



White Paper

Real-Time Streaming Analytics for Telecom: The Essential Guide

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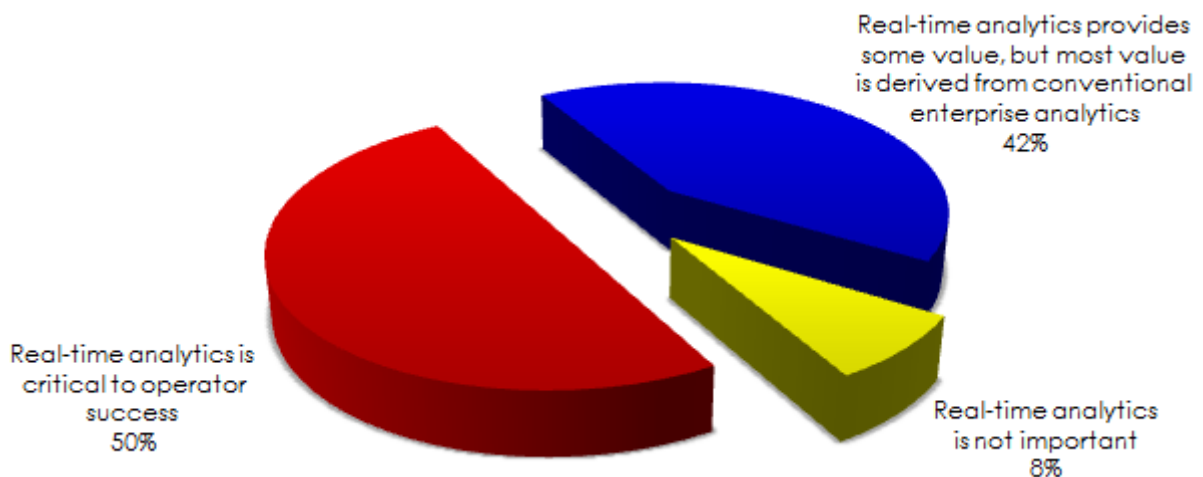
Real-Time Streaming Analytics in Telecom

Most service providers today are inundated by the explosion of traffic from their networks. They also have a plethora of customer information spread across their different systems and social networks. While some of this information resides as structured data within a communications service provider's operations support systems (OSSs) and business support systems (BSSs), large amounts of customer-related information speeds across the Internet as unstructured data.

Service providers do not have a good way of correlating, analyzing and acting on insights from this data in real time to personalize their customer experience and fuel customer loyalty, continuously monitor and respond to network and infrastructure issues, and proactively detect and prevent revenue leakage and fraud. They need to find ways to deliver new revenue-generating and customer-satisfying services without overloading the network and without costs running out of control.

Subscribers are becoming more and more demanding. They expect personalized offerings, ubiquitous access, broad choices and a reliable, seamless experience. Meeting these needs requires a fundamental rethink of a service provider's analytics infrastructure. Today, most service providers use offline data analysis for reporting and planning purposes. However, their current analytics infrastructure does not provide them with the kind of real-time analytics capabilities that can help them continuously monitor and respond to customer issues in real time, engage in personalized marketing in real time and proactively detect and prevent fraud. **Figure 1** illustrates the importance of real-time analytics, as pointed out in a recent *Heavy Reading* survey.

Figure 1: Importance of Real-Time Data Analytics vs. Conventional Enterprise-Wide Analytics



Source: Heavy Reading, 2014 (n=75)

We believe that real-time streaming analytics can effectively fill this major gap within a service provider's analytics infrastructure. A streaming analytics solution is designed to continuously ingest, correlate and analyze multiple streams of data in diverse formats and immediately trigger actions. This will help service providers take a preemptive, results-oriented approach to improving the overall experience for their high-value, demanding customers.

