The Forrester Wave™: Streaming Analytics, Q3 2017

Use This Technology To Make Your Enterprise Applications Sense, Think, And Act In Real Time

by Mike Gualtieri
September 7, 2017

Why Read This Report

We live in a real-time world, and so too should enterprise applications. In our 25-criteria evaluation of streaming analytics providers, we identified the 13 most significant ones — Amazon Web Services, DataTorrent, EsperTech, FICO, IBM, Impetus Technologies, Microsoft, Oracle, SAP, SAS, Software AG, SQLstream, and TIBCO Software. And we researched, analyzed, and scored them. This report shows how each provider measures up and helps application development and delivery (AD&D) professionals make the right choice.

Key Takeaways

Streaming Analytics Is About Real Time
All data originates in real time, whether from the click of a mouse, a sensor reading on a device, a transaction in a database, or a market feed. Streaming analytics is about finding and acting on insights from any or all of these data sources.

Event-Driven Digital Transformations
Streaming data is event data. It represents something that has happened, whether it be physical or digital. Streaming analytics is essential technology to orchestrate interactions between a complex portfolio of applications and the data sources.

Streaming Analytics Powers IoT Analytics
Streaming analytics solutions are particularly well suited to internet of things (IoT) applications because they are by nature real-time and spew sensor data that can be analyzed in real time. Many of the vendors offer edge versions of their streaming analytics solutions.

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by Mike Gualtieri

with Srividya Sridharan and Elizabeth Hoberman

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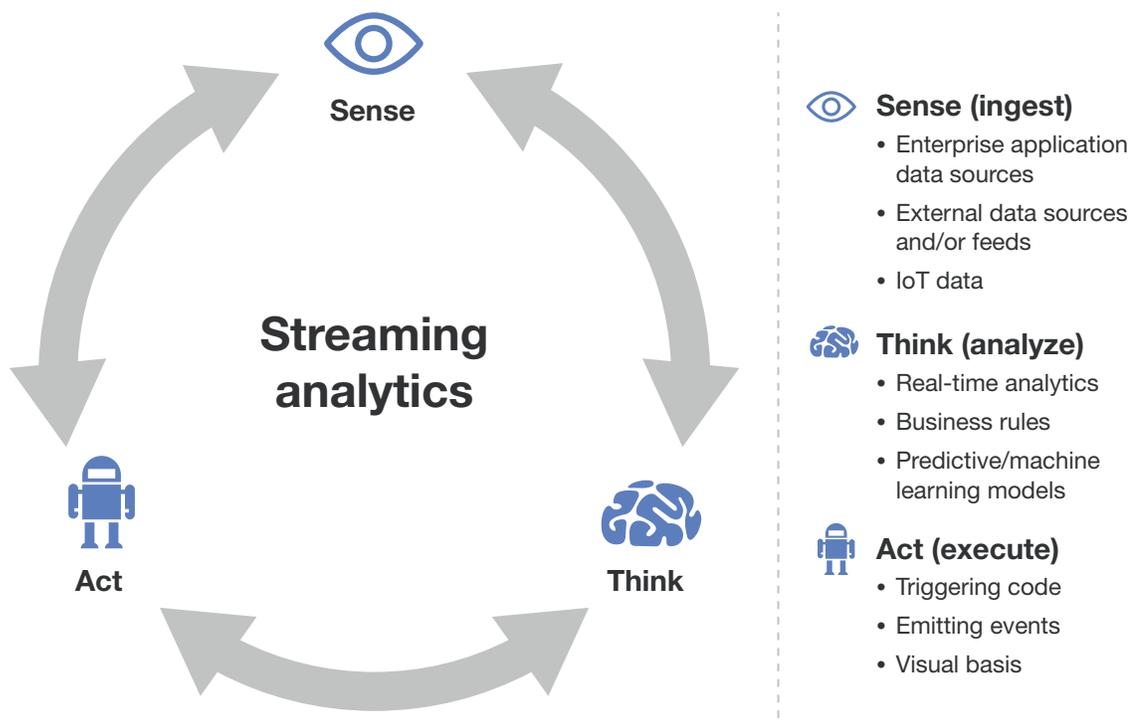FOR APPLICATION DEVELOPMENT & DELIVERY PROFESSIONALS

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Streaming Analytics Enables The Real-Time Enterprise

Streaming analytics solutions identify perishable insights — insights that enterprises must act on within a given time frame or else the opportunity to change the course of business outcomes will pass.[1] Streaming analytics solutions don't stop there though. They also offer continuous integration, orchestration of business processes, and embedded execution of code — all driven by streaming data from a multitude of data sources. If you are looking for business intelligence tools such as Tableau or data ingestion solutions such as Kafka, then you are reading the wrong report. However, AD&D pros, if you are looking to enhance or build applications that sense, think, and act in real time, then read on (see Figure 1).

