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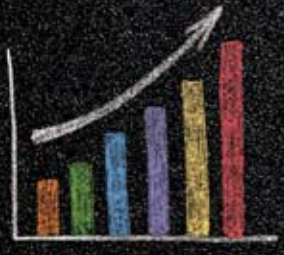

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EDITORIAL

EDITOR-IN-CHIEF
David Rubinstein
631-421-4158 x105
drubinstein@bzmedia.com

SOCIAL MEDIA AND ONLINE EDITORS
Christina Cardoza • ccardoza@bzmedia.com
Madison Moore • mmoore@bzmedia.com

SENIOR ART DIRECTOR
Mara Leonardi • mleonardi@bzmedia.com

CONTRIBUTING WRITERS
Lisa Morgan, Alexandra Weber Morales, Frank J. Ohlhorst

CONTRIBUTING ANALYSTS
Rob Enderle, Michael Facemire, Mike Gualtieri, Al Hilwa, Peter Thorne

CUSTOMER SERVICE

SUBSCRIPTIONS
subscriptions@bzmedia.com

ADVERTISING TRAFFIC
Mara Leonardi • mleonardi@bzmedia.com

LIST SERVICES
Shauna Koehler • skoehler@bzmedia.com

REPRINTS
Stacy Burris • sburris@bzmedia.com

ACCOUNTING
Viena Ludewig
631-421-4158 x110 • vludewig@bzmedia.com

ADVERTISING SALES

PUBLISHER
David Lyman
978-465-2351
dlyman@bzmedia.com

WESTERN U.S., WESTERN CANADA, EASTERN ASIA, AUSTRALIA, INDIA
Paula F. Miller
925-831-3803
pmiller@bzmedia.com

EASTERN U.S., EASTERN CANADA, EUROPE, MIDDLE EAST, WESTERN ASIA
Jonathan Sawyer
603-924-4489
jsawyer@bzmedia.com

PUBLISHING DIRECTOR
Ted Bahr
631-421-4158 x101 • ted@bzmedia.com

BZ Media

PRESIDENT Ted Bahr
FOUNDING EDITOR Alan Zeichick

BZ MEDIA LLC
225 Broadhollow Road, Suite 211
Melville, NY 11747
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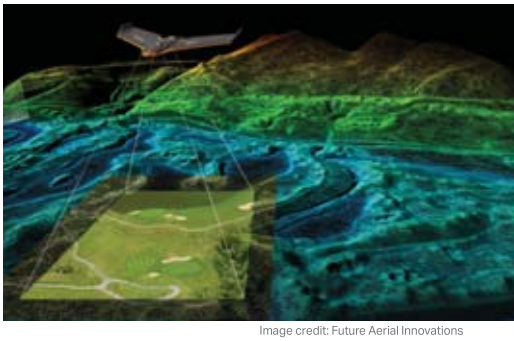

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NEWS WATCH

Google Cloud IoT Core connects devices globally

In many global industries, the need to be able to connect user devices to data is critical. To address that challenge, Google is launching Google Cloud IoT Core, a fully managed cloud service designed to securely connect devices to the Google Cloud Platform, manage those devices and integrate with data and analytics services.

Google Cloud IoT Core has two sub-services: MQTT Bridge, which provides security via TSL connectivity and certificates; and Device Manager, which hosts the ID and public key for devices and organizes the metadata for those devices.

Puppet announces new container and cloud-native solutions

Puppet is taking on the cloud and container world in its latest release of Lumogon and Puppet Cloud Discovery. The new offerings are designed to give enterprise IT professionals a complete visibility into this cloud infrastructure and container-based apps.

Lumogon provides a way for users to inspect, report and analyze their container applications. The company's new Puppet Cloud Discovery offering is a hosted service that provides insight into a user's AWS infrastructure.

JCP EC rejects the Java Platform Module System

The final results of the Public Review ballot for JSR 376, the Java Platform Module System, are in, and the Java Community Process executive committee (EC) has not approved this ballot. Of the 23 members, 10 voted for JSR 376, with 13 voting against it.

IBM, who was the first to vote no in April, commented, "IBM's vote reflects our position that the JSR is not ready at this time to move beyond the Public Review stage and proceed to Proposed Final Draft. The JSR 376 Expert Group and the public have raised a number of reasonable issues and concerns with the current public review draft of the specification that warrant further discussion and resolution."

