

# The Forrester Wave™: API Management Solutions, Q4 2018

The 15 Providers That Matter Most And How They Stack Up

by Randy Heffner  
October 29, 2018

## Why Read This Report

In our 26-criterion evaluation of API management solutions providers, we identified the 15 most significant ones — Axway, CA Technologies, Google, IBM, Microsoft, MuleSoft, Oracle, Red Hat, Rogue Wave Software, Sensedia, Software AG, TIBCO Software, Torry Harris Business Solutions, Tyk Technologies, and WSO2 — and 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

### **IBM, Google, Software AG, Rogue Wave Software, And WSO2 Lead The Pack**

Forrester's research uncovered a market in which IBM, Google, Software AG, Rogue Wave Software, and WSO2 are Leaders. TIBCO Software, Sensedia, Axway, Torry Harris Business Solutions, CA Technologies, Tyk Technologies, and MuleSoft are Strong Performers. Microsoft, Red Hat, and Oracle are Contenders.

### **AD&D Pros Need API-Based Agility To Propel Their Organizations To Digital Excellence**

The API management solutions market is growing because more AD&D pros see APIs as a critical foundation for agile software to support customer engagement, operational excellence, digital transformation, and business agility. They view API management solutions as foundations for secure and controlled connections within and across enterprise boundaries.

### **API User Engagement, API Design, Security, And Federation Are Important Differentiators**

API strategy sets the context for API management. An organization focused on one category of external API users (i.e., developers) may have narrow API management needs, but vendors that can provide API user engagement, deep API security, API design and governance, and operating models for federated partners and organizations best serve customers with multipronged API strategies.

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[A Developer's Guide To Forrester's Strategies For API Success](#)

[Four Steps For Building A Platform Business](#)

[Now Tech: API Management Solutions, Q4 2018](#)



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## API Management Is Critical Because APIs Drive Digital Business

APIs are a key foundation for digital transformation.<sup>1</sup> They drive optimized customer experiences, create integrated digital ecosystems across customers and partners, allow firms to benefit from the innovations of digital disruptors, drive operational excellence, and provide a foundation for platform business models.<sup>2</sup> Done right, APIs create business agility that fosters the rapid business reconfiguration necessary to continually adapt to an unknown future, revamp customer experience, address regulatory challenges, respond to new and changing competition, and react to a wide range of unpredictable scenarios.<sup>3</sup> API management solutions are central to managing the relationships between API providers and API users; AD&D pros should treat them as business applications that are critical to digital business success.

APIs create business agility that fosters the rapid business reconfiguration necessary to continually adapt to an unknown future of constant change.

### An API Management Solution Anchors An Organization's Strategic API Platform

Forrester identifies six major elements on a comprehensive API platform: API design and documentation, API creation and delivery, API testing, runtime service management, API life-cycle management, and API management.<sup>4</sup> Features and functionality of API management solutions vary widely in their scope and focus, and this is appropriate because enterprise API strategies vary widely. APIs are a means to many ends, and when an enterprise decides to become an API provider, it must decide which of those ends are important to its ongoing business success. These, in turn, focus API strategy on one or more of four major categories of APIs: internal, B2B, open web, and product APIs.<sup>5</sup> Each carries a different mix of requirements, and API provider organizations have multiple options for how to manage relationships with different groups and types of API users.

Varying vendor perspectives on these concerns lead to diverse product strategies, but at their core, API management solutions serve three major needs.

- › **Allowing API product managers to optimize value to the API provider.** Whatever the API use case, API providers can borrow from product management ideas and disciplines and manage their APIs as products — whether or not they intend to directly bring in revenue by charging for API use.<sup>6</sup> API management products provide one or more tools to define available APIs, set policies and limits for their use, analyze how developers use APIs, configure pricing and billing models and other usage parameters, and communicate and collaborate with API user and API creator communities.

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- › **Managing the relationship between API users and API providers.** API providers must fulfill four critical tasks. First, they must make it easy for API users — app developers internal or external to the API provider's organization — to access and understand how to use available APIs and write applications using APIs. Second, they must know and track who's using an API, typically by having them register for an API key. Third, they must communicate with API users, both individually and as communities. Finally, they must ensure that API users have the support they need to solve problems that arise, whether that support comes from the API provider or from other API users, such as through community discussion forums. API management products provide API user portals (AKA developer portals) with varying degrees of prebuilt capabilities for these requirements and more.
- › **Enforcing agreements on API use and security.** An API key is often only the first element of a provider's tracking of API use. API management products enforce the usage parameters that API providers and API users agree upon in a variety of ways, including the use of secure network connections (e.g., SSL or TLS), digital signatures, OAuth2 to allow the API provider's customers to authorize access to their data, and quotas and rate limits for how many API calls an API user can make. API management solutions use an API gateway — in most cases, one provided with the solution — to enforce security and access control. Increasingly, API gateways intersect with microservices, and vendors are responding by integrating with microservice frameworks (e.g., Consul, etcd, or Istio) and/or providing microgateways (although for some, their gateways are already light enough to be considered microgateways).