FIGURE 1 Use Streaming Analytics Solutions To Build Applications That Can Sense, Think, And Act In Real Time

Real-Time Streaming Data Represents Digital And Physical Events

Streaming data represents digital and physical events. It encompasses any data that enterprise applications, mobile apps, websites, infrastructure, external feeds, and IoT devices emit. That data represents an event that occurs in the physical or digital world such as a twitter post, a temperature reading on a sensor, a transaction on a mainframe, a stock market tick, the click of a button on an app,

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or an inbound customer service call.[2] AD&D pros can use streaming analytics to manipulate the flows of these events, calculate analytics, and detect patterns — all in real time.[3] Forrester defines streaming analytics as:

> *Software that provides analytical operators to orchestrate data flow, calculate analytics, and detect patterns on event data from multiple, disparate live data sources to allow developers to build applications that sense, think, and act in real time.*

Streaming Analytics Solutions Are Real-Time Thinkers

Streaming analytics solutions are platforms that are not just about ingesting streaming data and performing analytics. They are also execution platforms that can embed any arbitrary snippet or code, machine learning models, and rules that AD&D pros can use to enable the real-time enterprise by detecting urgent situations and acting immediately. These solutions (see Figure 2):

› **Sense in real time.** Enterprises have dozens, hundreds, and often thousands of applications that employees and customers use. All these applications generate data that has the potential to be valuable for real-time analysis, especially when combined from multiple sources. Streaming analytics solutions provide connectors to ingest and sense numerous application and IoT data sources in real time. This is a key value proposition of streaming analytics — to pull all relevant sources together in memory in real time.

› **Think in real time.** Streaming data moves in real time from multiple data sources, but not all of the data may be relevant. Streaming analytics solutions provide a plethora of analytical operators to calculate analytical aggregates and detect patterns of events. They also allow developers to embed machine learning models that data scientists create externally.[4] Developers can string these analytical operators together to create an arbitrarily simple or complex streaming pipeline. The goal: Detect urgent situations to act upon automatically or feed real-time dashboards for human decision makers. For example, streaming analytics could detect that a shipment will be late due to a breakdown or that a customer is shopping for motorcycle safety products because she has a pattern of browsing for motorcycle safety products such as helmets.

› **Act in real time.** Insights generated using streaming solutions are immediate but not valuable unless they are used to take action. Streaming analytics solutions can trigger processes in other applications, called APIs, or take any other arbitrary action that can be defined in code. For example, an IoT predictive maintenance application may monitor temperature and vibration data streamed from a conveyer belt. The streaming analytics solution could detect a spike in either temperature or vibration to indicate a looming shutdown. The solution could then push an alert to an operator or trigger an automatic shutdown of the machine. In addition, if the cadence of the streaming data is interrupted, that may also indicate a problem with the sensors on the machine.