Google I/O 2017 kicks off with new Android development features

Google packed its annual developer conference Google I/O with a number of new features and solutions for Android developers to start working with. Following its AI-first commitment, the company announced the TensorFlow Research Cloud, new TPUs for AI training, AutoML and a new site focused on AI research and tools: Google.ai.

On the Android operating side, the company announced the Android O Developer Preview 2, Android Go, the Kotlin programming language on Android, open-source Firebase SDK, Android Instante Apps and Android Go.

Additionally, the company's Google Play console was updated with new and improved features focused on application performance and quality.

Stack Overflow provides new insights into development

Stack Overflow is taking its massive amounts of data it collects and turning them into valuable insights with Stack Overflow Trends. With Stack Overflow Trends, the organization plans to leverage more than 8,000 questions developers ask every day to track interest in programming languages and technologies overtime.

Additionally, the organization announced a new iOS and Android mobile application for developers to check their projects on the go. The new applications allow developers to view, answer, post and vote on Stack Overflow questions as well as get notifications when someone answers or comments on a question.

Hyperledger Composer accepted into incubation

Hyperledger Composer, the collaboration tool for building "blockchain business networks," has been accepted into incubation by the Technical Steering Committee at Hyperledger. Hyperledger is an open source blockchain technologies organization. The project would like to work on Composer with the community in order to develop it into a powerful and complete development framework.

According to Hyperledger, Composer "accelerates the development of smart contracts and their deployment across a distributed ledger."

The Linux Foundation's IoT edge computing project

The Linux Foundation is on a mission to simplify and standardize the Industrial Internet of Things edge computing. The organization announced a new open-source project, EdgeX Foundry, designed to build a common open IoT solution framework.

According to the Linux Foundation, while the IoT can help businesses improve efficiency and increase revenue, the complexity of the IoT landscape is hindering adoption and impeding on market growth. EdgeX wants to encourage the IoT community to work together towards interoperable components. ▮

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Git'er done

SCM system keeps developers and projects on track

BY MADISON MOORE

With software configuration management (SCM), gone are the days when developers would email their code changes back and forth, waiting patiently for review. SCM has certainly changed the process for code review, feedback and collaboration, but it is the rise of distributed version control systems like Git that allow software teams to work faster than ever.

There is no shying away from it; Git appears to be the de facto standard for working with code changes, forking a repository, creating pull requests, collaborating, and deploying software. The only question teams should be asking is, what flavor of Git will work for them? Will it be GitHub, the developer-preferred version control system, or GitLab, an open-source git repo with options for enterprise, or maybe Atlassian's BitBucket, a Git solution for massive repos? Or, teams might even consider proprietary software like Perforce, which offers proprietary version control software for storing large binaries.

All of these tools use Git as a back end, but for many companies today, Git is the "end-all" tool for SCM and version control. And as open-source software continues to rise in recent years, developers need that open-source ecosystem so they can work in parallel and contribute to their projects in meaningful ways.

Git is at the center of this software evolution; and while SCM changes and the culture of open-source continues to grow, software experts expect Git will remain in the spotlight.

Evolution of SCM

In the beginning, SCM was just a simple system. As developers needed to collaborate with others on different systems, Centralized Version Control Systems (CVCSs) were formed, and these systems have a single server containing all of the versioned files, with a number of developers that check out files from that central location.

These systems — like CVS, Subversion and Perforce — have one single server that contains all these versioned files, and for a while, this was the standard for version control.

According to Jeff King, infrastructure engineering manager at GitHub, prior to about 2005, SCM systems were very centralized. This meant that someone set up the server and they were the person in charge of bringing up the source code, maintaining the tool, and more. In order to use the tool, developers had to get permission from the owner of the centralized system. This created a big barrier, since the workflow of open-source systems is highly decentralized, he said.

Distributed version control

Around 2005, there was an "explosion" of distributed version control systems, said King. Distributed version control systems are systems where there is no central authority for a project in terms of the technology. Everyone gets a copy of the history of an open-source project and everyone has access to the same tooling. Developers can submit a change one time and then leave, and they will still have the same access to the same tools as developers that frequently submit changes, according to King.

