (like Contact Center, Web site, Mobile app, AT etc), or IT systems that run these channels (CRM system, Website backend etc) are integrated with an RTM solution. When a customer contacts the vendor through one of this inbound channels, respective system calls an RTM solution, which in turn needs to decide which offer (or multiple offers) should be presented to the customer in this channel at this moment.

An RTM solution typically uses the following inputs to make its decision:

- A table of pre-computed ("pre-staged") offers originally prepared from the traditional (batch) campaign management tool
- A data mart with a customer profile (as up-to-date as possible)
- Contextual information from the channel provided alongside a request
- Ability to call some external system to get additional customer-related information as needed
- A library of available offers with pre-configured business logic to determine eligibility, priority and personalized parameters, based on both hard-coded business logic rules and predictive analytical models over above mentioned inputs.

This use case is often called "Next Best Offer" decisioning, and is by far the most widely implemented real-time marketing use case. When you hear that the company X has "implemented a real-time marketing solution", most likely they are doing NBO on one or multiple inbound channels.

REAL-TIME EVENT-BASED MARKETING

This is a diverse category of use cases sharing two aspects in common:

- A stream of customer-originated events is analyzed, and certain marketing actions happen "in the right time" based on analysis of these events
- Event delivery, processing, analysis and action execution all happen in real time, or near real time

Real-time Event-Based outbound offering

Real-Time Marketing solution analyzes diverse customer-originated events and decides which new marketing offer should be communicated to the customer, at which time, and through which channel. An opportunity to communicate an offer can be identified by the company based on specified customer actions or customer-related events, some trend or pattern of actions / events (which can also relate to an absence of specific expected action / event for some period of time). A relevant marketing offer is then communicated to the customer, typically through one of the outbound channels (SMS, Email, outbound call, mobile push, etc).

Real-time implementation of traditional event-based campaigns (RT-EBM *in lieu of* Traditional EBM)

A business may have a marketing use case (campaign to run), which would be "*Non Real-Time Event based*" by its nature, but which can't be automated using existing a daily recurrent batch campaign in an existing campaign management tool due to some limitations on a data side.

For example, in Finance, you might want to target customers who typically receive their paycheck via direct deposit on day X of each month, but didn't get the direct deposit this time. You want to offer them a payday loan. There is nothing requiring an urgent action (real-time), but you still want to communicate it next day in the morning. But your existing data infrastructure (Data Warehouse,

Marketing Data Mart) is too slow and does not keep up. You might have 2 days' delay in the data pipeline until an event (or its absence) becomes visible to your campaign management tool (like SAS® Marketing Automation).

Alternatively, your campaign might depend on an event – like "*a customer made a money order transfer*", while the "money order" table may not be available at the current data warehouse / data mart at all, and request for its production implementation may only be put down on the roadmap and take a year, or more to implement.

If you have a fully functional and well-integrated RTM platform in place which supports real-time event-based outbound offering, often you can leverage it to implement such campaigns based on mentioned events (direct deposit, money order for above use cases) as if they were real-time campaigns, in a way like you implement real-time logic. The value in this case comes not from a real-time aspect of the interaction, but rather from the ability to integrate on a lower level and bypass slow and insufficient data infrastructure with a quicker time-to-market temporary "shortcut" solution.

Real-time offer fulfillment use cases

There are multiple ways that a marketing offer can be communicated to a customer. It could be communicated with a real-time outbound communication (see above), it could be done with a traditional batch marketing campaign (either from SAS Marketing Automation or a third-party tool). It could even be a mass marketing channel like a TV ad. But many offers, once communicated to the customer, require fulfillment mechanics: you ask the customer to do something, and as he does, you want to thank him / provide some promised reward.

So this category of use cases is about RTM solution implementing fulfillment mechanics – providing rewards in real-time as the customers have fulfilled offer conditions.

In telco (mobile), this use case is predominantly in demand for the prepaid line of business, where you can provide a customer extra top-up dollars, extra minute bundles, or extra megabyte packages as a benefit for the fulfillment of offer conditions. In finance and retail, this use case is predominantly in demand for loyalty programs, and credit card lines of business (finance) when you want to stimulate customer's transactional behavior (card usage, number of transactions, transactions with specific merchants and thresholds, etc.) while rewarding in real-time with cash back, discounts, or bonus points.