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FIGURE 2 Streaming Analytics Solutions Can Ingest, Analyze, And Act On Streaming Data
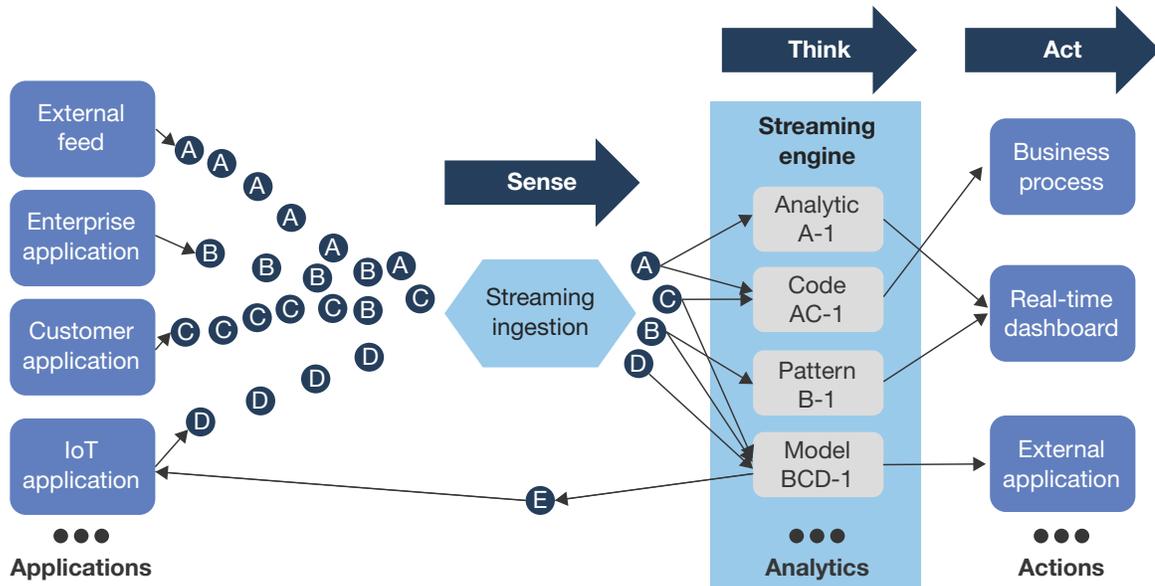
Streaming Analytics Evaluation Overview

To assess the state of the streaming analytics market and see how the vendors compare, Forrester evaluated the strengths and weaknesses of key vendors. After examining past research, user requirements, and vendor and expert interviews, we developed a concise set of 25 evaluation criteria, which we grouped into three high-level buckets:

› **Current offering.** We evaluated each product's technical architecture, stream handling features, and breadth and depth of real-time analytics. In addition, we assessed each product's administration and developer tools that help developers design, create, and test streaming workflows and/or applications. All evaluated products must have been publicly available by July 5, 2017.

› **Strategy.** We reviewed each vendor's strategy to assess its ability to compete and grow in the enterprise streaming analytics market. Key criteria include Forrester's confidence in the vendor's ability to execute on its stated strategy and support current and future customers. We also assessed each vendor's product road map to evaluate how this will affect the vendor's future competitive position relative to the other vendors in this evaluation.

› **Market presence.** To determine each vendor's market presence, we evaluated the installed base of paying customers, streaming analytics-specific revenue, market awareness of the vendor's streaming analytics solution, and partnerships with other technology and services firms.[5]

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Evaluated Vendors And Inclusion Criteria

Forrester included 13 vendors in the evaluation: Amazon Web Services, DataTorrent, EsperTech, FICO, IBM, Impetus Technologies, Microsoft, Oracle, SAP, SAS, Software AG, SQLstream, and TIBCO Software. Each of these vendors has (see Figure 3):

› **A core streaming analytics functionality.** The streaming analytics solution must be able to perform analytics operations and pattern detection within time windows on real-time data from multiple sources. We did not consider solutions that focus on ingestion and delivery of data but lack sophisticated analytical time windows to be streaming analytics.[6]

› **A standalone or an embeddable streaming analytics solution.** We included only streaming analytics solutions that are general-purpose solutions that can be integrated with or embedded into any application.

› **An installed base and a revenue history.** Included vendors must have referenceable large enterprise customers using the streaming analytics solution and a proven steady stream of revenue that customer adoption of the solution generates.

› **Motivated client inquiries.** Forrester clients often discuss the vendors and products through inquiries. Alternatively, vendors may, in Forrester's judgment, warrant inclusion or exclusion in this evaluation because of market presence, lack of customer momentum, financial troubles, and/or absence of client interest.

