The API is taking on new roles and is becoming critical to important technologies such as cloud computing and to the use of both Web and mobile applications.

The API has long been considered an important but routine technology used for writing software and for enabling applications to communicate and interact with resources such as operating systems and other programs.

Now, though, the API is taking on many new roles and is becoming what some experts consider to be among today’s most important technologies.

APIs are now crucial to important approaches such as cloud computing, mobile and Web technologies, machine-to-machine (M2M) communications, and analytics.

For example, many companies—including Facebook and Google—are using APIs to make their websites, applications, and data available as a platform to other businesses for use in providing their own services, such as analytics based on Facebook trends.

In addition, APIs enable people to share photos from websites such as Flickr with sites like Facebook, or even embed video from one site on another.

To meet these types of needs, developers have written and released hundreds of new APIs during the past couple of years.

ProgrammableWeb—a site that provides information about APIs, mashups, and the Web as platform—currently tracks 9,175 APIs, compared to just 6,000 a year ago.

Meanwhile, developers are deploying APIs in new ways, which are covered in the “API Implementation Trends” sidebar.

WHAT’S UP WITH THE API?

Today, developers are creating APIs that can be used in new settings.

“APIs are enabling hundreds of companies to expand the scope of what they do in the digital economy by allowing the creation of apps and by allowing integration with partners and customers that was much more difficult before,” said Greg Brail, chief technology officer of API services provider Apigee.

“Since APIs have been a feature in software development for so long, why is it important to focus on them now?” asked Carnegie Mellon University professor Bill Scherlis, director of CMU’s Institute for Software Research. “The answer is that, in recent years, we have been experiencing some important shifts in the technical underpinnings of APIs and, consequently, what is possible to do with them.”

He continued, “These shifts include improvements in the capacity to express and deliver increasingly complex services through APIs, the ability to help developers effectively exploit services delivered through APIs, … and how we can more effectively evolve APIs.”

And now, he said, modern APIs support the software frameworks that are at the core of complex and diverse ecosystems in such important areas as mobile applications, Web applications, big data analytics, enterprise resource planning, and cloud-based services.

Mobile APIs

The increasing popularity of wireless technology has led to the creation of many mobile applications. They have become powerful drivers for API development and adoption, explained Apigee’s Brail.
This is the case in part because an API is the simplest way for a mobile application to communicate with a back-end server and because any mobile OS can make API calls without special software, he noted.

In addition, most companies must support several mobile platforms. You want them all to communicate the same way, Brail said, and APIs enable this.

Developers must build APIs differently for mobile technology. For example, because wireless devices have limited computing, storage, and battery resources, the API responses they receive should entail less data to process.

“Compared to desktop apps or Web apps, mobile apps have less Internet bandwidth and higher network latency, and work with a slower CPU,” Brail said. “That means that the fewer API calls the app makes, the smaller their content. And the faster that API calls return, the better the app can perform.”

Also, said Delyn Simons, vice president, developer platform, for Mashery, an API infrastructure provider, mobile applications often take advantage of push alerts and location-aware alerts, so they need APIs that let developers smoothly pass along such notifications.

Web APIs

The growth of Web applications—including those that interact with multiple online resources—has made Web APIs important.

Some of the most widely used Web APIs are found on social-networking, music, e-commerce, and mapping sites.

Among the most popular Web APIs are those that work with Google Maps, Google Search, Twitter, YouTube, Flickr, Amazon, Twilio, Facebook, eBay, and Last.fm.

“Some companies, like Twitter and Facebook, have rich APIs around their data,” said Paul Lamere, director of development platforms for The Echo’s Nest, a music-intelligence platform company.

For example, there are hundreds of companies whose existence depends on using APIs to access Twitter data, he noted. These companies analyze the data and provide individuals and organizations with information about their reputation on the social-networking site.

API IMPLEMENTATION TRENDS

The many new ways in which APIs are being used has led to new trends in the way they are being implemented.

API frameworks

Writing complex APIs can be difficult, so many developers use prewritten libraries for some elements. This bypasses the complexities they would face in creating the elements themselves.

A new trend is the development of API frameworks, which include even more built-in functionality and infrastructure than libraries, said Carnegie Mellon University professor Bill Scherlis, director of the school’s Institute for Software Research.

“The client developer loses flexibility,” he noted, “but gains in the confidence that the overall architectural approach embodied in the framework will solve the problem.”

“The bottom line,” he said, “is that the users of modern APIs are able to rely increasingly on architectural and flow decisions made by framework designers, lessening both the effort required to get apps working and also the risk associated with architectural decision making for those apps.”

Aggregation

Working with individual APIs might be relatively simple, but application development that entails multiple APIs—such as those for storage, email, multimedia, and voice services—can be complex, costly, and time-consuming.

In response, a new trend is to aggregate multiple APIs into a single stack. This helps developers by, for example, providing them with one interface and one set of objects to work with for the entire stack.

Back end as a service

Many companies are API-enabling their back-end systems. This makes the systems more accessible and usable, not just by the organizations’ own applications but also by software that partners and outside developers build.

Back end as a service (BaaS) provides a unified way for Web- and mobile-application developers to connect their programs to cloud services.

The approach provides an interface and other capabilities that let developers more easily set up, use, and operate a cloud back end for these applications. In essence, the approach introduces the cloud-services architecture to back-end processing.