Real-Time Streaming vs. Conventional Analytics

Telecom operators have traditionally operated with complex, disparate silos of data. Useful information resides in customer relationship management (CRM), billing, inventory, provisioning and fulfillment, service management systems, network elements, element and network management systems, probes, deep packet inspection devices, application-specific databases and elsewhere. They also have different systems in different generations of network architecture, each holding different types of data, in different formats. Typical analytics efforts have involved gathering data from these disparate systems in offline mode to identify trends, patterns and behavior. However, by taking this offline approach, these operators lack real-time analysis capabilities that can help them collect network performance and usage data and correlate that with an end user's service experience.

We believe it is time for operators to take a fresh look at their analytics strategy. They must extend their existing business intelligence (BI) infrastructure that is well-suited for conducting offline, post-mortem analysis to incorporate technologies that can help them correlate, analyze, predict and act on the insights from data in real time. It calls for a fundamental rethink when it comes to their analytics infrastructure. We believe it is time for service providers to adopt real-time streaming analytics that can help them capture and analyze customer interactions across the network in real time.

Streaming analytics can be used to combine and correlate customer profile, CRM, location, network and usage data in real time to create a 360-degree, subscriber-centric view of the information. It puts service providers in a better position to identify and act on issues and trends that might impact a customer's experience, ideally before the customer becomes aware of them. It also helps service providers capitalize on opportunities to present relevant offers to their customers in real time, thereby increasing revenues.

This approach to decision-making is significantly different from a traditional enterprise data warehouse (EDW) approach where the main aim is to achieve a single shared version of the truth that everyone needs to align with. Operators have typically used extract-transform-load (ETL) tools to load the data from different data sources into a warehouse, normalized the data and used BI and data visualization tools to analyze and present the data. Typical data warehouse solutions take months to deploy and customize according to a service provider's business requirements, and are very expensive. The drawback is that all of this analysis is done off line and it is best suited for reporting and planning purposes.

Real-time streaming analytics helps operators capture and analyze customer interactions across the network in real time to gain continuous insight. It uses predictive analytics and correlation capabilities to provide end users with the insight they need to make better decisions without delay. Unlike traditional batch-oriented analytics, which is request-based, real-time streaming analytics is a continuous process that is event-based and it is predictive and proactive in nature. The additional advantage of using a single, general-purpose, real-time streaming analytics platform rather than a plethora of point solutions is that a service provider can help support multiple functions across an organization with a single, consistent architecture, thereby minimizing maintenance costs.

Figure 2 summarizes the difference between conventional batch-oriented analytics and real-time streaming analytics.

Figure 2: Conventional Batch-Oriented Analytics vs. Real-Time Streaming Analytics

	CONVENTIONAL ANALYTICS	REAL-TIME STREAMING ANALYTICS
Transaction Processing	Offline & request-based	Real-time continuous
Storage Cost	High	Low
Data Evaluation	Bulk evaluation	Incremental evaluation
Velocity	Batch	Real-time
Trigger	Request-based	Event-based
Data Variety	Structured	Structured & unstructured
Database	Disk-based	In memory
Support Cost	High	Low

Source: Heavy Reading, 2014

Capabilities of a Streaming Analytics Solution

A mobile telecommunications network is complex in nature and uses logical resources, such as spectrum, combined with physical resources, such as thousands of cell sites, small cells and radio access network (RAN) technology, to deliver an increasingly complex set of services to millions of demanding customers. The biggest challenge for service providers lies in their ability to collect, correlate and analyze the streaming big data generated by all this infrastructure in real time so they can proactively respond to situations that might present a revenue opportunity or impact a customer's experience. Let us look at some of the key capabilities that are "must haves" for a real-time streaming analytics solution:

Ability to continuously ingest, correlate and analyze multiple streams of data in diverse formats: Customer experience and operational and network intelligence depend on a myriad of factors. Given the number of factors that can shape customer experience, from dropped calls to bill shock to time spent trying to get through to a call center, customer experience data sets tend to be very large. Finding correlations and patterns between events can help identify the impact on individual customers, identify opportunities to enhance the experience (and drive incremental ARPU) and identify threats to the experience (likely to create a reason to churn). Since experience has an immediate emotional impact, data from disparate sources must be analyzed rapidly (preferably in near real time) to give operators the best opportunity to anticipate/control/respond to the situation.