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FIGURE 3 Evaluated Vendors: Product Information And Selection Criteria

Vendor	Product evaluated	Product version evaluated
Amazon Web Services	Amazon Kinesis Analytics	as of July 5, 2017
DataTorrent	DataTorrent RTS	3.5
EsperTech	Esper NEsper EsperHA Esper Enterprise Edition	6.1.0 5.5.1 6.1.0 6.1.0
FICO	FICO Decision Management Platform Streaming	3.5
IBM	IBM Streams IBM Streaming Analytics for Bluemix	4.2.1.1 as of July 5, 2017
Impetus Technologies	StreamAnalytix	3.1
Microsoft	Azure Stream Analytics	as of July 5, 2017
Oracle	Spark-based Oracle Stream Analytics OEP-based Oracle Stream Analytics	1 12.2.1.1.0
SAP	SAP HANA SAP Event Stream Processor SAP Dynamic Edge Processing	2.0 5.1 SP12 2.0
SAS	SAS Event Stream Processing	4.3
Software AG	Apama Streaming Analytics Platform	10.0.0
SQLstream	SQLstream Blaze	5.2
TIBCO Software	StreamBase	10.1

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FIGURE 3 Evaluated Vendors: Product Information And Selection Criteria (Cont.)

Vendor inclusion criteria

- **A core streaming analytics functionality.** The streaming analytics solution must be able to perform analytics operations and pattern detection within time windows on real-time data from multiple sources. We did not consider solutions that focus on the ingestion and delivery of data but lack sophisticated analytical time windows to be streaming analytics.

- **A standalone or an embeddable streaming analytics solution.** We included only streaming analytics solutions that are general-purpose solutions that can be integrated with or embedded into any application.

- **An installed base and a revenue history.** Included vendors must have referenceable large-enterprise customers using the streaming analytics solution and a proven steady stream of revenue that customer adoption of the solution generates.

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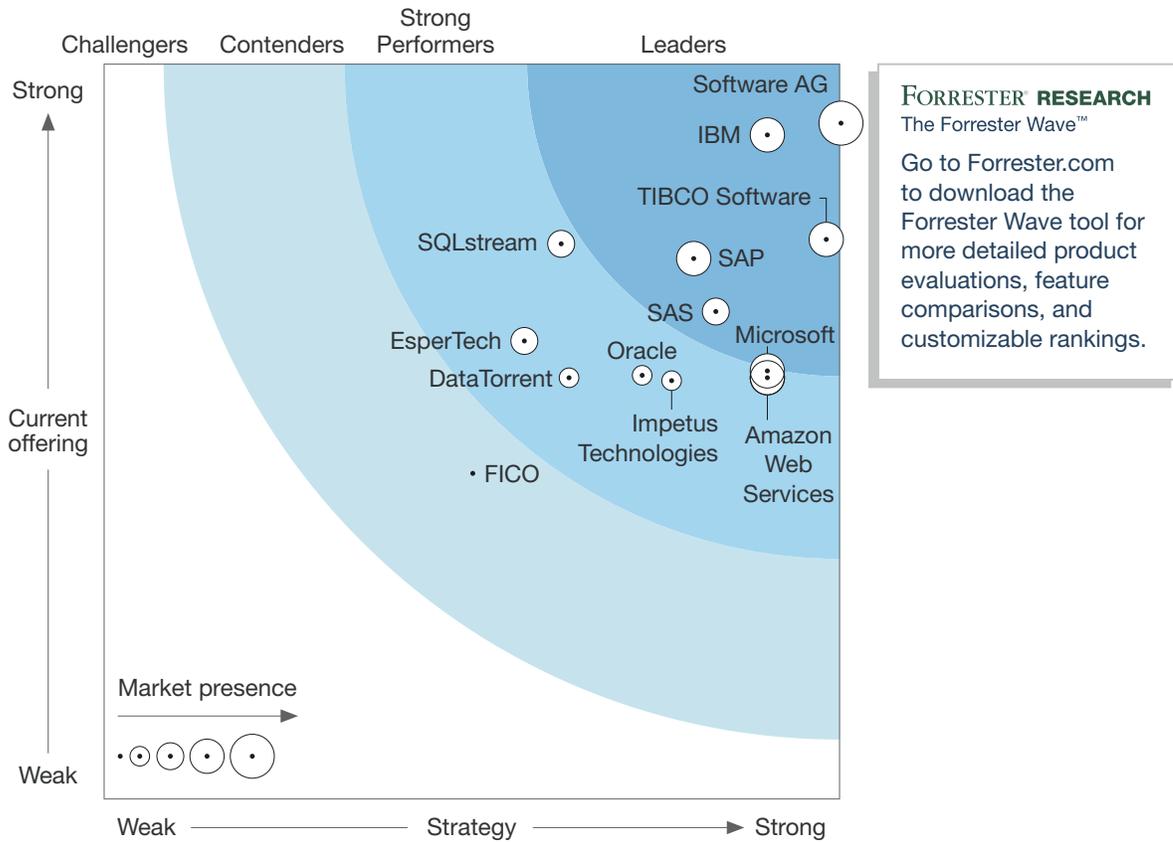
Vendor Profiles