Plus, distributed version control systems let developers have several remote repositories to work with, which means they can collaborate globally with different groups of people within the same project.

Of these distributed version control projects, Git was one of the most commonly used one, and it certainly has taken off in terms of developer adoption. According to Edward Thomson, senior program manager at Microsoft, Git provides every developer with an entire history and entire branching structure on their development machine, which lets them enable powerful workflows based around simple branching and pull requests, said Thomson. And, it gives developers more insight into their software projects more quickly, he said.

While Git is widely adopted, the biggest fundamental limitation with it is its scaling issue. With Git, developers all get a copy of the history of a project, and everyone has access to run the system on their own. However, large repositories can be cumbersome since each developer would have to make a complete copy of that history and do all of the requests locally on their workstations, said King. For most projects, this isn't a problem, but for those large projects with an entire code base in one single project, lots of developers working in that huge repository can create some scaling issues.

"What we see now is people trying to take a hybrid approach to centralized and decentralized systems," said King. "It's easier to modify a decentralized system to optimize some of these cases to use centralized resources."

What King means is, companies are using a decentralized tool like Git, but under the hood there is a centralized server that is meeting some of those scaling issues, he said. To the developers, it looks like they have a complete copy of the code history, when really they have only touched a part of the history, with the tool hitting that central server and filling in the gaps "on the fly" when it needs to, he said.

Tom Tyler, a senior consultant at Perforce Software, agreed that Git's difficulty handling larger repositories is a big limitation when it comes to software configuration management. He said Git was designed to perform well at a small scale, so the challenge for customers or users with large systems and a lot of interdependencies is that it can be difficult to manage all their dependencies among all the modules in the system.

For customers that have monolithic systems and highly modular systems, they also opt for dependency management using a centralized system, said Tyler. These systems are aware of all the components and dependencies, which Git can't exactly do that easily, he said.

"There are a few problems with Git for storing the large binaries, it just wasn't designed for it," said Tyler. "It's a great developer tool and people love it and it does have a lot of great features."

Today, Git isn't just a tool for developers. In the past, the operations side of software development was very manual, and had a hands-off style of working. But in the era of DevOps, SCM best practices are evolving so SCM is

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How does SCM fit in with Continuous Delivery?

SCM is the initiator of continuous delivery processes. It all starts with a change in SCM and ends in production. Every commit would trigger a build in one of the CD tools which would initiate the tasks that lead to software being deployed to our production clusters. That trigger is what makes the process continuous. Without it, we would be delivering periodically and could just as well call it eventual delivery.

Viktor Farcic

One of the changes that CD brought is that there is an increasing number of companies that are abandoning branches and committing code directly to master. That, on the first look, sounds like a step back. It took many years to convince everyone that a good branching strategy is a must in every software development company. Working without branches was too risky due to conflicts and potential bugs that would be introduced through commits. Now we (proponents of continuous delivery and deployment) are telling those same teams that they should commit directly to master. What changed?

The difference is in the processes that are initiated on every commit. CD, together with microservices adoption and the ideas behind immutable deployments, allows us to have a robust set of automated pipeline steps that can provide a reasonable guarantee that a commit that passed them all is ready to be deployed to production. By committing to a master branch we have a truly continuous process and, as a result, the time between a feature being developed and its deployment to production is reduced to an absolute minimum. Time to market was never shorter, and it is not uncommon for an organization to have tens or even hundreds of deployments every day. The flexibility and the power behind Git is one of the essential pieces that allowed us to reach this speed." ▮

—Viktor Farcic, senior consultant at CloudBees

Why SCM is crucial to a developer's workflow

The best way to understand version control is to imagine it as saving changes in a Microsoft document or a document in Google Docs. Think of the code as a text file, and then imagine going into the document and looking at the revision history to see all of the different changes, when people made changes to your document, and why.

The history of different versions of a shared Google document is easy to review, and that type of simple workflow is exactly why software configuration management and version control is essential to a developer's workflow today, according to MacKenzie Burnett, head of product at CoreOS.

Software configuration management is so fundamental today, that everything starts and ends with SCM, according to Job van der Voort, vice president of product at GitLab, who said he would argue that SCM systems are the only way to work nowadays.

"You now have one team that manages everything from an idea, to building the software, to shipping the software, to monitoring the software," said van der Voort. "I believe personally that this is the evolution of how developers work."