### Multiple Buying Scenarios Drive Diverse Requirements For API Management

The demands of digital business mean that most enterprises should become API providers, whether for internal use only, to enable better agility; for B2B integration; to enable dynamic ecosystems and value chains; for access by thousands of developers across the open web; or for opening products and services to direct control and configuration via product APIs.<sup>7</sup> When an organization's API strategy includes multiple such threads, satisfying diverse business scenarios requires that an API management solution have a wide variety of features. While there are many reasonable API strategy scenarios, Forrester identifies five major buying scenarios as examples to help clients understand and classify their needs.<sup>8</sup> Any individual API management solution may play well — or not — in any combination of these. An organization might want to:

- › **Build a broad open web community with simple, free REST APIs.** Like Facebook, Google, Twitter, and other big players, many organizations are building open web APIs in hopes of attracting large followings of independent developers. Often, a key goal is to grow existing revenue streams, either directly or indirectly. In this scenario, API strategies tend to focus heavily on simple REST APIs and rich portals to engage API users. Analytics are important to understanding who's using APIs and how. If an API allows access to data owned by the API provider's customers, OAuth2 is a common mechanism for allowing customers to authorize access to their data, but only a small number of API management solutions connect the dots of OAuth2 security specification into Forrester's model for closed-loop OAuth2.<sup>9</sup>

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- › **Support customer experience improvement with REST APIs.** Whether via mobile apps, chatbots, kiosks, websites, or other engagement channels, APIs are an important part of an enterprise customer experience strategy.<sup>10</sup> In this scenario, an organization may use API management as the coordination point for mobile app developers to create and consume APIs. Some API management solutions include additional value-added features related to mobile apps, such as authentication, push notifications, and geolocation support, allowing buyers to avoid acquiring a separate product for these functions.
- › **Facilitate governance and multiple API styles for an enterprise API strategy.** For more than a decade, enterprises have used SOAP and REST in their service-oriented architecture (SOA) strategies, along with application messaging such as AMQP and JMS.<sup>11</sup> Other API and messaging styles are taking hold, such as GraphQL, Kafka, MQTT, and WebSockets. API management solutions have varying levels of support for these. Some publish only REST APIs and may have limited support for even back-end connections to the others. The broadest solutions can help organizations govern a mature and disciplined service-based strategy that combines several styles.<sup>12</sup> For enterprise API governance, other important features include formal life-cycle management, support for multiple lines of business (LOBs), and integration with other elements of a comprehensive API platform.<sup>13</sup>
- › **Build a B2B community around mission-critical APIs.** Although API market attention centers heavily on open web APIs, the reference customers we spoke with for this Forrester Wave™ evaluation provide B2B APIs nearly 70% more often than open web APIs. APIs are a valuable addition to B2B integration strategies that may already include electronic data interchange (EDI), managed file transfer, and other digital interconnections. For API management, B2B scenarios increase the need to manage partner organizations, which may have many individual developers. They also require security federation for both portal users and API requests, more complex services with higher needs for security and integrity, and a broader range of messaging styles. Integration with trading partner management systems is a plus, but current API management solutions are light on this feature.
- › **Act as an API service provider that charges for API access.** Some organizations want to use the APIs themselves to create new sources of revenue. In this scenario, an API provider can either custom-build a billing solution or look to an API management solution for API pricing features and direct turnkey support for billing and credit card processing. Service provider scenarios tend to use simple REST APIs.

The reference customers we spoke with for this Forrester Wave evaluation employ B2B APIs nearly 70% more often than open web APIs.

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## API Management Solutions Evaluation Overview

To assess the state of the API management solutions market and see how the vendors stack up against each other, Forrester evaluated the strengths and weaknesses of top API management vendors. After examining past research, user need assessments, and vendor and expert interviews, we developed a comprehensive set of evaluation criteria. We evaluated vendors against 26 criteria, which we grouped into three high-level categories:

- › **Current offering.** Each vendor's position on the vertical axis of the Forrester Wave graphic indicates the relative strength of its current offering. Key criteria for these solutions include the flexibility and quality of its API user portal; the breadth and depth of tools for engaging with API users; API design, creation, and publishing features (including for non-REST APIs); delivery, version management, and team management; API policy and security; API product definition and billing; and flexibility for a variety of API-based ecosystems and business models, analytics, and product deployment models and options.
- › **Strategy.** Placement on the horizontal axis indicates the strength of the vendors' strategies. We evaluated the vendors' articulations of vision for business and technical factors surrounding APIs and thus driving requirements for API management, specific product enhancement plans (including both publicly known plans and plans disclosed to Forrester confidentially), and the commercial models by which customers may acquire the solutions.
- › **Market presence.** Represented by the size of the markers on the graphic, our market presence scores reflect each vendor's prospects for building a large installed base of customers (including both current customers and likely future customers, based on Forrester's insights into each vendor's market mindshare), and geographic presence, including the vendor's own global presence, the global footprint of its current software-as-a-service (SaaS) environment, and its ability to serve customers through services partners with presence around the globe.

### Evaluated Vendors And Inclusion Criteria

Forrester included 15 vendors in the assessment: Axway, CA Technologies, Google, IBM, Microsoft, MuleSoft, Oracle, Red Hat, Rogue Wave Software, Sensedia, Software AG, TIBCO Software, Torry Harris Business Solutions, Tyk Technologies, and WSO2.<sup>14</sup> Each of these vendors has (see Figure 1):

- › **A complete API management solution.** The vendor must offer a product or product bundle that has, at a minimum, all three core elements in Forrester's definition of API management: an API user portal (AKA developer portal) suitable for engaging an external developer audience; a business admin portal; and an API gateway. Some solutions provide additional components, such as API design tools, API development tools, integration platforms, runtime service management, microgateways, microservice products, or life-cycle management tooling.

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- › **A standalone API management solution.** The vendor's solution must be credible as a standalone product, separate from any associated platforms or products such as an integration product, application platform, or business application.<sup>15</sup> We made an exception for solutions that clients frequently ask about in Forrester inquiries.<sup>16</sup>
- › **At least 10 paying customers in production.** API management is a fast-changing space with several new players. To ensure a base level of industry experience with the solution, we require a minimum number of paying customers.

