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Using the SAS® Customer Intelligence 360 Hybrid Cloud Capabilities for True Omnichannel Marketing

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ABSTRACT

More than ever, customers are demanding consistent and relevant interaction across all channels. Businesses are having to develop omnichannel marketing capabilities to please these customers. Implementing omnichannel marketing is often difficult, especially when using digital channels. Most products designed for digital channels lack capabilities to integrate with traditional channels that have on-premises processes and data. SAS® Customer Intelligence 360 is a new offering that enables businesses to leverage both cloud and on-premises channels and data. This is possible due to the solution's hybrid cloud architecture. This paper discusses the SAS® Customer Intelligence 360 approach to the hybrid cloud, and covers key capabilities on security, throughput, and integration.

INTRODUCTION

Cloud computing has moved to the center of many organizations' technology strategy. While there are still some concerns, cloud computing's technological advantages such as the ability to scale up and down computing resources, better connection to networks, and the ubiquity of big data has made it more appealing to companies. Cloud computing also has the advantage of allowing companies to buy software as a service (SaaS) rather than purchasing the software outright. With SaaS, companies have access to an application 24/7 from central, off-site servers. It also removes the need to buy hardware. The cloud's elastic capacity ensures that companies have access to the computing they need and only pay for what they use.

Even though the benefits of cloud computing are significant, there are still needs for on premises computing. While organizations are adapting cloud computing at a rapid pace, many computing processes are still traditional and on premises. These systems are valuable parts of an organization's computing environment, and may not yet be replaced with cloud computing due to costs, complexity, integration with other systems, and inability to move data into the cloud due to technical and business reasons.

On premises systems are often transactional and generate huge volumes of data at a very rapid pace. While using this data in a cloud computing system can be valuable, it is often cost or time prohibitive to upload such a large volume of data into the cloud. This is especially the case if the data is updated or made obsolete at a rapid pace.

This paper discusses the needs for a hybrid computing architecture to ensure on premises data can be used with cloud computing. This includes not only accessing on premises data, but to combine it with data generated in the cloud computing environment. The architecture helps orchestrate cloud and on premises computing environments to provide the advantages of both. The paper will also introduce SAS's new cloud offering for customer intelligence, SAS® Customer Intelligence 360, and how it hybrid architecture can support organizations with on premises computing resources, including another of SAS's customer intelligence offerings, SAS® Real-time Decision Manager.

WHAT IS HYBRID COMPUTING AND WHY DO I NEED IT?

Many organizations have seen the benefits of cloud computing and are adapting it at a rapid pace. The pace has quickened in the last few years as cloud computing has matured with services and tools from major vendors from Amazon, Microsoft, and IBM.