Ability to analyze real-time data at the source and extract actionable insight: Streaming analytics solutions should operate with little or no latency to deliver insights and automated responses in milliseconds. A high-performance complex event processing (CEP) engine within the solution that performs continuous analysis and incremental updates of analytic results is highly desirable. Integrated process management capabilities can help trigger automated responses to discovered insights, such as kick-off a fraud investigation process, a repair process or a personalized marketing offer in real time.

Ability to take a model-driven approach to developing streaming analytics applications: A graphical and collaborative modeling environment can help operators accelerate the creation of streaming analytics applications. It helps multiple developers collaborate on creating multiple models – for streams, CEP queries, policies, processes, process networks, dashboards, etc. – and then share these resources with other developers, thereby significantly reducing the development time and cost for these applications.

Extreme scalability: Since real-time streaming analytics captures and analyzes customer interactions and transactions across the network, it must be scalable and flexible. It needs to take into account the massive and ever-increasing volumes of subscriber-related data that must be analyzed in real time to make decisions faster. These solutions need to efficiently support the data volumes, the concurrency and query complexities associated with streaming analytics. The components of the solution must be elastically scaled with minimal impact on running applications, and the solution should allow for its components to be distributed on commodity hardware, thus maximizing scale while minimizing cost.

Advanced data visualization: Displaying data in reports/dashboards customized to the needs of multiple stakeholders within an operator's organization is critical. Current data visualization tools require human interpretation followed by manual intervention to manage the customer experience (anticipate, control, respond,

optimize). Streaming analytics solutions can automatically trigger decision-making processes to control and respond to the customer experience – for example, presenting the appropriate information to a call center agent in advance of him/her taking the call from a particular customer or automatically remediating failing infrastructure to prevent service degradation.

The dashboards should provide users with a picture of current performance, and visually highlight anomalies and exceptions. Users should be able to easily drill in to specific activities or transactions to get the context and take the appropriate action. They should be able to easily compose and personalize them without programming. Time-sensitive data should be updated in dashboards in real time. And, finally, dashboards should be HTML5-compliant for use on both desktop and mobile devices.

Key Use Cases of Streaming Analytics

To a very large extent, telcos have limited insight into their network and subscribers. The transactional systems that most have in place work well at pinpointing critical outages when they occur; they were rarely designed to allow network performance to be continuously analyzed to proactively identify service issues, the impact on their most profitable customers and how it might ultimately impact customer retention. With fixed or dwindling capex budgets, network analytics will play a greater role in helping telcos boost network performance, improve the customer experience and increase customer retention rates while reducing costs.

Network lifecycle events have a large impact on customer satisfaction as there are many moving parts that can impact customer experience. Suboptimal network performance results in longer call center calls, more customer support costs and an unsatisfactory customer experience. **Figure 3**, based on a recent *Heavy Reading* survey, points out some of the key use cases that can be tackled using streaming analytics over big data.

Figure 3: Critical Pain Points That Big Data & Streaming Analytics Can Address



Source: Heavy Reading, 2014 (n=75)

Effective utilization of streaming analytics can help alleviate many of the pain points that operators are struggling with. Let us look at some of the use cases that real-time streaming analytics can help address.

Targeted offer & campaign management: Streaming analytics helps service providers deliver real-time targeted offers and focused campaigns based on data, such as subscriber network usage, subscriber location, traffic, loyalty points, events and rules. Identifying and offering innovative promotions, such as incentives for early adopters, engaging in cross-product promotions and offering loyalty points, will be critical in driving value-added services adoption that can be delivered either by the service provider itself or by partnering with over-the-top players.