**FIGURE 1** Evaluated Vendors And Product Information

Vendor	Product evaluated
Axway	Axway AMPLIFY API Management
CA Technologies	CA API Management
Google	Apigee API Management Platform
IBM	IBM API Connect
Microsoft	Azure API Management
MuleSoft	Anypoint Platform
Oracle	Oracle API Platform Cloud Service
Red Hat	Red Hat 3scale API Management
Rogue Wave Software	Akana API Platform
Sensedia	Sensedia API Platform
Software AG	webMethods API Management Platform webMethods API Cloud
TIBCO Software	TIBCO Cloud Mashery
Torry Harris Business Solutions	API Connect
Tyk Technologies	Tyk Enterprise
WSO2	WSO2 API Management

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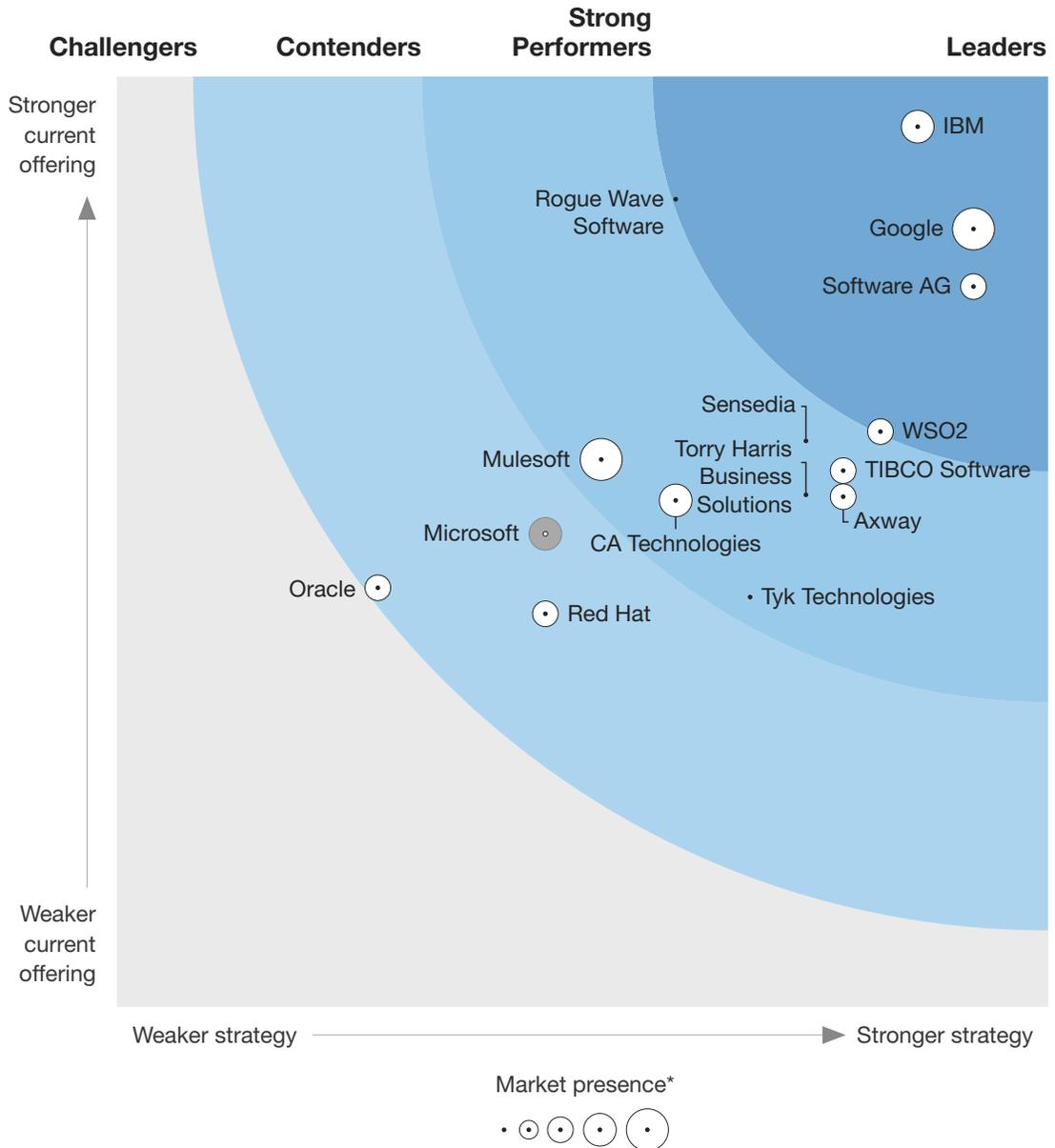
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## Vendor Profiles

We intend this evaluation of the API management solutions market to be a starting point only and 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 2 and see Figure 3). Click the link at the beginning of this report on Forrester.com to download the tool.

**FIGURE 2** Forrester Wave™: API Management Solutions, Q4 2018

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\*A gray marker indicates incomplete vendor participation.

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**FIGURE 3** Forrester Wave™: API Management Solutions Scorecard, Q4 2018

	Forrester's weighting	Axway	CA Technologies	Google	IBM	Microsoft*	MuleSoft	Oracle	Red Hat
<b>Current offering</b>	50%	2.74	2.72	4.18	4.73	2.54	2.94	2.25	2.11
Portal for API users	20%	3.00	3.00	5.00	5.00	2.20	1.80	3.00	2.20
API user engagement	22%	1.00	1.80	3.80	5.00	3.00	2.20	2.20	3.00
API design and publishing	18%	4.10	3.00	3.60	4.80	2.70	4.30	2.10	1.20
Delivery management	12%	2.10	3.00	3.90	4.70	2.55	3.80	2.70	1.95
API policy and security	15%	3.80	3.00	4.30	3.90	2.20	2.20	0.85	1.00
Ecosystems and commercial models	5%	2.40	2.70	4.70	4.40	1.60	3.80	3.00	3.30
Product architecture	8%	3.00	3.00	4.30	5.00	3.00	4.30	2.30	3.00
<b>Strategy</b>	50%	3.90	3.00	4.60	4.30	2.30	2.60	1.40	2.30
Product vision	35%	3.00	3.00	5.00	3.00	1.00	3.00	1.00	1.00
Planned enhancements	45%	5.00	3.00	5.00	5.00	3.00	3.00	1.00	3.00
Commercial model	20%	3.00	3.00	3.00	5.00	3.00	1.00	3.00	3.00
<b>Market presence</b>	0%	3.00	3.80	5.00	3.80	3.80	5.00	2.60	3.00
Number of customers	60%	3.00	3.00	5.00	3.00	3.00	5.00	1.00	3.00
Geographic presence	40%	3.00	5.00	5.00	5.00	5.00	5.00	5.00	3.00

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

\*Indicates a nonparticipating vendor.