Unlike middleware, which integrates back-end services to an application via a server, BaaS accomplishes this via the cloud, eliminating the need for developers to manually incorporate the APIs of each service individually.

Specifically, BaaS connects to back-end APIs and lets Web- and mobile-application developers link their programs to services such as cloud storage and integrate them with social networks.

API service providers

Many companies do all API-related work themselves. However, there are now service providers that can help businesses plan, deploy, launch, and manage their API infrastructure.

These providers make it easier for companies to deliver APIs to partners, developers, and others.

These APIs could also let a business make money by providing other organizations with access to its resources, at a cost.

API service providers include SOA Software, Layer 7 Technologies, Axway, Apigee, Mashery, Socrata, WebServius, Mashape, and Apiary.
Also, said Scott Morrison, chief technology officer at Layer 7 Technologies, a provider of security and management products for API-driven integrations, “APIs are a new approach to integrated distributed applications that leverage the basic architecture of the Web.”

He said, “APIs are exploding right now because modern Internet applications are no longer monolithic but instead build on functionality that already exists on the Web. For example, a travel website might incorporate maps from Google. It acquires these maps using APIs.”

Cloud computing

Cloud computing is fundamentally a distributed technology, noted Layer 7’s Morrison.

“APIs are the preferred modern approach to integrating distributed applications on the Internet,” he explained. “so the cloud makes extensive use of them.”

APIs flexibly let developers make available the various distributed resources with which cloud computing works, noted Peter Biddle, general manager for Intel’s cloud services platform.

Another advantage, said Morrison, is that “the API approach

passes through their APIs, said Layer 7’s Morrison.

In some cases, the API infrastructure can be programmed with additional knowledge about the API calls, which could be used to extract even more business-specific information, explained Apigee’s Brail.

M2M

APIs are playing a critical role in M2M communications, which is becoming increasingly important in many settings that benefit from systems being able to talk directly with one another.

For example, smart utility meters must communicate directly with appliances and home systems to enable the meters to receive power-usage information and then adjust operations to avoid excessive energy consumption.

For this to work, M2M systems must be able to handle unpredictable demand and usage patterns as their APIs connect to social networks and to a growing number of other organizations.

“One issue is to consider what the API touches on the back end,” said Apigee’s Brail. “Many corporate systems were not designed to be accessed by tens of thousands of clients from around the world, so it’s not as simple as just opening the firewall to them from the Inter-

Today, developers are creating APIs that can be used in new settings.

By enabling access to other resources, Web APIs let developers build webpages and Web applications with advanced functionality and features, more interactivity, and higher customization levels than widgets provide.

For communications, Web APIs have typically used SOAP, a client-server protocol that sends and receives data in an XML-based format.

Now, though, they are increasingly utilizing Representational State Transfer (REST), a simpler, distributed-system framework that uses various Web protocols and technologies to retrieve data from websites.

“The biggest difference between legacy SOAP Web services and today’s RESTful APIs is [the latter’s] simplicity,” noted Mashery’s Simons. “As Web APIs have become easier to work with, they have become more accessible to more developers. The time it takes to get a developer onboard with an API has been greatly reduced.”

Analytics

As more corporate data flows through APIs, they become an effective, centralized setting for analytics.

Organizations can apply analytics to all the data that
net. Rather, it’s important to have a layer in front that can control how much traffic gets to the back end.

Some companies are becoming less willing to share the data that other companies currently access via APIs, making APIs less useful, noted The Echo’s Nest’s Lamere. These companies consider the data to be valuable and prefer to keep it in-house, he explained.

Said CMU’s Scherlis, “[API] progress is likely to continue at a rapid pace over the next five to 10 years. APIs will become more expressive, with a broader range of granularity and a higher level of capability, and with cleaner abstractions.”

“As APIs have become the dominant way to build back ends for mobile apps, we will see APIs continue to replace older integration and middleware architectures,” said Apigee’s Brail.

“APIs are making it simple and easy for developers to create useful applications using data from private and public cloud platforms,” said Intel’s Biddle. “APIs that are too difficult to work with are their own barrier to adoption. Thus, elegant, attractive APIs and associated services will naturally win out.”

“The important new role for APIs will be talking to connected devices such as cars, refrigerators, ticket kiosks, home security, electronic billboards at gas pumps, or in elevators, all of which will combine to create the Internet of Things,” said Mashery’s Simons.

“As more and more businesses provide direct, real-time access to meaningful information and services, entirely new service categories and user experiences are likely to emerge,” said Biddle. “This presents an enormous opportunity for established enterprises to leverage their reach and more nimble startups to capitalize on their vision.”

As this occurs, though, he warned. “We must be vigilant and impeccable in respecting privacy and personal data. It’s crucial that we build trust and security into everything we do at the deepest levels, and put users in ultimate, irrevocable control over their personal data and how it is used or shared.”

“The modern API movement succeeds because APIs are simple and accessible and tap directly into existing expertise in building Web apps,” said Layer 7’s Morrison. “The low barrier to entry that APIs put up—literally, all a developer needs to start working is a text editor and a browser—is an incredibly important reason for their success.”

“The future looks bright for APIs. When we created the Web, we finally got something right with building scalable distributed systems,” he continued. “APIs are about leveraging this beyond simple browser-based communications. This is how it will be done today and in the future.”

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