Event-based & personalized marketing: Mobile services are all about speed and capacity in the age of 4G, and streaming analytics plays a significant role. For example, it informs the service provider of the number of customers using a specific operating system or device, how long they spend on certain sites, where and when they use the devices and more. One significant advantage of streaming analytics is that it can take advantage of location-based data and movement-over-time patterns that help providers and site owners to better target users through geo-fencing or location-based advertising. In this scenario, a subscriber enters a certain geographic zone and receives a non-chargeable, timely SMS or sees a relevant ad banner through his/her social media account from a local merchant based on profile and buying behavior. Personalized offerings using mobile data can also be used to encourage migration to new packages and networks, thereby reducing the pressure on networks in a given location. Although this mechanism provides an appealing revenue stream for a mobile provider, this type of personalized advertising brings up the issue of privacy (which will vary depending on geographic region) and subscriber control (being able to opt in or out of promotions). These are issues to be considered and monitored carefully. Although the notion of location-based advertising and personalized advertising may seem complex for providers, through proper execution and by abiding by policies, it can prove to be an appealing choice for further monetization.

Churn prediction & prevention: Streaming analytics can help identify those customers that have a higher propensity to churn and possibly take those in their social circle with them. Predictive analytics allows service providers to shift their analytics focus from looking at old data to looking at current data in a predictive and preventative fashion. The key to a streaming analytics solution being able to help with churn mitigation revolves around its ability to process information about all interactions that impact the customer experience, including network coverage, current location, bandwidth consumption, billing information, support history and device type – all in real time. Quick responses to customer issues can help keep a subscriber happy and prevent churn.

Social network analysis: A growing area for streaming analytics is that of social network analysis (SNA), which is becoming increasingly popular in telecom as service providers are looking for ways to gain a competitive edge and better understand their customers. Streaming analytics can help operators make sense of the stream of billions of social network transactions and identify influencers and patterns among social calling circles of friends and families. This information is then used by service providers in both a defensive and offensive manner to help with overall customer experience management, increasing revenues, improving operational efficiency and reducing costs.

Subscriber experience management: Collecting either network data or customer data from systems and transactions will only provide a partial picture of either service or customer conditions. What is required is the real-time capture of customer data complete with location and core data measurements, such as latency from video apps, which can provide operators with invaluable real-time actionable insight when funneled through the right processing solution. Operators can use this data to better understand their subscribers, their behavioral patterns and their service performance in real time.

The real-time capture of enterprise geo-location data from subscriber devices, as well as profitability, service status and customer profile information, can provide service providers with unparalleled decision-making capabilities. Operators can easily monitor individual subscribers, as well as corporate customers and their

transactions on corporate access point nodes (APNs). Operators can get immediate information on provisioning and configuration issues experienced by corporate subscribers trying to access APNs. Operators can also identify potential mobile switching center (MSC) failures and reroute the traffic of their most valuable customers to a different MSC to avoid service degradation while notifying their less-profitable subscribers of potential problems and giving them an estimated timeframe for when the connection and service will be restored.

By comparing service metrics, such as the number of dropped calls and latency in video-based services with location-based KPIs and correlating this information with a subscriber's dynamic and static information, operators can identify cell towers, MSCs and HLRs that are performing poorly and impacting the service experience of their VIP customers in real time. This also helps operators take preventive steps to increase capacity, upgrade the network and patch devices over the air, before a high-value customer's experience is negatively impacted by a potential service degradation or failure. Streaming analytics also gives operators better insight and visibility into their network performance and the quality of service that they deliver.

Minimizing revenue leakage & fraud: All operators manage an ecosystem of partners with distinct product sets and features with different pricing and settlement terms. This creates uncertainty and exponentially increases revenue assurance, fraud and leakage concerns. As operators continue to integrate application stores with complex settlement agreements among operators, publishers and settlement/storefront providers, the importance of big data and streaming analytics coupled with revenue assurance will progressively become more important.

Using the full context of the customer's financial behavior, revenue assurance platforms combined with streaming analytics can help create the most effective personalized course of action and payment plan for each customer behind on a payment. A streaming analytics solution can raise fraud alerts to block transactions or kick off a revenue assurance remediation process. Streaming analytics can also help uncover previously hidden patterns to prevent revenue leakage.