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**FIGURE 3** Forrester Wave™: API Management Solutions Scorecard, Q4 2018 (Cont.)

	Forrester's weighting	Rogue Wave Software	Sensedia	Software AG	TIBCO Software	Torry Harris Business Solutions	Tyk Technologies	WSO2
<b>Current offering</b>	50%	4.34	3.04	3.87	2.88	2.75	2.20	3.09
Portal for API users	20%	5.00	4.20	3.80	3.00	3.00	2.20	3.00
API user engagement	22%	4.20	3.00	3.80	3.00	3.00	1.00	3.00
API design and publishing	18%	3.10	2.60	3.70	3.90	2.70	2.50	3.20
Delivery management	12%	4.40	3.00	5.00	1.60	1.90	1.95	3.30
API policy and security	15%	5.00	2.15	3.30	2.60	2.60	2.55	3.00
Ecosystems and commercial models	5%	4.70	3.00	3.30	1.90	3.00	2.55	3.30
Product architecture	8%	4.30	3.00	4.30	3.00	3.00	4.30	3.00
<b>Strategy</b>	50%	3.00	3.70	4.60	3.90	3.70	3.40	4.10
Product vision	35%	3.00	5.00	5.00	3.00	5.00	3.00	5.00
Planned enhancements	45%	3.00	3.00	5.00	5.00	3.00	3.00	3.00
Commercial model	20%	3.00	3.00	3.00	3.00	3.00	5.00	5.00
<b>Market presence</b>	0%	1.00	1.00	3.00	3.00	1.00	1.00	3.00
Number of customers	60%	1.00	1.00	3.00	3.00	1.00	1.00	3.00
Geographic presence	40%	1.00	1.00	3.00	3.00	1.00	1.00	3.00

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

**Leaders**

- › **IBM's overall product line breadth complements its API management leadership.** IBM's API management solution provides broad and deep functionality in many areas and thus can serve a wide variety of API strategies, although the vendor's vision should focus more on the intersection between business strategy and APIs. As a core element of IBM's portfolio of integration and cloud platform technologies, the solution and its microgateway can serve as the foundation for a comprehensive API platform. Particularly notable are the solution's features for defining groups and teams, which facilitate coordination of API publishing across LOBs and B2B partners. IBM provides a wide range of deployment options, including a free-forever tier of access. Its commercial models

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have a low-cost entry point and the flexibility to adapt to different customer needs and can retain a low-cost profile in high-volume deployments. For enterprise API governance scenarios, the solution provides basic built-in life-cycle management and a hierarchical tagging feature that's helpful for grouping API portfolios.

Overall, the reference customers provided by IBM are very satisfied with both vendor and product. On average, they've been in production for more than a year with self-managed deployments, using the solution for all four API categories. They make broad use of the solution's features and functions (except that none yet use the microgateway) and mostly are very satisfied with the product's detailed features and functions. Characteristic comments about IBM and its solution include: IBM is more of a partner than a vendor; its broad API platform and its value for money were key decision factors; it listens; it's investing rapidly in the solution; and it should focus more on business use cases than the technology.

- › **Google retains historic strengths, tying them to microservices and its cloud platform.** With its Apigee API management solution, Google continues with strong market presence, API business vision, and solution functionality. It's among the first solutions to directly integrate with microservices frameworks (e.g., Consul, Eureka, and Istio) for API enforcement and service discovery. For organizations that charge for APIs, Google has quite flexible features for defining a variety of billing strategies and provides out-of-the-box billing integration. It continues to develop Apigee's life-cycle management capabilities, increasing its ability to serve mature enterprise API governance scenarios. Digital transformation and API business strategy continue to be strong elements of the firm's API management vision, to which Google is coupling deeper integration into the Google Cloud Platform (GCP) ecosystem, most notably with GCP's analytics and intelligence capabilities.

Overall, the reference customers provided by Google are highly satisfied with its solution and moderately to very satisfied with the vendor. On average, they've been in production for at least two years with SaaS portal deployments, using the solution for all four API categories. They make broad use of the solution's features, except the microgateway, and they tend to be very to extremely satisfied with the product's detailed features and functions. Characteristic comments about Google and its solution include: Google has a comprehensive view of the industry, and this provides great value to customers' API strategies; its API billing is very flexible; and its out-of-the-box portal is limited and difficult to customize.

- › **Software AG's new architecture improves its ability to serve diverse API strategies.** With an improved product architecture and a new microgateway, Software AG's solution provides breadth of capability for many types of API strategies. Its communities feature and other capabilities provide flexibility for engaging API users in different ways. The solution has very strong life-cycle management that, because it's optional but well integrated with API admin and user portals, provides a solid foundation for mature and disciplined API programs. Software AG focuses specifically on the solution's ability to federate with other solutions, such as the ability for its API

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portal to publish APIs hosted in other firms' gateways. The vendor's articulation of the future for API management recognizes major forces like the need for dynamic ecosystems, business-focused API management, and diverse means of B2B integration, and its product enhancement plans reflect this.