This evaluation of the streaming analytics market is intended to be a starting point only. We encourage clients to view detailed product evaluations and adapt criteria weightings to fit their individual needs through the Forrester Wave Excel-based vendor comparison tool (see Figure 4).

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FIGURE 4 Forrester Wave™: Streaming Analytics, Q3 '17

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FIGURE 4 Forrester Wave™: Streaming Analytics, Q3 '17 (Cont.)

	Forrester's weighting	Amazon Web Services	DataTorrent	EsperTech	FICO	IBM	Impetus Technologies
Current Offering	50%	2.87	2.86	3.11	2.21	4.51	2.84
Architecture	25%	2.30	2.40	2.00	2.40	4.00	2.40
Administration	5%	5.00	3.00	3.00	1.00	5.00	3.00
Deployment	10%	2.90	3.60	3.70	3.00	5.00	3.00
Stream handling	20%	2.60	3.00	3.40	2.40	4.60	2.40
Analytics	20%	2.90	2.50	3.80	1.40	4.70	3.80
Business solutions	20%	3.25	3.25	3.25	2.50	4.50	2.75
Strategy	50%	4.50	3.15	2.85	2.50	4.50	3.85
Acquisition and pricing	5%	5.00	5.00	5.00	3.00	5.00	5.00
Solution road map	50%	4.00	3.00	3.00	2.00	4.00	4.00
Ability to execute	20%	5.00	2.00	3.00	3.00	5.00	3.00
Implementation support	25%	5.00	4.00	2.00	3.00	5.00	4.00
Market Presence	0%	3.60	1.80	2.60	0.40	4.00	1.60
Installed base	40%	4.00	1.00	2.00	0.00	4.00	1.00
Evaluated product vendor revenue	20%	2.00	1.00	0.00	0.00	3.00	0.00
Market awareness	20%	3.00	3.00	4.00	1.00	4.00	4.00
Partners	20%	5.00	3.00	5.00	1.00	5.00	2.00

All scores are based on a scale of 0 (weak) to 5 (strong).

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FIGURE 4 Forrester Wave™: Streaming Analytics, Q3 '17 (Cont.)

	Microsoft	Oracle	SAP	SAS	Software AG	SQLstream	TIBCO Software
Current Offering	2.90	2.88	3.67	3.31	4.59	3.77	3.80
Architecture	3.20	2.60	3.00	2.90	4.00	3.30	3.40
Administration	5.00	1.00	5.00	3.00	5.00	3.00	5.00
Deployment	1.70	2.40	5.00	4.30	5.00	3.60	3.00
Stream handling	2.60	3.80	3.00	2.40	5.00	4.60	4.00
Analytics	2.30	2.90	4.10	4.10	4.70	3.80	3.50
Business solutions	3.50	3.00	3.75	3.50	4.50	3.75	4.50
Strategy	4.50	3.65	4.00	4.15	5.00	3.10	4.90
Acquisition and pricing	5.00	3.00	5.00	3.00	5.00	5.00	3.00
Solution road map	4.00	3.00	3.00	4.00	5.00	3.00	5.00
Ability to execute	5.00	5.00	5.00	5.00	5.00	3.00	5.00
Implementation support	5.00	4.00	5.00	4.00	5.00	3.00	5.00
Market Presence	3.80	2.00	3.60	3.00	4.20	2.60	4.00
Installed base	4.00	1.00	3.00	3.00	4.00	2.00	4.00
Evaluated product vendor revenue	2.00	2.00	3.00	2.00	4.00	1.00	3.00
Market awareness	4.00	3.00	4.00	4.00	4.00	3.00	4.00
Partners	5.00	3.00	5.00	3.00	5.00	5.00	5.00

All scores are based on a scale of 0 (weak) to 5 (strong).