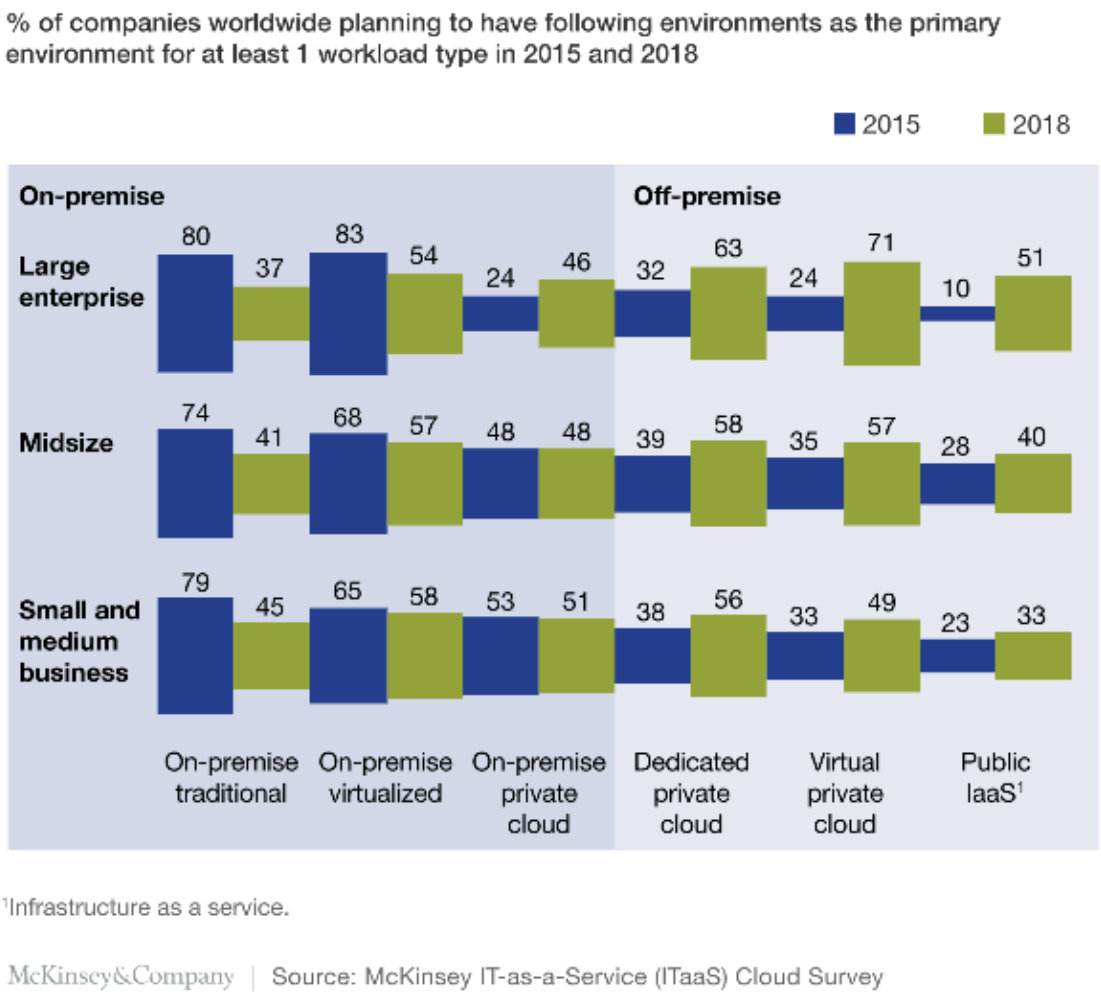

Figure 1 Companies of all sizes are shifting to off-premise cloud services

Even with the growth of cloud computing, on premises computing is still a vital part of an organization's computing infrastructure. For example, per the 2015 Computer Weekly/TechTarget IT priorities survey, on premises is the favored deployment model, with 57% of the 111 UK IT managers questioned opting for it over a variety of cloud-based technologies. While this is often due to concerns about privacy or regulations, often it may also be due to data and other systems being accessible only from an on premises environment. This is especially the case with complex legacy systems with transactional systems that involves human interactions, such as scenarios involving financial or retail systems.

Right now, cloud computing is often used in isolation from on premises computing. When data is uploaded to the cloud computing environment, it is often partial or older data. While this may be enough when analyzing historical data, it is often insufficient analyzing data that is more current. Real-time computing often requires access to data being generated by real-time systems in traditional, on premises environments. Also, it is often difficult to predetermine what data is needed for real-time computing; this results in the need for accessing data in real-time.

While integration of cloud based systems is possible with traditional web services, it often causes concerns about security and latency.

Security concerns arise when allowing an external system to access on premises systems. On premises systems often manage customers' private information, or an organization's proprietary and mission critical data. The result is that there are heightened concerns on giving external systems access. While these

concerns can be addressed with firewalls, authorization, and encryption, traditional web service integrations still need external system to access on premise systems and data.

Computing processes often require rapid access to data and other processes. While ensuring speedy access can be a challenge when the data and processes are in the same environment, it is more so when a cloud system is accessing on premises data (often called split environment). While the cloud system and the on premises data stores can be tuned for low latency, the organization has less control over the public network that is used to connect the two environments and the geographic distance from each other. Latency over the Internet can be 100s to 1,000s times higher than local networks and it is disconcertingly inconsistent and unpredictable. Thus, data access between a cloud system and an on premises system can be inconsistent and cause issues, especially with real-time processes.

Thus, an approach called hybrid computing is required to bring together cloud and on premises computing resources to address security and latency concerns. Hybrid computing allows organizations to bringing together on premises systems with cloud computing systems, and orchestrate them as a unified computing environment. This allows organizations to take advantage of services and data in suitable environments, which are often determined by performance, access, and security concerns.

Hybrid computing provides benefits of cloud and on premises computing. The data and services in the on premises part of a hybrid computing environment can provide secure, direct, and low latency access that may be critical for integration with other on premises systems. The cloud part of a hybrid computing environment can provide scalability and failover capabilities exceeding the capabilities of on premises systems. Cloud services can often be easier to integrate with other cloud services, whether they are public (cloud environments provided by a service provider, and could be accessed by any organization or private (cloud environments that are designed and maintained by a specific organization).