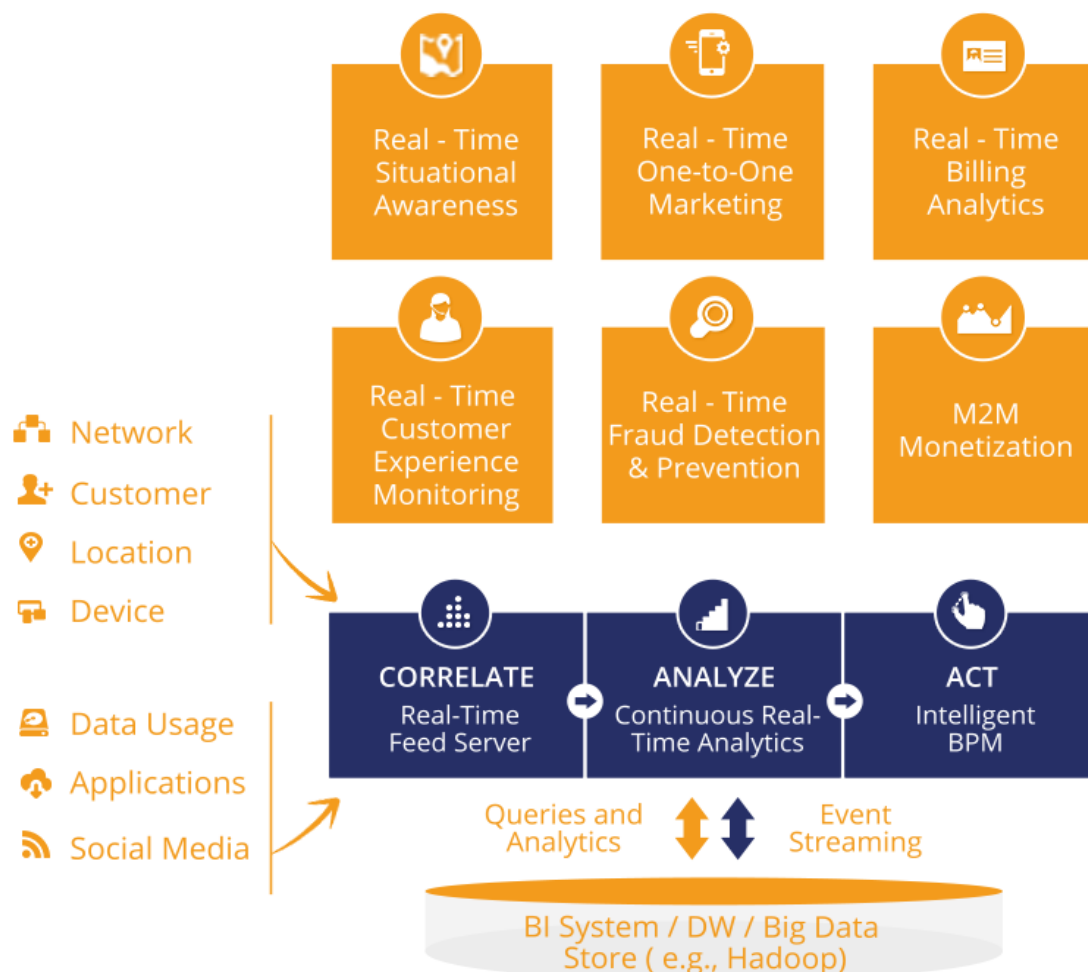
Mobile spam is a growing problem for network operators, with the GSMA estimating that spam constitutes as much as 20 percent of messages in some regions. While the ultimate victims of spam are the operator's customers, the growing levels of spam create a number of problems for operators. Revenue loss and leakage, wasted network bandwidth, and higher staffing and support costs all affect the bottom line, to say nothing of the negative impact on customer experience, potential increase in churn rates and the impact on the operator's brand. In extreme cases, excessive fraudulent activity has resulted in government regulatory intervention. Operators are therefore increasingly looking for flexible solutions that will allow them to keep up with and even stay one step ahead of the spammers and their increasingly sophisticated fraud strategies. Solutions must be able to detect spamming in real time so that fraudulent activity can be shut down as quickly as possible. Furthermore, it must be possible for the solution to process increasingly complex spam rule definitions as spamming behavior evolves.