Leaders

› **Software AG strengthens its focus on industrial IoT.** Software AG's Apama continues to be a broadly applicable and perennially capable streaming analytics platform. With its recent acquisition of Cumulocity, Apama deeply extends its reach deeper into industrial IoT use cases by providing device management, digital twin, and other connectivity-oriented services. There is no stopping Apama to become the real-time engine for digital transformation that extends all the way from

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the factory floor to direct customer interactions. To be successful, Software AG must continue to expand its already large partner ecosystem to assert its leadership in IoT. Software AG customers include Bosch, Deutsche Post DHL Group, HSBC, and Octo Telematics.

› **IBM Streams powers real-time cognitive applications.** Cognitive everything is a noble vision that has already created a leap in thinking about how enterprises chart their future with customers, operations, and the workforce. A prerequisite to cognitive computing is that data must be made sense of in real time. IBM Streams aims to be the nervous system that connects the real-time world to the applications that will power cognitive decisions, augment human intelligence, and automate business processes. Cognitive is an all-in strategy for IBM, but huge successes have yet to materialize. Other streaming analytics vendors are adding machine learning capabilities to power intelligent applications too, but IBM's broader portfolio of cognitive technologies gives it an edge. IBM customers include Darwin Ecosystem, Dimension Data, PSA Group, and Verizon Wireless.

› **TIBCO Software unifies real-time analytics.** TIBCO is focused on insights — and not the garden variety insights that lay dormant and unactionable on someone's desk. Rather, TIBCO focuses on perishable insights that companies must act upon immediately to retain customers, remove friction from business processes, and prevent logistics chains from stopping cold. TIBCO StreamBase is a full-featured streaming analytics solution that integrates with applications to automate actions and also offers Live DataMart to create a real-time visual command center. TIBCO's exploratory business intelligence tool Spotfire is also integrated to allow business intelligence professionals to analyze historical time series data collected from streaming sources. TIBCO's success in the market will come from developing high-value solution accelerators that leverage both analytics capabilities for the world's largest enterprises. TIBCO customers include AA Ireland, Kuveyt Türk Participation Bank, and Melbourne Airport.

› **SAP HANA Smart Data Streaming brings event processing to SAP HANA.** SAP HANA is SAP's blazing fast in-memory database that handles both transactions and analytics. And SAP's Smart Data Streaming is fully integrated into SAP HANA to also analyze high-velocity streaming data including that from IoT data sources. SAP HANA customers will find nothing missing from Smart Data Streaming for the most complex of streaming applications. For customers that don't have SAP HANA, SAP offers Event Stream Processor that is not dependent on SAP HANA. Both offerings provide enterprise tooling for development and deployment and include a low-latency complex event processing engine. SAP's streaming analytics solutions will continue to be most relevant to the large universe of SAP customers. SAP streaming analytics customers range from a leading stock brokerage firm to a global shipping organization and government departmental applications.

› **SAS Event Stream Processing complements other solutions.** SAS Event Stream Processing is a relatively new offering, but with stellar low-latency analytics capabilities. In addition to the common streaming analytics features, SAS Event Stream Processing is integrated with many continuous machine learning algorithms. It is also the real-time backbone of numerous SAS business solutions including SAS Customer Intelligence, SAS Fraud Framework, SAS Decision Management, SAS

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Risk Management, SAS Asset Performance Analytics, and others. SAS can continue to differentiate in streaming analytics by integrating its vast library of advanced analytics in Event Stream Processing. SAS's customers include Rijkswaterstaat and Telefónica.

Strong Performers

› **Microsoft Azure Stream Analytics enables the real-time cloud.** Microsoft has made streaming analytics broadly accessible to developers on Azure by using a SQL approach to develop streaming applications. This fully managed cloud service is integrated with other Azure services to enable real-time capabilities within other services such as IoT and dashboards. Azure Stream Analytics is exposed in the visual studio tooling to make it easy for Microsoft developers to use it in existing applications. Azure Stream Analytics is a cloud-only solution. But because it is so important for IoT applications, Microsoft is currently in private preview to run some subset of streaming analytics on edge devices. Microsoft customers include Honeywell International, thyssenkrupp Elevator, and TransAlta.