Overall, the reference customers provided by Software AG are extremely satisfied with both vendor and product. On average, they've been in production for a year and a half with SaaS or self-managed deployments, using the solution for internal, B2B, and product APIs. They make broad use of the solution's features and functions, and they're very to extremely satisfied across all the product's detailed features and functions. Characteristic comments about Software AG and its solution include: Software AG is committed to customers' success; its integration platform was a key decision factor, along with its demilitarized zone (DMZ) security model (which does not require configuring firewall holes); and its product is easy to use.

- › **Rogue Wave Software's Akana has a strong feature set but inconsistent support.** Akana has particularly strong API security and policy capabilities and good breadth across most all of our evaluation criteria. Its API user portal is among the most configurable and extensible. It doesn't have a microgateway, but the vendor plans to build direct integration with microservices frameworks. Akana's configurable life-cycle framework continues to be a strong foundation for building mature support for a variety of federated API strategies and ecosystems. In addition, the solution's licenses feature provides great flexibility to support different API ownership, visibility, and subscription models. That said, both add complexity to the solution, and the vendor plans to simplify them. As an example of the solution's depth, Akana is one of the few solutions that implements Forrester's view of closed-loop OAuth2 policy specification, which reduces the potential for errors that provide greater (or less) data access than intended.

Overall, the reference customers provided by Rogue Wave Software expressed moderate satisfaction with its solution and low satisfaction with the vendor. On average, they've been in production for at least two years with both SaaS and self-managed deployments, using the solution for all four API categories. They use most of the solution's features, and they express mixed satisfaction across the product's detailed features and functions but are sometimes very satisfied. Characteristic comments about Rogue Wave Software and its solution include: The broad feature set and deep security capabilities were key decision factors; Rogue Wave's licenses feature provides strong flexibility for API product management; the solution is complex to install and configure; the solution supports high traffic volumes well; the vendor struggles to handle support request volumes; and the vendor has been slow to address certain enhancements but is working through these items on its road map.

- › **WSO2's open source solution provides a solid base for a variety of API strategies.** As the only fully open source solution in our Forrester Wave analysis, WSO2 provides good breadth across all evaluation criteria. Particular strengths include formal life-cycle management and non-REST APIs, both of which facilitate mature and disciplined enterprise API strategies. Across other areas, WSO2's solution typically provides flexibility to address a variety of approaches to APIs. Examples

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include hierarchical tagging, configurable portal navigation, separate API keys for sandbox and production use, API-specific discussion forums, configurable API user metadata, WebSockets support, and conditional rate limiting. Its microgateway provides a labeling feature that simplifies management of groups of APIs. The solution doesn't yet have a feature for packaging APIs into API products. WSO2's future vision centers on digital ecosystems and changing solution architectures (e.g., microservices and low-code).

Overall, the reference customers provided by WSO2 are highly satisfied with its solution and very satisfied with the vendor. On average, they've been in production for at least two and a half years with self-managed or vendor hosted deployments, using the solution for internal, B2B, and product APIs. They don't always use the solution's full feature set, but they tend to be very to extremely satisfied with the product's detailed features and functions that they do use. Characteristic comments about WSO2 and its solution include: WSO2's open source foundation makes the solution very affordable while also having features comparable with those of others; its partnership attitude inspires confidence and trust; the solution is easy to use, even if documentation isn't always clear and thorough; and the analytics are somewhat basic.

**Strong Performers**

- › **TIBCO Software has strong microgateway and integration but average other features.** With Flogo, the open source foundation of its microgateway, TIBCO Software opened a new direction in its overall strategy and architecture. This includes tighter integration between its cloud integration platform and API management while maintaining clean layering between the two. On the whole, it provides a solid, average feature set with strong API proxy creation features and good support for non-REST APIs (e.g., GraphQL, SOAP, and WebSockets). Its configurable portal, user engagement tools, and analytics make it strong for open web API user scenarios, and good API product definition builds on this foundation. Although Mashery provides no out-of-the-box formal life-cycle management, its Digital Business Process Automation Add On provides a strong base for building custom life cycles to serve enterprise API governance scenarios. TIBCO's future plans include greater use of AI within API management, native OpenAPI support, and portal-level publishing of streams and events.

Overall, the reference customers provided by TIBCO Software are highly satisfied with its solution and very satisfied with the vendor. On average, they've been in production for about two years with a mix of SaaS, hosted, and self-managed deployments, using it for all four API categories. They make broad use of the solution's features and functions (except for the microgateway), and they express mixed satisfaction with the product's detailed features and functions but mostly are very to extremely satisfied. Characteristic comments about TIBCO Software and its solution include: The developer portal and integration platform are key decision factors; customers want faster movement toward OpenAPI spec (away from Mashery's I/O Docs); some API security features are missing or need custom configuration; and the vendor's partnership attitude and support are strong.

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**› Sensedia has a strong portal, API products, and governance but limited geopresence.**

Based in Brazil, Sensedia has historically served the Latin American market, but it's beginning to make inroads in Europe. Its solution fares well across most of our evaluation criteria, with its best strength in API user portal customization (based on Drupal). Focusing mostly on REST API publishing, the solution embeds Apache Camel for integration flows and for leveraging SOAP APIs, creating APIs from databases, and connecting to other non-REST back ends. Beyond REST, Sensedia is one of the early vendors to support publishing GraphQL and WebSockets APIs. The solution provides formal life-cycle management via its API repository, so it serves well for mature and disciplined enterprise API strategies — and the vendor plans to enhance these capabilities to make them easier to use. Other notable features include a flexible way to define billing hits, a microgateway, quotas and limits based on data volumes, and API product packaging with built-in billing integration.

Overall, the reference customers provided by Sensedia are extremely satisfied with both vendor and product. On average, they've been in production for about a year and a half with SaaS or self-managed deployments, using the solution for all four API categories. They make broad use of the solution's features and functions, and they express mixed satisfaction with the product's detailed features and functions but are often very satisfied. Characteristic comments about Sensedia and its solution include: Sensedia's implementation is easy: support is very good: and the analytics need improvement.