Streaming analytics solutions allow for the processing of real-time network feeds so as to detect spam while it is being sent. Complex spam detection patterns can be defined and used against high-volume network events. By correlating variables such as SMS rates, IMSIs and IMEIs used over time, location data and time of day information, spam can be detected and prevented. Spam detection alerts and trends can be visualized in real-time dashboards, and automated spam management processes can be initiated to immediately deal with each spam case.

Vendor Analysis: Vitria Operational Intelligence

Vitria Technology Inc., is a pioneer in streaming analytics and continuous operational intelligence (OI) software. Vitria OI has been deployed by telcos globally to help them uncover, analyze and act on insights from streaming data – while it still counts. Vitria OI provides operators with a way to tap in to live streams of data from a wide variety of sources and then correlate, analyze and derive insight that can be immediately acted upon to help them gain better situational awareness of network operations, improve their customer experience, engage in more personalized one-to-one marketing, and detect and prevent fraud – in real time.

Figure 4: Vitria OI for Streaming Analytics for Communications Service Providers



Source: Vitria

Once deployed, Vitria OI's unified streaming analytics and action platform provides service providers with continuous, real-time OI that benefits a wide variety of initiatives, including those related to marketing, monetization, network, customer care and security programs.

Communications service providers manage increasingly complex networks that consist of thousands of cell sites that handle billions of messages every day. They are tasked with delivering an increasingly complex set of services to millions of demanding customers. One of their biggest challenges lies in being able to collect, correlate and analyze this streaming big data in real time so they can proactively respond to situations that might present a revenue opportunity or impact a customer's experience. Traditional BI and data warehousing approaches that rely on persisting data and bulk analysis introduces far too much latency to be able to deliver insights in a timely manner.

Vitria OI uses an event-driven architecture to tackle streaming big data, delivering real-time analytics that can help detect customer-affecting issues, even before they happen. It leverages an elastic architecture that scales to support the extreme event rates of the most demanding networks. It easily integrates with a service provider's existing OSS infrastructure. Examples of data sources that it can tap into include data that resides in traditional data warehouses and other big data analytics stores, as well as live streaming data, including network data, Web application data and IP address data, location-based data, device data, customer profile data, demographic data, billing data, usage data and data from social networks.

By correlating and analyzing these multiple streams of data, Vitria OI provides service providers with continuous, real-time OI that puts them in a better position to optimize their network operations, improve their customers' experience, engage in more targeted one-to-one marketing to increase loyalty and reduce churn, and proactively detect and prevent fraud.

Conclusion

Converting the growing deluge of information into actionable real-time information is an arduous task that service providers must tackle if they want to meet their business objectives that center on providing revenue generating opportunities and delivering superior customer experience. Real-time streaming analytics will play a pivotal role in the success of operators as this capability will not only provide operators with real-time intelligence, but also help them to maximize their revenue potential from a short window of opportunity.

Service providers possess a tremendous amount of information, but unfortunately most is trapped in disparate BSS and OSS infrastructures, disconnected from each other and from the bigger, strategic picture. Real-time streaming analytics tools allow operators to free data from these silos and put them to work to provide granular understanding of the individual subscriber, as well as monitor and manage the network. Real-time streaming analytics stands out with its ability to allow users that are closest to their data to quickly pull, overlay and analyze any combination of internal business and technical data, plus external industry content, so decisions can be made based on as many variables as required.

Real-time streaming analytics can provide wireless, wireline and cable/MSO operators with the market insight, location intelligence and industry context to quantify and manage strategic growth opportunities, prioritize network expansion by revenue potential, decipher the competition's weaknesses (and be prepared to combat their threats), accurately identify prospects for new services (as well as at-risk, high-value customers) and detect and preempt potential network and service issues before they impact customer experience.

In today's highly competitive service provider market, we believe that service providers must remain agile and focused on ways that they can improve their network and the experience of their top customers in order to differentiate their services from those of their competitors. Real-time streaming analytics performed on the big data assets that a service provider possesses is, and will be, a critical means to achieve that goal.