› **Amazon Web Services makes streaming the future of all applications.** Amazon Kinesis Analytics is the latest addition to the Kinesis family of cloud services that started with Amazon Kinesis Streams and Amazon Kinesis Firehose. Where the focus of Kinesis Streams and Kinesis Firehose is on ingestion and management of high-throughput streaming data, Kinesis Analytics brings the brains. Launched in 2016, Kinesis Analytics brings full-blown real-time analytics to any cloud application developer that knows SQL. That is a very customer-friendly move because most developers already know SQL, so the concepts of analytical time windows can be expressed directly in SQL statements. This is not a command line service. AWS has built impressive tooling that allows developers to design, develop, and test streaming SQL in a visual tool. And, of course, Kinesis Analytics is integrated with Kinesis Streams and Kinesis Firehose. Adoption has been stellar for a cloud service that has only been available since 2016. Amazon Kinesis is a cloud-only solution, so customers will turn to other solutions when on-premises deployment is a requirement. Customers using Kinesis Analytics include Cloudticity, Palringo, and Yieldmo.

› **SQLstream makes streaming easy and blazing fast.** SQLstream's Blaze platform is accessible to the broadest possible developer audience because it centers on using standard SQL to express streaming analytics applications. The company implements those continuous queries in an engine that performs highly because it is implemented in C/C++ and takes advantage of every possible low-level optimization such as double buffering and lock-free execution. Blaze includes a rich set of tooling to develop, test, and deploy applications. SQLstream got a major vote of confidence for its technology and SQL approach in 2016 by Amazon Web Services, which licensed a subset of the technology for Amazon Kinesis Analytics. SQLstream customers include ECaTS, Kontron, and Rubicon Project.

› **Impetus Technologies covers open source bases without the headaches.** Take your pick. Impetus' StreamAnalytix supports Apache Storm and Apache Spark and is architecturally positioned to support other open source streaming analytics software such as Apache Flink.

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StreamAnalytix also embeds EsperTech to provide advanced streaming analytics capabilities such as complex event processing. What also shines about the StreamAnalytix solution is that it includes enterprise-grade visual tooling for both development and deployment of streaming applications. StreamAnalytix tooling also unifies streaming and batch by supporting arbitrary Spark jobs such as machine learning. Impetus has the opportunity to make StreamAnalytix the de facto tooling standard for Spark and future streaming engines, but it must gain several more enterprise customers and assert itself more in the open source community. Impetus StreamAnalytix customers include 8x8, United Airlines, and Verizon.

› **Oracle restarts with Spark.** During the past several years, Oracle offered streaming analytics that ranged from complex event processing to real-time visualization tools. The latest incarnation takes Oracle's complex event processing capabilities and layers them on Apache Spark (Spark Streaming). The advantage of this approach is that it leverages the innovation that is taking place in the Spark community not only for streaming but also for arbitrary batching processing including training machine learning models. The disadvantage of the approach is that Spark is primarily a micro-batch architecture, meaning that processing windows are fixed, which limits the low-latency processing features. It's a smart move for Oracle because it can offer solutions on Spark, but it's still beholden to the pace of innovation of the open source community.

› **DataTorrent builds an open source community.** DataTorrent is a venture-backed startup that is behind the top-level Apache Apex project. The company has built an impressive community in a short time, especially given that many other open source streaming analytics options exist such as Apache Flink, Apache Spark, and Apache Storm. The open source market appears crowded, but DataTorrent's focus on enterprise needs and enterprise-grade development and deployment tooling may give it an edge. DataTorrent's technical founders have brought in a new enterprise-focused management team to increase adoption mainly by building out horizontal solutions accelerators such as fraud prevention and real-time customer intelligence. DataTorrent customers include Capital One, General Electric, and PubMatic.

› **EsperTech is open source and offers flexible deployment options.** Since 2006, EsperTech has offered an open source SQL-based solution for streaming analytics and complex event processing. EsperTech is unique from all other streaming analytics solutions in this evaluation because in addition to an enterprise solution, it offers an embeddable version that both enterprises and ISVs can use directly in other software. EsperTech's future is in growing the number of OEM agreements with ISVs that wish to embed streaming analytics in their products. EsperTech customers include Cumulocity, E-TRADE, and Huawei Technologies.