**› Axway is almost there with microservices integration and a fully SaaS solution.** Our Forrester Wave evaluation caught Axway just prior to a major upgrade in its solution. Thus, its AMPLIFY API Management solution will soon have a fully SaaS implementation (versus managed hosting now) and a good architecture for direct integration with microservices frameworks like Istio. Its current strengths include its API design (it resells Stoplight), its API proxy creation (via both its traditional gateway and its API Builder), the breadth and depth of its API policy, and its non-REST API support. Building on the security federation in its gateway and its portal's ability to combine APIs from multiple catalogs, the solution provides a good foundation for a variety of API ecosystem models. Its portal is based on Joomla, and the Joomla ecosystem provides many extensions that may help with API user engagement, but rather than integrating these out-of-the-box, Axway's strategy is to let customers choose and integrate the ones they want.

Overall, the reference customers provided by Axway are extremely satisfied with the vendor and highly satisfied with its solution — although not all are in production yet. They all intend self-managed productions, using the solution for all four API categories. Mostly, they make broad use of the solution's features and functions, and they're moderately to very satisfied with the product's detailed features and functions. Characteristic comments about Axway and its solution include: It's a reliable and proven on-premises solution; the vendor is very responsive to customer needs, but its implementation support gets mixed reviews; its gateway provides strong security; and the solution is robust and reliable.

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- › **Torry Harris Business Solutions' systems integration services add value.** Torry Harris Business Solutions is a full-fledged systems integrator that treats its API management solution as a versioned, supported product. This provides a strong combination of broad out-of-the-box product features and innovative API strategy and delivery skills. Its product strategy is driven by a vision for platform business models and disruptive ecosystems. This, in turn, is exemplified by a corollary product, Digit Market (not part of this evaluation), which wraps the API management core with additional marketplace capabilities. Its API management solution provides a solid, average base of feature-function that fares well in many of our evaluation criteria, and it has a flexible way of connecting API documentation into the portal that can support multiple ways of managing API documentation. Torry Harris productizes multiple other elements useful to an API platform, such as API testing tools, a repository, build tools, documentation authoring, and API business strategy planning.

Overall, the reference customers provided by Torry Harris Business Solutions are very satisfied with both vendor and product. On average, they've been in production for less than a year with self-managed installations, using the solution for all four API categories. They make broad use of the solution's features and functions, and they tend to be very to extremely satisfied with the product's detailed features and functions. Characteristic comments about Torry Harris and its solution include: The vendor has strong knowledge and experience in API management and SOA governance; the product is good but has places where it needs improvement; and the gateway provides strong security integration.

- › **CA Technologies continues its gateway strength while its portal is in transition.** CA Technologies is in the process of upgrading the architecture foundation for its API portal, and the new version is as yet incomplete. The vendor allows customers to buy either the emerging new and strategic version or the "classic" version (fully supported but no longer enhanced), which currently has a richer set of features for portal customization, API user engagement, definition of API plans and groups, SOAP API support, and quota definition. The firm's stated intent is to carry forward most or all classic functionality into comparable features in its new architecture. CA Technologies' Live API Creator provides a low-code approach to creation of APIs and API proxies. Its microgateway is a slimmed-down version of its main gateway, which allows it to support many of the same policy definitions, yet it has a large memory footprint compared with other microgateways. The main gateway remains a key strength both for its core API and messaging security features and for its strong support for mobile-related functionality.

Overall, the reference customers provided by CA Technologies are very satisfied with both vendor and product. On average, they've been in production for two and a half years with self-managed deployments, using the solution for all four API categories. They make broad use of the solutions' features and functions, and they're moderately to very satisfied with the product's detailed features and functions. Characteristic comments about CA and its solution include: Its gateway core is robust and mature; the solution's value for money is good; its portal strategy has been confusing but is coming together over time; policy creation can be complex; and vendor support is strong.

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- › **Tyk Technologies focuses on core API management at the expense of portal features.** Tyk Technologies' most consistent strengths are in API policy, API security, REST API design, and API documentation. Compared with others, Tyk intentionally invests relatively little in features for portal customization, tools for API users, API user engagement, partner federation, and non-REST APIs. This makes its solution a good choice for organizations that anticipate heavy customization and branding in the developer experience delivered by their API user portal. Tyk's main gateway is light enough to call it a microgateway, and it provides native support for microservice frameworks like Consul, etcd, and Eureka. Although it's a small vendor, it's gaining credibility with large enterprise customers, has a growing geographic presence, and is enhancing its roster of small-to-midsize SI partners. Tyk's future strategy looks beyond REST APIs (e.g., gRPC and internet-of-things [IoT] protocols) and focuses on infrastructure-as-code for API management. It's among the most affordable solutions in this evaluation.

Overall, the reference customers provided by Tyk are extremely satisfied with the vendor and moderately satisfied with its solution. On average, they've been in production for about two years with SaaS or self-managed deployments, using the solution for all four API categories. They make broad use of the solution's features and functions except for the API user portal, and they express mixed satisfaction across the product's detailed features and functions but are sometimes very satisfied. Characteristic comments about Tyk and its solution include: Its open source foundation was an important decision factor; the vendor is keen to partner with customers on product strategy; it fits well in continuous integration and continuous deployment (CI/CD) scenarios; API product configuration is a bit convoluted; analytics are basic at best; and implementation was straightforward.