Other software experts expressed just how essential SCM is to a developer's workflow, like GitHub's senior director of infrastructure, Sam Lambert, who said that he "just doesn't know anyone responsible developing software that doesn't use SCM."

"I just couldn't imagine doing iwithout it," said Lambert. "It's like building a gigantic bridge and burning the [plans] after. You have this thing that works with no tracking of the changes that were made going forward."

Also, SCM is critical to a developer's workflow because it is the mechanism that allows developers to collaborate today, according to Edward Thomson, senior program manager at Microsoft. The source code that's check in to the version control system is the "source of truth" for a software project, he said, since it reflects not just the current state of development, but everything that's been shipped to the customer.

"Without version control tools, you'd lose that ability to collaborate easily and you'd lose that traceability," said Thomson. ▮

—Madison Moore

◂ continued from page 9

even used by the operations teams and the QA/testing teams, according to Tyler. These teams understand what version control is and how it is used, where in the past they didn't interact with the system directly, said Tyler. This is changing for many companies and customers today, he said.

Git-ing in control of SCM

The open-source version control system and tool, Git, is probably the most popular SCM and version control system in the industry right now, according to Rahul Chhabria, principal product manager for BitBucket Cloud at Atlassian. It has changed the concept of having developers work with very large working copies, to having smaller pieces of a repository and being able to only work on the things that you want to work on, said Chhabria.

One of its benefits as a distributed version control system, is it lets developers work anywhere in the world, even if they don't have access to the internet. Developers can make those changes, and when the get back online, they can push up those changes and Git will automatically track what's changed elsewhere. Chhabria said this is especially important because software development today is all about shipping software fast.

Just like GitHub's King cited, Git's limitations include its difficulty handling large files. To combat this, some companies like Atlassian are contributing to a standard called Git LFS, which lets them extend Git. For instance, what Atlassian has done is taken the ability for large files to be stored in a remote location, so they will not weigh down a core repository, said Chhabria. When developers want to make a change, the calls are separated and are all on Git, he said.

Because of this, many companies today are creating their own highly scalable private Git repository, so that it's their own repository on the Git standard, according to senior analyst with Forrester Research, Christopher Condo. Some companies don't want to put their code on GitHub because then it means everyone has access to the code, or they can get access to the code. But by supporting the Git standard, said Condo, developers can take their code off of one repository and go to another Git standard repository of their choosing.

"[Enterprises] are opening up to competition but they realize they have to use this open standard," said Condo. "The idea of being open-compatible and the ability for developers to say, 'I don't like your [repo] I'm going to develop on top of it and go somewhere else, it seems important. Developers don't want to be locked into a particular vendor."

With the rise of distributed software development teams, Git is sort of designed for the open-source way of working, and Condo notices several companies adopting this open-source philosophy, and he sees it spreading from the open source community into enterprises. By supporting the Git repository standard, teams can take their code and go to another Git standard repository of their choice. Atlassian, Microsoft, Amazon, and Red Hat are just a few of these organizations that understand the open standard and are adopting the Git standard so customers and developers can avoid being locked into a particular vendor, according to Condo. ▮

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Top 10 vulnerabilities in mobile applications

BY DON GREEN

My team in the Threat Research Center at WhiteHat Security specializes in mobile application business logic assessments, which is a hands-on penetration test of both mobile client-side apps and the business logic that can be used to circumvent the security built into the program. In a rapid application development environment, it's a best practice (and required for some compliance guidelines) to have a third party test the application — especially given how much code is recycled from one mobile app to another by the software engineer.

My team finds vulnerabilities in how a mobile application is used on a native device (iOS or Android), not just in a dynamic scan, but via deliberate malicious user tests of functionality by an experienced hacker. An average phone connects to more than 100 different IP addresses during the day, and most information flowing in and out of a phone is unencrypted. (SMS, emails, etc.) Development teams need a penetration test of their most business-critical applications to make sure these are not an avenue of information exfiltration for their users or organization.

This Top 10 list is for you — developers and software engineers — designing mobile apps today.

It's not logical to order the top ten list of vulnerabilities my team encounters by either severity, impact, or prevalence, as these vulnerabilities found can cause problems for an organization in terms of data loss, sharing private information, or other areas ripe for exploitation by hackers. So here are the Top 10 by vulnerability class, and the solution for how to avoid them:

Don Green is the Mobile Security Manager at WhiteHat Security.