Remember that extra care needs to be taken to prevent abuse and fraud when rewards are provided in real-time, including monitoring and accounting for returns, etc.

GENERAL OMNI-CHANNEL AND CUSTOMER DIALOGUE AUTOMATION AND ORCHESTRATION

Once you implement a fully-functional RTM solution and integrate it with a number of channels to support above mentioned use cases, you sometimes find that you can leverage the solution for other use cases not originally planned.

For example, consider a dialogue-like interaction with a customer over text messages.

- You could have integrated your RTM solution with a Text messages channel to send outbound marketing messages.
- You could have integrated with inbound text messages event stream to catch technical delivery reports.
- You could have integrated with a services fulfillment system to fulfill offers that the customer has agreed to on an inbound channel.

But now you just put it all together and design a campaign to ask your customer whether they want to activate some service – and you send an SMS and then you parse a reply (whether it is "Yes", "Yup", "Yeah" or "No"), and activate a service if they asked for it. This becomes only a

new campaign design, no new integrations or technical changes in a system. One of our customers actually had such experience.

Other use cases revolve around synchronization of offerings between channels, which is sometimes referred to as “Omni-Channel” approach. For example, we want to remove irrelevant offers from different channels as soon as the customer has declined, or just did not react for an offer on one channel. This is all fully doable with an RTM platform built with SAS solutions.

BUSINESS CASES AND USE CASES EXAMPLES, BY INDUSTRY

FINANCE (BANKING)

The following diagram depicts examples of marketing business cases for a finance organization (to the left), and how these business cases can leverage available RTM solution technical use cases or usage patterns (to the right) as outlined previously.

For example, a “Credit limit increase” business case is often implemented with traditional monthly recurrent campaigns (eligible customers get scored monthly for an opportunity to increase card limit). But it is also feasible to leverage credit limit increase campaigns in a real-time setting – when a customer is on a shopping spree and approaches his current limit.

This is a high level example mapping, and each customer situation varies.

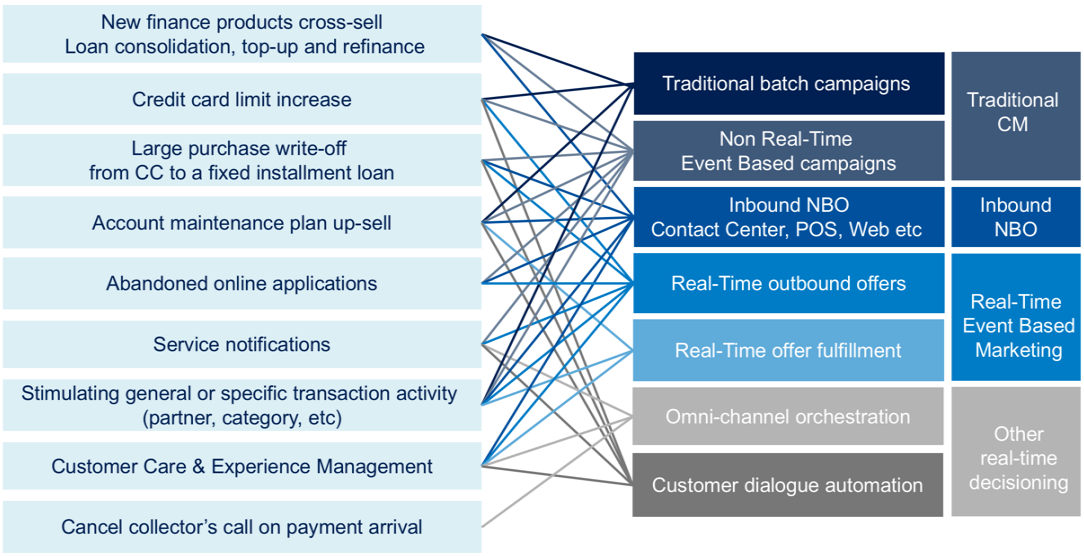

Figure 1 **Example mapping of RTM use cases to the business cases in Finance industry**

TELECOMMUNICATIONS (MOBILE CARRIER)

The following diagram depicts example of how different technical RTM use cases and solution capabilities (to the left) can be leveraged to implement different marketing business cases (to the right).