- › **MuleSoft excels at API design and proxies but lags on API product management.** With historical roots as an enterprise service bus (ESB), MuleSoft builds its API management solution on a strong service creation foundation. It has strong design tooling, flexible API documentation, and the power of a full ESB-based integration engine for building APIs and API proxies. Its API security policy, API product, and API user engagement features don't run as deep as those of others, but it's investing in each of these areas. Its design tools can specify API fragments, such as entity schemas, that may be included in multiple APIs. A business groups feature provides a hierarchical organization structure for both complex enterprise scenarios (e.g., federated publishing across LOBs) and B2B partner scenarios. A visualizer tool shows dependencies between APIs that can include runtime monitoring data in its dependency graphs. Its strong versioning features include built-in Maven support, and "API notebooks" allow API providers to interactively show multiple APIs working together.

Overall, the reference customers provided by MuleSoft are very satisfied with both vendor and product. On average, they've been in production for at least two years with SaaS deployments, using the solution for all four API categories. They make broad use of the solution's features and functions, and they express mixed satisfaction across the product's detailed features and functions but are sometimes very satisfied. Characteristic comments about MuleSoft and its solution include: The

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solution's integration capabilities were an important decision factor; the API user portal is lacking on content management and other features to make it more flexible to meet different scenarios; proxies are easy to set up, but some security policies are lacking; and implementation is easy.

**Contenders**

- › **Microsoft serves Azure customers with basic, integrated API management.** Azure API Management provides good API design and documentation as a foundation for serving Azure customers with a basic API management feature set. The solution supports publishing both REST and SOAP APIs and integrates with many Azure services for API implementation. Its API policy support is code-based, meaning that API creators must craft XML files that specify sequences of policies to be executed (the code may also be edited via a form-based model). Across several areas of our evaluation criteria, the solution provides useful features like tags, API mocking, and portal customization via the embedded Orchard content management, but on the whole, the solution is best for customers already on Azure rather than being attractive on its own. Future plans include a self-hosted API gateway (useful for hybrid deployments) and deeper support for serverless models.

Because Microsoft declined to participate in our evaluation, it provided no reference customers. Scores are based on Forrester estimates.

- › **Red Hat's focused API strengths are as yet not integrated with its broader platform.** Red Hat's 3scale continues its focused historical strengths in defining API products; publishing them with a good API user portal; and optionally charging for API usage with its built-in flexible billing models, including a flexible way to specify billing hits. In addition, 3scale has a flexible architecture for policy enforcement, including the ability to embed enforcement inside a Java application and a gateway light enough to serve as a microgateway. Since Red Hat acquired 3scale, it has expanded the strategy to include integration (Fuse), API design (Apicurio), API mocking (Microcks), and a microservices foundation (OpenShift). As yet, these elements are not well integrated, but further work is in Red Hat's product plans. Still, the individual elements provide good functionality that strengthens the 3scale base. Future plans for Red Hat include asynchronous APIs and API management-as-code, by which it means allowing all elements of solution configuration to be controllable as versionable files.

Overall, the reference customers provided by Red Hat are very satisfied with its solution and moderately to very satisfied with the vendor. On average, they've been in production for just under two years with SaaS and self-managed deployments, using the solution for all four API categories. They make broad use of the solution's features and functions except for API products, and they express mixed satisfaction across the product's detailed features and functions but are often very satisfied. Characteristic comments about Red Hat and its solution include: The solution needs

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more role-based access control; API pricing and packaging is flexible; overall, the admin portal is easy to use, but API proxy configuration can be confusing and requires special skills (programming in Lua); and analytics need improvement.

- › **Oracle has strong API design and integration but thin API security and management.** Oracle has been slow to build its API management capabilities, but it took a strong step forward with its acquisition of Apiary. Although Apiary centers on API design, not full API management, it provides a strong foundation to build from in terms of API design capability and prospects for upselling to its full API management solution. Across the solution, Oracle has a fair bit of catching up to do, but bright spots include its integration with the Oracle Cloud platform, especially integration and identity services. One of Apiary's unique features is its style guide — a policy engine for validating API designs against a variety of customizable rules. Besides Apiary, Oracle's major focus thus far has been on the server side of its API management solution. As yet, Oracle's API user portal is, in essence, a sample application that customers use as a starting point, running it either on-premises or in Oracle's cloud. Future plans include deeper integration between the solution's elements and richer API user portal features.

Overall, the reference customers provided by Oracle are highly satisfied with its solution and moderately satisfied with the vendor. On average, they've been in production for less than a year with SaaS and self-managed deployments, using the solution for internal, B2B, and product APIs. They make broad use of the solution's features and functions, and they're moderately satisfied with the product's detailed features and functions. Characteristic comments about Oracle and its solution include: The solution's API design functions are very strong; its gateway is flexible; API product features are weak; analytics are basic; and its API portal is weak — but reference customers also say that Oracle is catching up quickly to other solutions.

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## Supplemental Material

### Online Resource

The online version of Figure 2 is an Excel-based vendor comparison tool that provides detailed product evaluations and customizable rankings. Click the link at the beginning of this report on Forrester.com to download the tool.

### Data Sources Used In This Forrester Wave

Forrester used a combination of five 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 concerning the solution version generally available to customers as of August 3, 2018. Our data sources included:

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- › **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 where necessary to gather details of vendor qualifications.
- › **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.
- › **Strategy briefing.** We asked each vendor to provide a briefing on its firm's vision, strategy, execution, and market approach.
- › **Customer reference calls.** To validate product and vendor qualifications, Forrester also conducted reference calls with three of each vendor's current customers.
- › **Product documentation.** To supplement and validate findings from the above sources, we conducted our own research on product features and functions using vendors' online product documentation.

**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. Vendors marked as incomplete participants met our defined inclusion criteria but declined to participate or contributed only partially to the 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. 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.