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Contenders

› **FICO focuses streaming on real-time decisions.** FICO is certainly not new to real-time decisions, but with Decision Management Platform Streaming, it now offers this capability to a broader number of use cases on any streaming data. The FICO Decision Management Suite provides a full complement of leading business rules, machine learning, and decision optimization tools for enterprises. Now that platform also includes FICO Decision Management Platform Streaming to process and analyze streaming data. FICO has built visual tooling to process incoming streams and even orchestrate arbitrary batch jobs. It's off to a good start, but FICO must build out more capabilities for administration and analytical operators to be more competitive. FICO customers include Concepture and Frost-Arnett.

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Supplemental Material

Online Resource

The online version of Figure 4 is an Excel-based vendor comparison tool that provides detailed product evaluations and customizable rankings. Click the link at Forrester.com at the beginning of this report to download.

Data Sources Used In This Forrester Wave

Forrester used a combination of four data sources to assess the strengths and weaknesses of each solution. We evaluated the vendors participating in this Forrester Wave, in part, using materials that they provided to us by August 25, 2017.

› **Vendor surveys.** Forrester surveyed vendors on their capabilities as they relate to the evaluation criteria. Once we analyzed the completed vendor surveys, we conducted vendor calls when necessary to gather details of vendor qualifications.

› **Executive briefings.** An executive backed by a product team from each vendor presented and answered questions on the vendor's product strategy and market sizing.

› **Product demos.** We asked vendors to conduct demonstrations of their products' functionality. We used findings from these product demos to validate details of each vendor's product capabilities.

› **Customer reference surveys.** To validate product and vendor qualifications, Forrester also fielded reference surveys with two of each vendor's current customers.

The Forrester Wave Methodology

We conduct primary research to develop a list of vendors that meet our criteria for evaluation in this market. From that initial pool of vendors, we narrow our final list. We choose these vendors based on: 1) product fit; 2) customer success; and 3) Forrester client demand. We eliminate vendors that have limited customer references and products that don't fit the scope of our evaluation.

After examining past research, user need assessments, and vendor and expert interviews, we develop the initial evaluation criteria. To evaluate the vendors and their products against our set of criteria, we gather details of product qualifications through a combination of lab evaluations, questionnaires, demos, and/or discussions with client references. We send evaluations to the vendors for their review, and we adjust the evaluations to provide the most accurate view of vendor offerings and strategies.

We set default weightings to reflect our analysis of the needs of large user companies — and/or other scenarios as outlined in the Forrester Wave evaluation — and then score the vendors based on a clearly defined scale. We intend these default weightings to serve only as a starting point and encourage readers to adapt the weightings to fit their individual needs through the Excel-based tool.

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The final scores generate the graphical depiction of the market based on current offering, strategy, and market presence. Forrester intends to update vendor evaluations regularly as product capabilities and vendor strategies evolve. For more information on the methodology that every Forrester Wave follows, please visit The Forrester Wave™ Methodology Guide on our website.

Integrity Policy

We conduct all our research, including Forrester Wave evaluations, in accordance with the Integrity Policy posted on our website.

Endnotes

[1] See the Forrester report "Perishable Insights — Stop Wasting Money On Unactionable Analytics."

[2] That all of these examples are events should not surprise longtime followers of streaming analytics solutions because this market used to be called complex event processing (CEP) platforms. See the Forrester report "The Forrester Wave™: Complex Event Processing (CEP) Platforms, Q3 2009."

[3] Real time means as soon as is necessary for a business purpose. For example, algorithmic trading might require microsecond responses, while geofence applications might require a few seconds.

[4] Data scientists create machine learning models in other tools. See the Forrester report "The Forrester Wave™: Predictive Analytics And Machine Learning Solutions, Q1 2017."

[5] Some vendors in this evaluation also offer products in other markets. Our assessment for market awareness is based only on the market awareness of the vendors' product, not the overall awareness of the vendor.

[6] For example, Confluent is not included in this Forrester Wave because Apache Kafka focuses on streaming ingestion and delivery but lacks the sophisticated real-time analytics capabilities as defined by Forrester's streaming analytics category.

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