For example, “Inbound NBO” solution capability (use case) is often leveraged to present same offers as routinely delivered with traditional batch campaigns. And “real-time offer fulfillment” capability (use case) can be leveraged for bundles up-sell, Top-Up and Spend stimulation business cases.

This is a high level example mapping, and each customer situation varies.

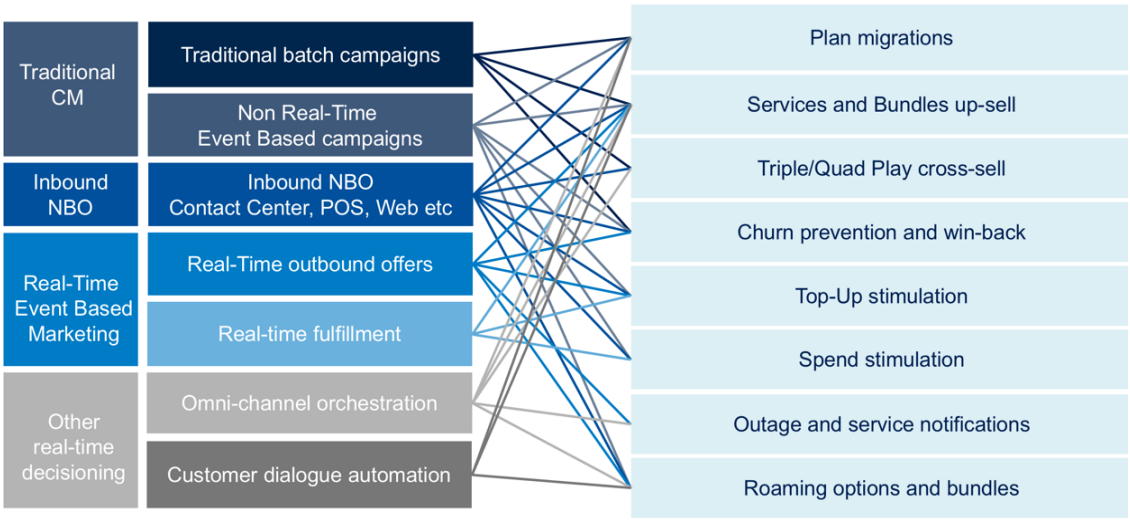

Figure 2. Example business cases in Telco (mobile carrier) with mapping to the RTM use cases

GENERALIZED RTM SOLUTION ARCHITECTURE

The diagram on a Figure 3 depicts a high level architecture overview of a typical traditional campaign management solution architecture (not yet upgraded to real-time capabilities), a typical “AS IS” situation. It could be implemented using SAS, or third-party tools.

The following diagram on a Figure 4 depicts a high level “TO BE” architecture overview of a highly integrated, fully featured Real-Time Marketing platform based on SAS® Customer Decision Hub solutions and SAS Event Stream Processing. Though not always implemented in its entirety, this is the reference architecture that allows us to unleash the full capability of SAS marketing solutions and cover all use cases as outlined above.

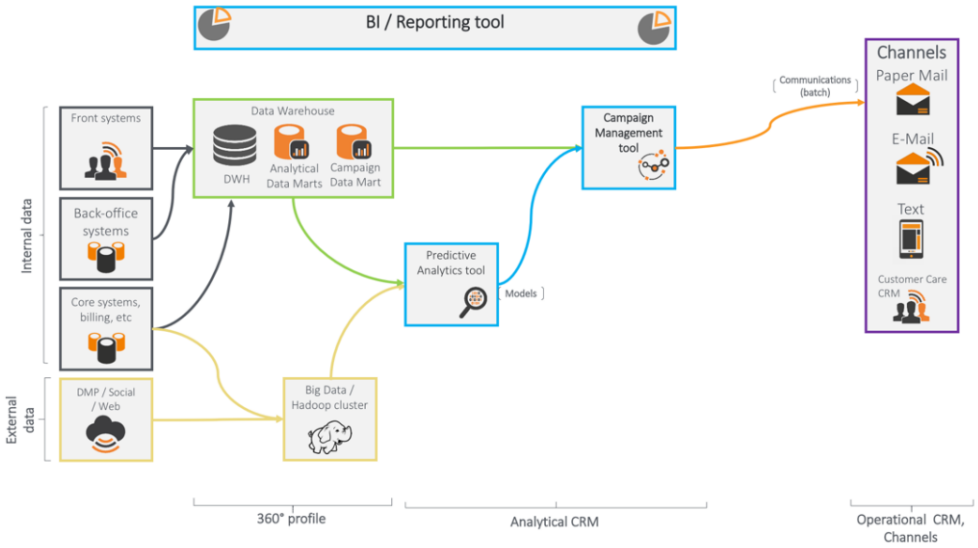

Figure 3. Generalized architecture of a traditional Campaign Management solution, before real-time implementation