WHY HYBRID COMPUTING WITH CUSTOMER INTELLIGENCE?

One of the more popular cloud systems are those that manage customer interactions. These systems have been implemented by businesses to provide personalized and effortless experiences through a wider variety of integrated touchpoints, such as web sites mobile apps, and email. Customers have high expectations for such experiences based on adoption of technologies, and the amount of data that is available to both customers and businesses.

There are a few goals for meeting these expectations. They first is to manage the multiple options that a customer has in interacting with a business. With the rise of digital channels, customers want to use the web, mobile apps, and social channels to interact with a business. Still, many customers still want to interact with a person to get help from a knowledgeable, kind person in complex or difficult situations. This may be via chat, but phone and retail stores are still a popular channel given the direct, personal experience that can be provided. Thus, businesses must manage more channels than ever to provide customers with the choices they desire.

Another goal is to provide personalized experience in all touchpoints. Given the choice, a customer may use any combination of the many possible channels when interacting with a business. Even if they start an interaction in one channel they may switch in the middle to another channel. For example, if a customer is purchasing a TV, they may first do research on the web, use social media to gather opinions, look at displays at a retail store, and then buy via the web. Given such behavior, failure in any of these channels will result in a failed experience and a loss of sale or customer.

While there have been significant increases in customers interacting with business using digital touchpoints, there is still need to provide more traditional touchpoints such as call centers and POS. Many of these touchpoints are still using traditional technologies that are on premises. While there is a trend to move these systems to the cloud as well, the investments in current systems may make such moves cost prohibitive. Also, many of these systems have integration with traditional transactional systems for sales, inventory, fulfillment, and finance that are still on premises.

The final goal is to provide interactions that are seamless and agile. Given the many touchpoints a customer may use, it is a prerogative each touchpoint is aware of previous interactions with the customer, even if was in a different touchpoint. Without such knowledge, any personalized experience presented may not be appropriate given past interactions. For example, a customer may enter information on the

web when looking for insurance and then contact the call center for more information. In such cases the customer expects the call center agent to have the information that was entered on the web, and provide information that fits the context of the information provided.

Minimizing latency is critical for marketing systems. The systems are interacting with customers in real-time. Any delay in the interaction may result in either missed opportunities or inappropriate interactions. Thus, data access for these systems must occur in milliseconds to ensure that the data is available when interacting with the customer.

The result is the need for a marketing system that can interact will all touch points regardless of the underlying technology. It must be able to both collect data about customer's interactions and behavior across the touchpoints, but also deliver personalized content and interactions to those touchpoints. Finally, the system must be able to create comprehensive customer profiles that can be updated based on interactions across the touchpoints.

Given these needs, marketing systems require hybrid cloud computing capabilities. Hybrid cloud enabled marketing systems to be accessed anywhere, integrated with touchpoints, and have scalability and reliability which can support a business's operational environment 24/7. Only with such capabilities can a marketing system provide personalized customer experience from both digital channels, such as web sites, mobile apps, social, and email, as well as traditional channels such as call centers and POS.

These are the reasons why SAS's new cloud-based customer intelligence offering, SAS® Customer Intelligence 360, provides hybrid cloud computing capabilities.

HOW SAS CUSTOMER INTELLIGENCE'S HYBRID COMPUTING DELIVERS OMNICHANNEL MARKETING

SAS® Customer Intelligence 360 enables organizations to collect digital data from their web sites, mobile apps, and emails. Data is collected from each channel on a customer level, collecting not only clicks and impressions but the full range of behavior such as purchases, form submits, and locations. The data can be combined with other online customer data sources, such as promotional, demographic, and purchased data. This provides the ability to create a full, comprehensive profile of each customer across the digital channels.

The customer profiles can be used for deep analytical insights of customers. An easy-to-use marketing interface backed by advanced analytic capabilities enables marketers to transform data collected from digital channels. This provides forward-looking views of customers' journeys, enabling understanding of most significant business drivers, forecasting how drivers and business measures will perform in the future, and running goal-seeking routines to determine optimal levels needed.