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## Integrity Policy

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

## Endnotes

- <sup>1</sup> While it's true that transforming to realize the benefits of digital business requires specific initiatives such as mobile apps, IoT, and predictive analytics, it's a mistake to frame one's transformation around such initiatives. Instead, focus on a more critical and fundamental reality that runs underneath all of them: the need to prepare for an unknown future of continuous business and technology change. See the Forrester report "[APIs Underpin A Digital Business Platform.](#)"
- <sup>2</sup> Software is critical to the platform business models that digital-first execs across industries from accounting to transportation are pursuing. Beyond delivering the immediate customer value these leaders envision, AD&D pros can also deliver a platform business need that execs are likely to miss: Software architecture determines how well a platform business can adapt to the inevitable twists, turns, and surprises it will face. Forrester outlines four steps for building a platform business with an architecture to enable disruptive change. See the Forrester report "[Four Steps For Building A Platform Business.](#)"
- <sup>3</sup> As industry disruptions go, new government regulations come with long lead times, but executives still can choose shortsighted responses focused solely on regulatory demands. A better response is to use changing regulations — and other disruptions — as opportunities to advance API strategy and digital business transformation. Forrester uses upcoming regulation for European banks (specifically, PSD2) as a demonstration of how, with good API strategy, AD&D leaders can help their organizations turn disruptions into business opportunities. See the Forrester report "[APIs Turn Disruptions Into Business Opportunities.](#)"
- <sup>4</sup> Forrester provides descriptions of these six API platform elements along with their relationships to key organizational roles. See the Forrester report "[A Developer's Guide To Forrester's Strategies For API Success.](#)"
- <sup>5</sup> Neither eBusiness nor technology management teams can build a successful API strategy in isolation — collaboration is key, and four categories of APIs underpin different focal points for API strategy. See the Forrester report "[Brief: Four Ways APIs Are Changing Your Business.](#)"
- <sup>6</sup> Clients sometimes ask Forrester, "How are enterprises monetizing APIs?" What they're really asking is, "How are enterprises charging for API usage?" This is certainly a useful question, but monetizing APIs is a much bigger concept. See the Forrester report "[Monetizing APIs: Help Execs Think Bigger, And Drive More Revenue.](#)"
- <sup>7</sup> Forrester's scenarios here don't explicitly call out the API category of product APIs. However, these might be represented in any of the scenarios. Product APIs are an important perspective, especially during the early stages of an API strategy, wherein an organization is striving for creativity about what kinds of APIs it might have. See the Forrester report "[Brief: Product APIs Create Distinct Customer Value And Opportunity](#)" and see the Forrester report "[Keep API Strategy On Track With An API Taxonomy.](#)"
- <sup>8</sup> As background to Forrester's creation of the scenarios in this section, see the Forrester report "[Establish Your API Design Strategy.](#)"
- <sup>9</sup> In our evaluation, Forrester examined features for implementing a particular aspect of stringent control, for which we coined the term "closed-loop OAuth 2." To qualify for this, the solution must act as both OAuth2 authorization server and OAuth2 resource server, and it must connect three dots relating to specification of OAuth2 policy. First, OAuth scope names must be specified in direct association with the definition of specific API calls. Second, meaningful scope descriptions must be specified only once and in direct association with scope names. Third, when an API user's application requests access to data through an API, the authorization dialog that the API management solution presents to a resource owner (e.g., an API provider's customer) must use the scope name(s) requested by the application to

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retrieve the specified scope description(s) for display and acceptance by the resource owner. Closing this loop lowers the risk of OAuth2 misconfigurations that result in mistaken resource owner authorizations (e.g., a customer authorizing “account read” access when the OAuth2 scope actually allows reading transaction history as well).

- <sup>10</sup> Mobile apps are a critical channel for customer engagement and business process improvement, and it’s clear that mobile apps need APIs to access business data and transactions. The problem for AD&D pros is how to design these APIs. See the Forrester report “[How To Design APIs For Mobile.](#)”
- <sup>11</sup> AMQP stands for advanced message queuing protocol; JMS stands for Java message service.
- <sup>12</sup> Although many voices in the market speak as though SOA implies SOAP and APIs are always REST, this isn’t true. Both SOAP and REST may be used with both SOA and APIs. Indeed, there’s no clear definition of the distinction between SOA and APIs that holds across the market. Forrester makes the distinction that SOA is for creating core business flexibility and APIs are for extending the reach of an agile business to many new contexts. SOA and APIs share a strong core of best practices for maturity as well as having some unique aspects. See the Forrester report “[Drive Business Agility And Value By Increasing Your API And SOA Maturity.](#)”
- <sup>13</sup> Forrester finds that the term “API life-cycle management” is frequently misused in the industry. When using this term, many vendors mean only that they provide tools that help at different points of the API life cycle, such as design, testing, and runtime security. Forrester would call this merely “life-cycle support.” By contrast, formal life-cycle management provides definitions of the sequence of steps in an API life cycle and controls or approvals for whether and how an APIs will advance from one life-cycle stage to the next. Only a few of the available API management solutions include strong support for formal life-cycle management.
- <sup>14</sup> We invited Kong to participate, but the vendor declined. Because our volume of client inquiries about Kong is low, we decided not to include it as a nonparticipating vendor.
- <sup>15</sup> In other words, it must be credible for prospects to include on their shortlists, even if it is the only product they would buy from the vendor.
- <sup>16</sup> Although Forrester classifies Microsoft’s API management solution as an embedded API management solution (i.e., one that is closely associated with a vendor’s core product or platform, making it most attractive to buyers that are current or prospective customers of that product or platform), many Forrester clients consider Microsoft in their evaluations. Compared with the other embedded API management players (e.g., SAP), Microsoft attracts this attention because of its greater standing in the industry as a global cloud platform. Amazon Web Services, Google, and Microsoft stand out as Leaders in our related Forrester Wave analysis, so many developers ask about Azure API Management. See the Forrester report “[The Forrester Wave™: Development-Only Public Cloud Platforms, North America, Q2 2018.](#)”

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