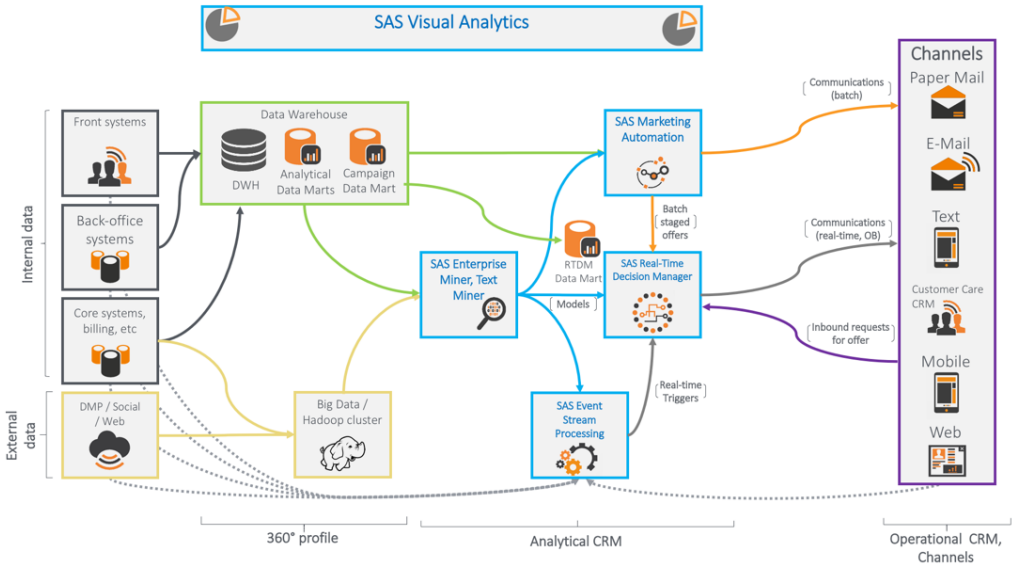

Figure 4. Generalized architecture of a Real-Time Marketing platform built SAS solutions

NOTE: For a detailed explanation of the architecture, view the recorded video of our presentation from SAS Global Forum 2016 at http://sasgf16.v.sas.com/detail/videos/breakout-sessions/video/4854656102001/10120---integrated-marketing-with-sas®-in-the-age-of-real-time

Additionally, updates to this paper can be accessed after SAS Global Forum 2016 at:

http://t1a.com/papers
http://www.sascommunity.org/wiki/Presentations:Marje_Papers_and_Presentations

ARCHITECTURE DETAILS – INBOUND NEXT BEST OFFER DECISIONING

Next Best Offer decisioning is a natural use case for the SAS® Real-Time Decision Manager, so no major architectural challenges arise in this implementation. 3rd party systems that operate certain inbound channels need be upgraded to request a decision through a Web Service call to SAS RTDM server, which is a functionality it provides natively.