Insights can be used to guide and shape real-time customer interactions, making contextual decisions that result in personalized, relevant offers on an organization's web site, mobile app, or email. SAS® Customer Intelligence 360 provides the full breadth of capabilities to turn customer experience insights into marketing programs. The behavior data collected from the channel can be utilized to target personalized offers and content at the right moment in the right channel. The targeting can be based on business rules as well as predictive models. Effectiveness of targeted content can be measure using A/B tests and multivariate tests (via predictive models).

SAS® Customer Intelligence 360 uses hybrid cloud computing capabilities to provide a true omnichannel marketing solution that can merge customer profile and interactions across both digital and traditional channels. This is done using hybrid computing to bring cloud computing together with on premises computing resources. The result is that SAS Customer Intelligence can combine views of customers that includes all past experiences with an organization, recent behaviors and real-time actions into a cohesive, 360-degree view.

SAS® Customer Intelligence 360 provides hybrid computing capabilities with the use of a stand-alone application called an agent. An agent can be installed on premises or a private cloud, and is designed to be integrated with systems such as RDBMS, CRM, transactional systems, and traditional marketing systems. The agent can then be connected to SAS® Customer Intelligence 360 to provide a low latency connection for hybrid computing capabilities.

Security of the connection between the agent and SAS® Customer Intelligence 360 is ensured with the use of HTTPS and token-based authentication. A tenant in SAS® Customer Intelligence 360 is assigned a client ID and secret (stored in a configuration properties file on premises). The two are used to generate a JSON web token (JWT). The JWT is used in the header of every HTTPS request to SAS® Customer Intelligence 360 to establish the secure WebSocket. While the agent does use traditional REST APIs for some functions, the agent use WebSocket to ensure that transmission of customer data is secured.

Further security is ensured by supporting GET requests when the agent is receiving data from SAS® Customer Intelligence 360. GET requests are read-only requests made from a client for a specific resource. In the case of the agent, it would be a request to SAS® Customer Intelligence 360 for customer data, such as events or data related to customers. Since these requests are made from within the firewall from an organization, it is considered more secure compared to external systems pushing data into on premises systems. Alternative requests, or PUSH requests, has more likelihood of being forged, enabling unauthorized access to on premises systems. Additionally, DMZ or pinholes in the firewall, which expose internal computing services to the internet, are required POST requests, which results in more risks of unauthorized access.

Low latency of the connection between the agent and SAS® Customer Intelligence 360 is addressed with a streaming API that uses the WebSocket. Most integration with cloud systems use REST APIs, which makes discrete, individual requests to the cloud system and expect separate responses for each request. This means that an agent would need to make a new request each time customer data is required, or poll the service on a given interval. While this is enough when data is only required periodically, it can cause latency issues if data is required in real-time, such as customer behavior on the web site or new social interactions.

The use of WebSockets between the agent and SAS® Customer Intelligence 360 means once a connection has been established between the agent and SAS® Customer Intelligence 360, it remains active. All requests for customer data is sent using the connection, so there is no overhead of making individual connection for each request. Thus, the connection has less latency and can handle continuous access of customer data.

The secure, low latency connection between an agent and SAS® Customer Intelligence 360 provides a key foundation for true omnichannel marketing. This integration provides the ability to create a common, contextualized view of a customer that includes interactions in digital and traditional channels. Customer data acquired from a channel can be shared for use in other channels for targeting, segmentation, and analysis.

The integration also enables usage of customer data in-place instead of having to move it to another system. In some cases, organizations may not be able to move data to a system in a public cloud. For example, there may be privacy concerns or regulations that may prevent data to be sent to a public cloud where there might be concerns about unauthorized access. Also, the volume of data may be too large for efficient transfer, especially if the data is needed in real or near real-time.

With SAS Customer Intelligence 360's hybrid computing capabilities, the data can be kept in place while the result is shared. For example, if an organization has an on premises call center system, the data captured during a call with a customer can be processed on premises for updating a customer segmentation or determining next best action. Once such decisions have been made on premises, it can be shared with SAS® Customer Intelligence 360 so it can be used when interacting with customers on a web site on mobile app. The same can be done with data captured by SAS® Customer Intelligence 360 so that segments and targeted offers can be shared with other systems.