1 **Binary Protection:** Insufficient Jailbreak/Root Detection. Rooting or jailbreaking a device circumvents data protection and encryption schemes on the system. When a device has been compromised, any form of malicious code can run on the device, which can significantly alter the intended behaviors of the application logic. Recovery and data forensic tools generally run on rooted devices as well.

Solution: With regards to security, it is best to not have the app run on rooted or jailbroken devices, or to at least do some form of root/jailbreak detection. Detecting whether a device has been compromised adds an extra layer of policy enforcement and risk mitigation to protect the data within the application from being exposed.

2 **Insufficient Transport Layer Protection:** Applications frequently fail to encrypt network traffic when it is necessary to protect sensitive communications. Encryption (usually TLS) must be used for all authenticated connections, especially Internet-accessible web pages. Backend connections should be encrypted as well, or risk exposing an authentication or session token to malicious actors on the same network as the application host. These backend connections may represent a lower likelihood of exploitation than a connection over the external Internet; however, their impact in the case of exploitation can still result in compromise of user accounts or worse.

Encryption should be used whenever sensitive data, such as credit card or health information, is transmitted. Applications that fall back to plaintext or otherwise be forced out of an encrypting mode can be abused by attackers.

Solution: Ensure the application has a security constraint that defines a confidentiality and integrity-based secure transport guarantee. This will ensure that all data is sent in a manner that guarantees it cannot be observed or changed during transmission. If TLS must be terminated at a load balancer, web application firewall, or other inline host, it should re-encrypt the data in transit to the target host(s).

3 **Information Leakage — Server Version:** Server information is present in the response.

Information Leakage is an application weakness where an application reveals sensitive data, such as technical details of the web application, environment, or user-specific data. Sensitive data may be used by an attacker to exploit the target application, its hosting network, or its users; leakage of sensitive data should be limited or prevented whenever possible.

Information Leakage, in its most common form, is the result of one or more of the following conditions: A failure to scrub out HTML/Script comments containing sensitive information, improper application or server configurations, or differences in page responses for valid versus invalid data.

Solution: Remove unnecessary information from server responses that could give an attacker extra information regarding your network.

4 **Bnformation Leakage — Sensitive Data:** Informationally this is similar to the Server version in 3, but

touches on more leakage within the app, app-to-app, etc.

Solution: Information Leakage generally occurs in two categories: globally or resource specific. Vulnerabilities based on global information leakages are often related to verbose error messages or server/application framework version disclosures. These leakages can often be solved by a configuration setting. Resource-specific information leakage issues are related to the disclosure of developer comments, files or sensitive personal information. Resource-specific leakages often require direct mitigation each time they occur.

5 Insufficient Authorization/Authentication: Insufficient Authorization results when an application does not perform adequate authorization checks to ensure that the user is performing a function or accessing data in a manner consistent with the security policy.

Authorization procedures should enforce what a user, service, or application is permitted to do. When a user is authenticated to a web site, it does not necessarily mean that the user should have full access to all content and functionality.

Solution: Enforce a proven authorization framework scheme which emphasizes policy-based configuration files over hard coded authentication/authorization checks wherever possible.

6 Bryptography — Improper Certificate Validation: This application is either not validating SSL/TLS certificates or is utilizing an SSL/TLS certificate validation system that will not correctly verify that a trusted provider issued the certificate. The client should be configured to drop the connection if the certificate cannot be verified, or is not provided. Any data exchanged over a connection where the certificate has not properly been validated could be exposed to unauthorized access or modification.

Solution: Ensure that your application's certificate validation is configured to correctly verify that a certificate is provided, and from a trusted source like a reliable Certificate Authority. Or, code-in the latest certificate transparency standards approved by IETF or the CA/B Forum.

7 Brute Force — User Enumeration: There are numerous ways for an attacker to determine if a user exists in the system; a brute force attack is a method to determine an unknown value by using an automated process to try a large number of possible values. The attack takes advantage of the fact that the entropy of the values is smaller than perceived. For example, while an 8-character alphanumeric password can have 2.8 trillion possible values, many people will select their passwords from a much smaller subset consisting of common words and terms.