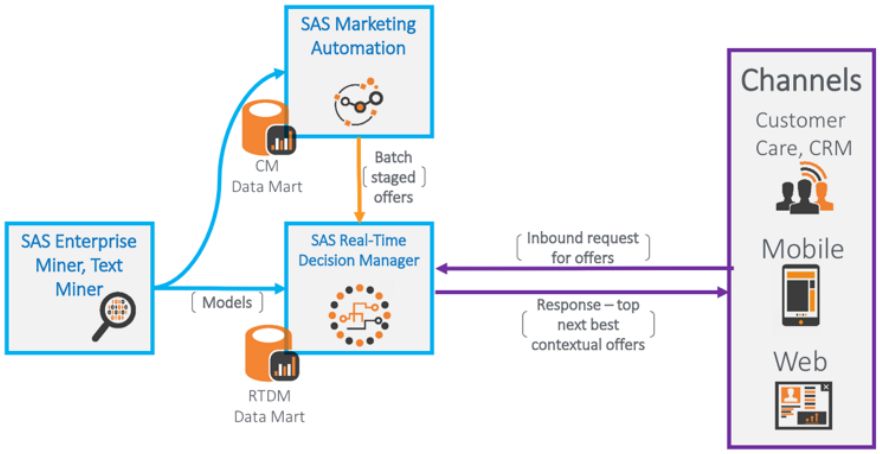

Figure 5 Inbound Next Best Offer decisioning architecture with SAS® Real-Time Decision Manager

However, you should still produce a careful lower-level solution design for your implementation. The solution design must encompass correct and comprehensive structure of web service parameters, offer catalogue and parameters, campaign custom details and diagram design, lookup data mapping, custom decisioning processes and offer arbitration logic, etc.

ARCHITECTURE DETAILS - COMPLEX REAL-TIME EVENT-BASED CAMPAIGNS

It is somewhat more complicated to implement a comprehensive Real-Time Marketing platform to support complex, multi-stage real-time event-based campaigns across multiple event sources and communication channels.

If you assume that incoming source event streams may be diverse with potentially high throughput of events per second, and complex pattern-matching analysis of these event streams is required, then you might want to leverage the power of SAS® Event Stream Processing as a primary processor of these source event streams.

It is also typical that campaigns you are going to run may have multiple steps (stages), like in Figure 6 or Figure 8:

Figure 6. Typical real-time event-based campaign (Telco)

So how do you make it all work together?

Figure 7 demonstrates an example of how SAS solutions collaborate with each other to facilitate execution of a campaign such as on Figure 6:

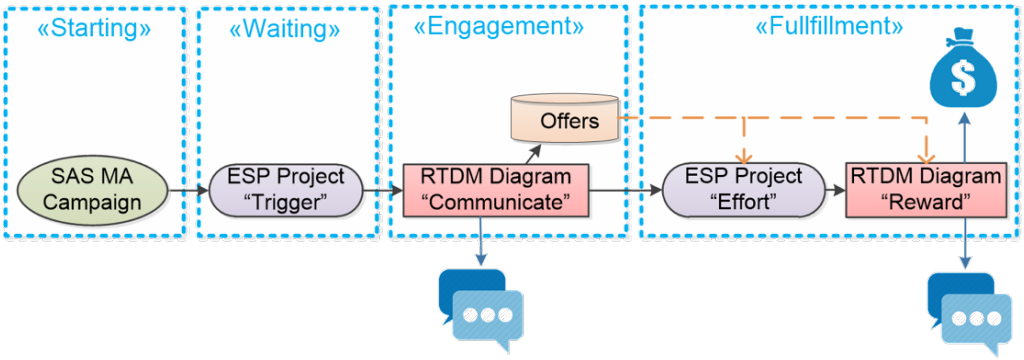

Figure 7. Typical real-time event-based campaign (telco) implementation with SAS solutions

This is great, but how does it work on a lower level? And what about even more complex campaigns?

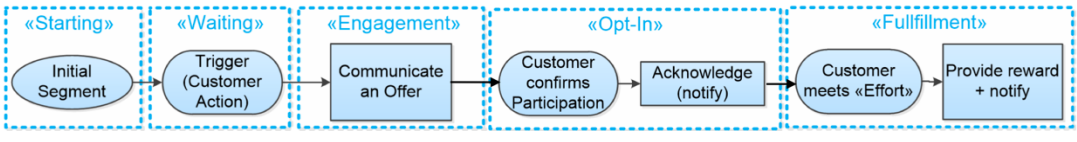

Figure 8. More complex real-time event-based campaign (Telco) – featuring additional "opt-in" step

Figure 9 demonstrates how this collaboration works on a lower logical level, through database storage and real-time web services. It is clear that you are not limited in the number of steps you want to support for a campaign. Virtually any complex campaign can be supported and implemented this way.