HYBRID INTEGRATION WITH SAS® REAL-TIME DECISION MANAGER

An example of SAS® Customer Intelligence 360 using an agent is the integration with SAS® Real-Time Decision Manager. SAS® Real-Time Decision Manager is a SAS® Customer Intelligence solution for making interactive decisions about customers. The solution is used with inbound channels such as web sites, call centers, and POS systems. The solution can integrate with these channels to execute real-time campaigns to decide about how to interact with a customer, such as offering a cross-sell/up-sell offers, how to personalize an offer, or the next best action. The decision can be based on customer's behavior,

profile, segmentation, and real-time scoring, to ensure that the right decision is made while interacting with the customer.

Integrating SAS® Real-Time Decision Manager with SAS® Customer Intelligence 360 provides access to on premises customer data and can provide more context in determining what content to present to a customer. Since SAS® Real-Time Decision Manager can execute on premises or in a private cloud, the customer's private data can be processed in place without having to move it to SAS® Customer Intelligence 360. Also, campaigns can take advantage of SAS® Real-Time Decision Manager's ability to execute real-time scoring, execution of business rules, and arbitration to determine the best content for a given customer.

The integration is created with an agent that can invoke SAS® Real-Time Decision Manager via the REST interface to the solution's run-time servers. The agent is configured with a token that is used to establish a secure connection with SAS® Customer Intelligence 360. Once the connection is established, the SAS® Customer Intelligence 360 user can specify what events should be shared with SAS® Real-Time Decision Manager. Events are customer behavior identified by SAS® Customer Intelligence 360 via interaction with a customer on a web site, mobile app, or email. Some examples of events are page views, clicks, and entering a geofence.

In SAS® Customer Intelligence 360, tasks are configured to target content to customers on a web site or mobile app. Tasks provide users the ability to specify what customers to target and with which content. Tasks are triggered by the behavior of a customer, such as a page view, or entering a certain location. One of the settings that can be set in a task is to only deliver content staged to SAS® Customer Intelligence 360 by an external system. An API is provided for external systems, such as SAS® Real-Time Decision Manager, to stage content into a channel managed by SAS® Customer Intelligence 360.

When a customer triggers one of the selected events, the agent is notified of the event in real-time via an active WebSocket. The agent then sends a request to a SAS® Real-Time Decision Manager run-time server, which executes a campaign. The campaign can take advantage of on-premises data that may not be available to SAS® Customer Intelligence 360. Once the campaign is executed and an offer is selected for the customer, SAS® Real-Time Decision Manager queues the offer. The queued offer is then sent to SAS® Customer Intelligence 360 via a REST API for staging offers. Once SAS® Customer Intelligence 360 receives the offer, it is staged for delivery to the customer at the next opportunity, such as a web site visit or opening a mobile app.