If error messages change when the username and/or password are submitted incorrectly, an attacker can determine the existence of a valid username/email address based on any differences in the error messages.

If user ID is generated sequentially in a predictable manner, (XXX102017, XXX112017, etc.) an attacker can enumerate through the list of users by incrementing the user ID.

Solution: The user enumeration vulnerability typically occurs in the following functionality: Login, Registration, or Forgot Password. The application should not reveal whether a username is valid. The response to valid and invalid input in either field should be completely identical.

For example, instead of "Sorry, your password is invalid", a proper response might say: "Sorry, your username or password is incorrect. Please try again."

8 Insufficient Session Expiration: After a user signs out of an application, the identifiers that were used during the session are supposed to be invalidated. If the server fails to invalidate the session identifiers, it is possible for other users to use those identifiers to impersonate that user and perform actions on his behalf.

Solution: First, it is a best practice to ensure a logout button is implemented in the application; and second, when the user clicks this button their session is properly invalidated.

9 Information Leakage — Application Cache: Sensitive data can be leaked from application caches, either through the main application code or via third-party frameworks.

Mobile devices present a unique challenge with regards to secure data storage. The devices can be easily lost or stolen. Many users do not lock their devices. The cached data can be viewed by an attacker who is performing data forensics on the physical device.

Solution: Ensure that sensitive data is not accidentally leaked through the cache. Developers can prevent it through creating a threat model for OS, framework, and platform to check and verify the way data is handled during URL caching, keyboard press caching, logging, copy or paste caching, app backgrounding, browser cookies objects, HTML5 data storage and analytic data that is sent to the server or another app.

10 Binary Protection — Insufficient Code Obfuscation: This is specific to Android/Java, the most common phone OS. To better protect Java applications from being reverse-engineered, several tools have been developed to scramble or obfuscate the code. Google has included one of the most popular of these tools, ProGuard, as part of the Android SDK. The ProGuard tool shrinks, optimizes, and obfuscates your code by removing unused code and renaming classes, fields, and methods with semantically obscure names. The result is a smaller sized .apk file that is more difficult to reverse engineer.

Solution: ProGuard is integrated into the Android build system, so you do not have to invoke it manually. ProGuard runs only when you build your application in release mode, so you do not have to deal with obfuscated code when you build your application in debug mode. Having ProGuard run is completely optional, but highly recommended and can help your security posture on those systems.

Best wishes to all you mobile app developers out there! My team hopes to see less of these vulnerabilities in future apps your organization sends to us to evaluate. ▮

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Eclipse MicroProfile optimizes Java EE

BY LISA MORGAN

Java EE developers are now experimenting with microservices and they need a coherent way to optimize their development efforts. Over the years, Java EE has supported distributed application architectures based on RMI/IIOP, Web Services and REST. The Eclipse MicroProfile project is the next step in that evolution because it optimizes enterprise Java for a microservices architecture.

"The cadence of Java EE is slowing," said John Clingan, senior principal product manager at Red Hat. "It was introduced as a yearly cadence, but it slowed from two years to three years and now it has a four-year cadence. Microservices are evolving at a much faster pace, so the Java EE community needs a way to bridge the gap."

Before MicroProfile, Java EE implementations were experimenting with microservices across many separate projects including WildFly Swarm, WebSphere Liberty, Payara, and TomEE. Since the efforts were similar, the community formed MicroProfile to collectively deliver APIs and a portable platform optimized for microservices.

The goal of MicroProfile is to balance the benefits of open collaboration, open source and standards. Toward that end, the MicroProfile initiative was introduced at the Red Hat DevNation in June 2016. Version 1.0 became available three months later. MicroProfile 1.0 comprises three technologies including JAX-RS, which enables the development of RESTful applications with Java EE; Context Dependency Injection for Java EE (CDI) which is a component model for enterprise Java; and JSON-P.

In December 2016, MicroProfile became an Eclipse project so it could remain vendor-neutral and benefit from the formal processes Eclipse established such as governance. The project is being actively evangelized by committers and non-committers publicly at conferences and user group meetings, and in social media.