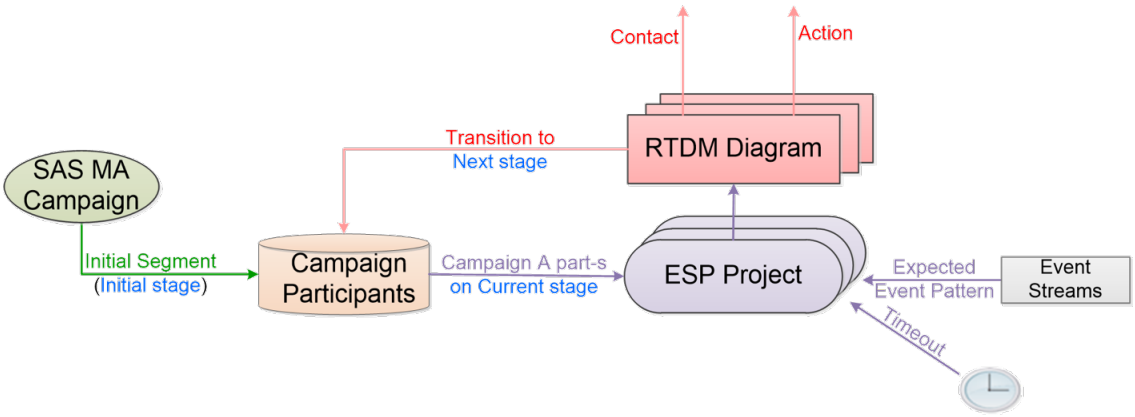

Figure 9. Interaction of SAS MA, RTDM and ESP when executing complex RT-EBM campaign

TIPS & RECOMMENDATIONS

Having designed a variety of solutions for many clients, we have gained considerable expertise to provide some tips and recommendations for clients that undertake the implementation of the RTM solution within their organizations.

1. Be pragmatic and try not to overcomplicate your implementation. Think about the business cases and use cases first. Only implement solutions for real business cases that you have now, rather than potential unrealized requirements from the future.
2. Consider all business cases from a "**Batch First**" standpoint – can it be implemented in batch (with SAS Marketing Automation) entirely, or at least partly, without sacrificing much business value? If it can, implement it in batch, as it is significantly easier to implement, test and maintain. Implement Real-Time campaign logic only when you need to, and only when you can get real value from it.
3. Think about the logical solution architecture (data flows, event flows, decision flows) first. What are the business requirements and use cases? How do you support them all? How can you leverage the most from your SAS solutions from a functional standpoint? How do you make it easy for business users to design and test their campaigns? Which data are you going to refer to?

   The physical deployment architecture (servers, storage, components deployment etc.) is arguably less important and often easier to change or upgrade on later stages, rather than higher level functional solution architecture.
4. Rewarding customers for their actions in real-time is great and works great for the customer, but extra care needs to be exercised to mitigate risk of abuse and fraud.
5. There is one widespread misconception. Customer's IT often say things like "**there is no point to implement real-time marketing solution until there is high quality real-time (or near real-time) customer data mart (360° profile) in place**", which is often far from becoming reality.

   This is not entirely correct. Added value from a real-time marketing solution comes from multiple sources even when the existing customer profile data mart has only offline data (updated nightly or even less frequently):

   1) For Next Best Offer use cases (inbound channels): RTM Solution ability to receive from the channel the context of current customer interaction and take into consideration when

deciding on an offer: a topic of customer's call / visit; an agent ID who is servicing client; Time of call and waiting duration, etc.

2) The way you implement real-time campaigns in SAS® Real-Time Decision Manager naturally and literally forces business users to become more customer-centric, to think of a customer first (and what offer we choose to match a customer's needs) rather than be product-centric / offer-centric as traditional campaigns often are. It is proven and it is nearly common knowledge that customer-centric approaches to marketing typically yield better results.

3) For Real-Time Event-Based Marketing, Real-Time Fulfillment use cases you get added value from implementing them with real-time marketing solutions, as you are now able to react on certain events and triggers faster and communicate with your customers in real-time, thus increasing customer response rate. The effect is not generally impacted by a data lag of a few days for slowly changing customer attributes.

6. Be pragmatic and reasonably approach solution technical architecture on redundancy and fault tolerance. Compare your infrastructure investments with the potential cost of a failure.