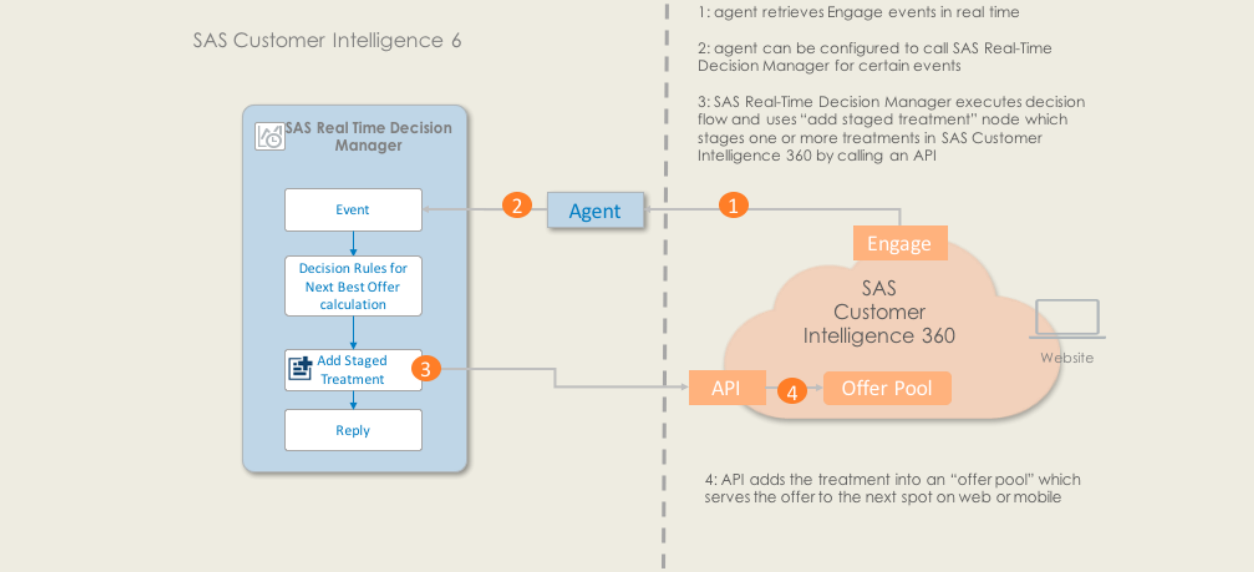

Figure 2 Integration for On Premises Decisioning

HYBRID INTEGRAITON WITH SAS® EVENT STREAM PROCESSING

Another example of a hybrid cloud integration with SAS® Customer Intelligence 360 is the use of SAS® Event Stream Processing. SAS® Event Stream Processing can analyze millions of events per second, detecting patterns of interest as they occur. When a certain pattern of events is identified, it can send the events to another system for processing.

In this integration, an agent is integrated with SAS® Event Stream Processing to provide events identified in SAS® Customer Intelligence 360. SAS® Event Stream Processing is in turn integrated with SAS® Real-Time Decision Manager so that a detection of an event pattern can be used to trigger a campaign. The SAS® Real-Time Decision Manager campaign is configured to determine the content to deliver to a customer based on the detected event pattern. The selection can be performed by retrieving more on premises customer data, executing real-time scoring and business rules, and arbitrating content to determine the best content to present. The selected content is then sent to SAS® Customer Intelligence 360 via the staging API so it can be delivered to the customer at the next opportunity via a web site or mobile app.

As with the integration of SAS® Customer Intelligence 360 and SAS® Real-Time Decision Manger, the integration with SAS® Event Stream Processing can provide the ability to use on premises customer data without having to move it to SAS® Customer Intelligence 360. The integration also provides the capabilities to track customer behavior on the web or mobile app, and use SAS® Event Stream Processing's sophisticated capabilities to identify complex event patterns that may show a change about a customer, such as intent to buy, likelihood of attrition, or change in customer's lifecycle.

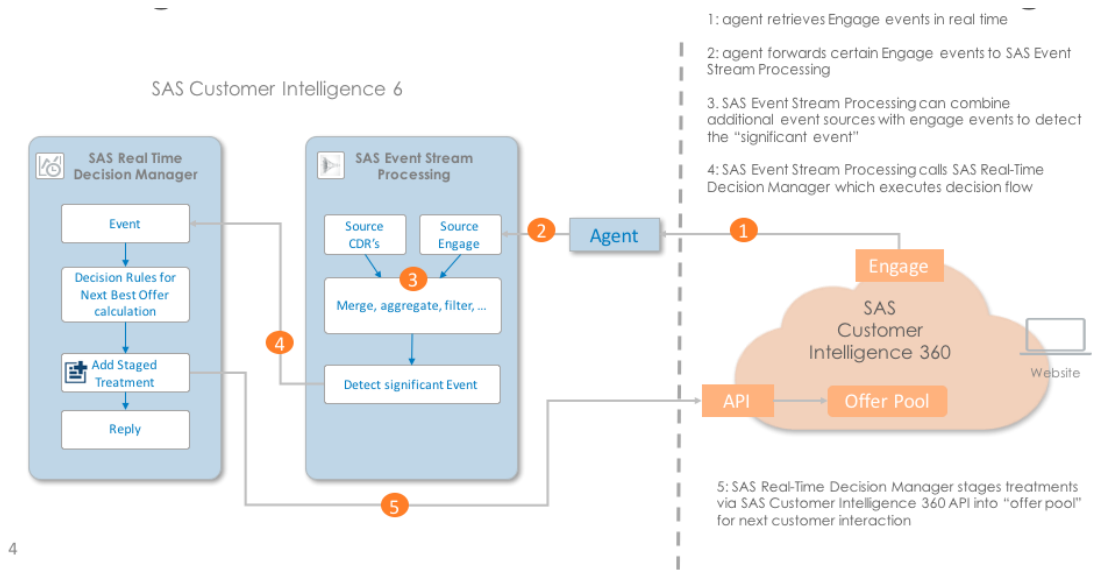

Figure 3 Integration with On Premises Event Stream Processing

INTEGRATION WITH NON-SAS PRODUCTS

These examples are with SAS products, which uses out-of-the-box plug-ins with the agent. However, the agent can be integrated with non-SAS products as well. Customer behavior events detected by SAS® Customer Intelligence 360 can be recorded to RDBMS, Hadoop, or NoSQL data stores for off-line analysis and reporting. The events can also be sent to CRM, call center, and POS systems to provide information about customer behavior on web sites and mobile apps.