   What <u>really</u> happens if your real-time marketing solution is down 3 times in a year (which is a lot) for 1 day each (which is a lot), and you were unable to present real-time offers at that time? In many cases it only means that the system was running well 99% of the time (362 days out of 365) so it presented 99% of the offers, **so it brought in 99% of its potential value**.

   How much does it cost in infrastructure investments to implement highly available no-single-point-of-failure deployment architecture including clustered database (like Oracle® RAC), hardware for multiple extra SAS server tiers, load balancers, etc? Overall It can cost millions.

   Will this infrastructure investment prevent you from losing this 1% potential solution value? Sometimes, but not always. So called "Highly Available" deployment architecture only protects you from certain kind of failures (like server failure, random software component failure). It does not protect you from other failures like deployment of an incorrect version of a real-time campaign, or administrator shutting down everything by mistake, or a database user ID being blocked by a weird security policy, etc.

   So is it worth it to invest a lot in a "completely redundant and highly available" infrastructure to hunt for this 0.5% "recoverable" value?

   Isn't it better to divert the same investment to functional and business improvements, such as:

   - hiring new campaign designers, marketing analysts, data scientists?
   - building more and building better campaigns and models?
   - investing in data infrastructure to get broader, faster and easier available customer data?
   - integrating new interaction channels?

   It's for you to decide.

7. There exist situations when you know that some implemented business logic <u>must not fail</u>. For example, you promise something to a customer, some reward on his actions – and this promise needs to be fulfilled (sooner or later), no matter what.

   But any complex system, and especially business-oriented flexible solutions, do sometimes fail – regardless of how "redundant and fault tolerant" their deployment seems. It will fail sooner or later – if not because of a pure technical issue, then due to other reasons. Like an administrator mistake, deployment of untested change in a real-time campaign, or some unexpected change of a logic or interface on a 3rd party system, or any other reason.

   So for situations when your business logic of a real-time campaign really must not fail, you need

to design a workaround "backup" process which will help you to cover up later after something goes wrong in real-time. Most often you'd want to implement such workaround logic in batch – with an ETL tool, or with SAS Marketing Automation campaign.

8. Implement and establish robust business processes for testing and deploying real-time campaigns, and ensure business users strictly comply with the processes. This is really important both for technical solution stability, and consistent business results.
9. If your business users (campaign designers) struggle to implement some decision logic based on access to complex data structures, rely on database **views**. You can put all difficult data aggregation logic in a view, and expose this simple "customer level" view to SAS RTDM.

   If this becomes an often case, consider granting your campaign designers enough privileges to create **their own views** in a separate schema of a database which is visible from SAS RTDM – but also teach them how to check if this view performs well on per-customer queries, if it uses indexes.

   This may technically deviate from some existing IT policy ("*users are not allowed to change anything in a production database*"), but in reality there is very little risk associated. You can't really harm a database just by creating some views in a specially designated schema, assuming that you're already allowed to connect to the database and you already can run same SQL query in it (which is often the case).
10. Implement detailed logging of every web service request that SAS RTDM receives, and response it provides. Log every request and response parameter detail, and both timings. There are multiple ways to implement such logging – on a channels side, on an integration middleware, or on SAS RTDM side using Data Processes upon entering a diagram and before a reply node. Having all requests and all responses logged in a structured form to a database allows you to effectively troubleshoot, monitor and report on solution health, and perform campaign back testing on historical data.

CONCLUSION

In this paper we have provided our vision of the Real-Time Marketing solution and background on why it is relevant in the current business environment.

We explained the SAS Customer Decision Hub concept and SAS solutions portfolio that is used to build Real-Time Marketing platforms, and demonstrated the high-level architectural overview of these solutions work together.

We introduced RTM Solution technical use case (usage pattern) taxonomy and example business use cases in Telco and Finance industries, and demonstrated example mapping of how business cases can be leveraged through different technical use cases (usage patterns).

Finally, we have provided our insights into tips and recommendations that should serve as best practices for businesses who are considering implementing an RTM solution.

We hope this paper provides business users as well as IT specialists with useful insights on the Real-Time Marketing solution in general and its implementation using SAS® solutions and technologies.

We believe that integrated real-time marketing solutions is one of the areas where you would expect biggest growth and demand in most competitive industries, and also biggest software product innovations in coming years.

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