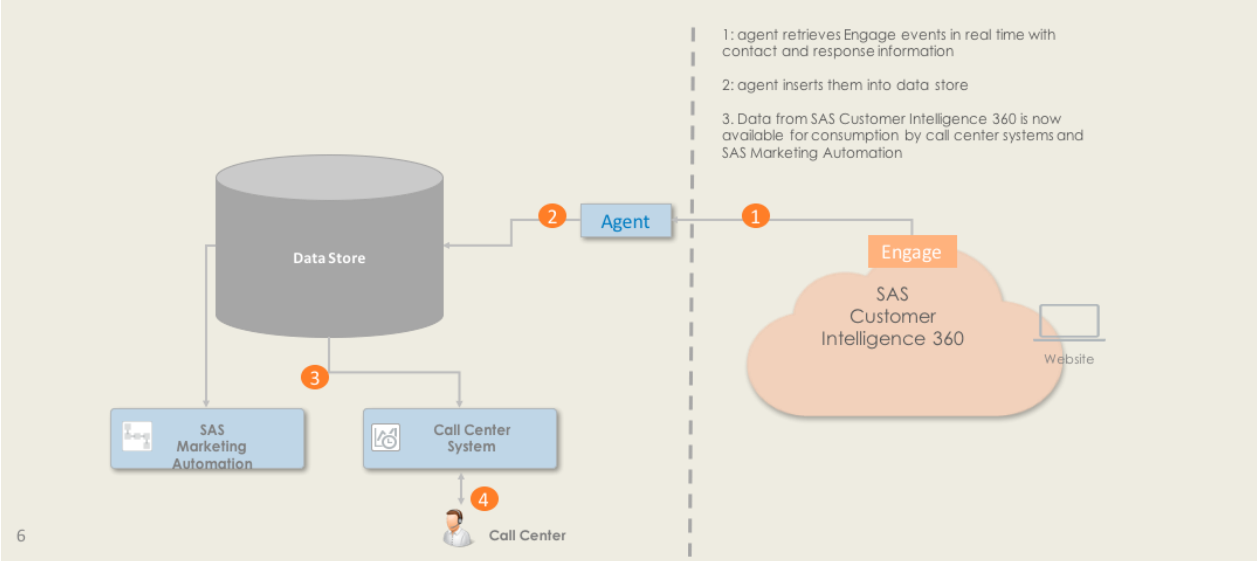

Figure 4 Integration with On Premises Data Store

Agents can also be configured to send customer events to SAS® Customer Intelligence 360. Events identified in on premises channels, such as call center and POS systems, can be sent to SAS® Customer Intelligence 360 using an agent. The agent can be integrated with these systems, and send events to SAS® Customer Intelligence 360 using the same authentication and connection mechanism as when receiving events. The events can be used by SAS® Customer Intelligence 360 to make targeting and segmentation decisions based on a complete context of customer behavior that includes non-digital channels.

CONCLUSION

It is imperative for organizations to meet customers' demands for consistent and relevant interactions across all channels. Given many of the channels used by customers are digital, there is a trend to use cloud-based marketing systems. Yet, providing consistent and relevant interaction requires integrating data captured from digital channels with data from traditional channels such as call center and POS systems. Only by integrating all touch points can you achieve true omnichannel marketing.

The best way to address such a challenge is to use hybrid cloud computing capabilities. This provides the best of both worlds, where the public cloud systems can integrate with digital channels while on premises and private cloud systems can access customer data that cannot or should not be sent to the public cloud.

SAS® Customer Intelligence 360 is a marketing solution providing such hybrid cloud capabilities. It provides capabilities to integrate with on premises and private cloud systems to share customers' behavioral data. It provides an integration framework addressing concerns about security and latency common to hybrid computing. Integration with other SAS solutions such as SAS® Real-Time Decision Manager and SAS® Event Stream Processing provides access to advanced analytic and decisioning capabilities augmenting SAS® Customer Intelligence 360's targeting and segmentation capabilities. SAS® Customer Intelligence 360 can provide hybrid computing capabilities that can meet an organization's needs for ominichannel marketing.

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