How MicroProfile Is evolving

The MicroProfile roadmap is currently in the works with availability for MicroProfile 1.1 planned for Q2 2017. It includes a configuration API which externalizes a configuration from its microservice, and other features will roll into MicroProfile 1.1 and beyond as they are ready, like fault tolerance APIs, a JWT token exchange for improved security and Health Check which enables an application to publish its health status to the underlying cloud platform. For the latter, if the application is no longer healthy, then a cloud runtime can restart that application instance.

> *'Microservices are evolving at a much faster pace, so the Java EE community needs a way to bridge the gap.'*
>
> *—John Clingan, Red Hat*

The MicroProfile community is collaboratively defining APIs although there can be multiple implementations of the APIs among members. For example, version 1.0 of the configuration API is ready to be formalized. In the meantime, IBM, Apache Geronimo, Apache Tamaya, and Red Hat are creating their own implementations.

"It's specifications first and then individual implementations," said Clingan. "If we think it's better for all of us to collaborate around one implementation, we have that option."

The longer-term goal is to submit MicroProfile technologies to a standards organization like the JCP, although developers are encouraged to experiment with the technology now. The MicroProfile community would also like help prioritizing its initial list of potential JSRs and non-Java EE technologies that could be part of future MicroProfile versions.

"It took four years to go from Java EE 7 to Java EE 8 and there was no way for developers to experiment with it," said Clingan. "We want to put the technology in developers' hands right away and then accelerate towards standardization."

That way, members of the community and startups who want fast access to technology can get it and enterprises concerned about risk understand that the technology is heading towards standardization.

Get involved

The MicroProfile community currently includes Red Hat, IBM, Payara, Tomitribe, Fujitsu, Hazelcast, kumuluz EE, individual contributors, the London Java Community, Hammock and SOU-Java. The group is open to any individual or organization that is interested in Java EE and microservices on a committer or non-committer level. Per Eclipse guidelines, committers must be voted in.

"We honor all feedback," said Clingan. "We want to hear from people who have interest or expertise even if they don't have the time to be a committer."

Getting involved with Eclipse MicroProfile is as easy as clicking the "Join the Discussion" button on the MicroProfile.io home page which links to the MicroProfile Google group. There, individuals can participate in and start discussions.

Learn more at microprofile.io ▮

Microsoft: The future is AI, data, cloud services

BY DAVID RUBINSTEIN

The opportunity for developers to have broad, deep impact on all parts of society and all parts of the economy have never been greater.

That's the view of Microsoft CEO Satya Nadella, who kicked of the company's Build conference in Seattle last month with a keynote outlining the company's vision for the future of computing.

"In 1992, the total amount of Internet traffic was 100 gigabytes per day. Today, per second, we have 17.5 million times that. An autonomous car will generate 100 gigabytes per second. And, by 2020, there will be 25 billion intelligent devices."

Nadella believes how the future of computing evolves "comes down to the design principles and choices we make. I believe we can make practical design choices that help enshrine our timeless values. The first one is that we empower people with technology. Let's amplify their ingenuity. Let's use technology to bring more empowerment to more people... as the world becomes more technology driven, building trust in technology is critical. It's us taking accountability in the experiences we create.

"When we say we want to empower every person, every organization on the planet, to achieve more, it especially speaks to empowering every developer," he continued. "That mission is what has been driving us in this mobile first, cloud first world."

With all this data being generated, and using it to gain efficiencies and better outcomes, machine learning and artificial intelligence will come to play a much larger role in applications and devices, Nadella said.

"AI is everywhere, the ability to reason over large amounts of data, create intelligence and distribute it," Nadella said. "Moving from a mobile-first, cloud-first world to a new world that is going to be made up of an intelligent cloud and an intelligent edge."

Satya Nadella speaks at Build 2017.

Nadella noted that among the fundamental characteristics of this new application pattern is that the user experience is getting distributed across devices. During the keynote, a scenario was shown in which someone checks in with Cortana at home to see what her day looks like, then carries over to her car, where she is given driving routes to her meeting to avoid traffic. When it appears the person will be late for the meeting, Cortana inquires if a message should be sent to others in the meeting notifying them that the person will be late, and even connects her to the meeting from the car.

"That multidevice experience is what needs platform capability. You need new abstractions, not just for a single piece of hardware, but for all your devices," Nadella said.

The second big change, he noted, is artificial intelligence. "This platform shift is all about the data. When you have that [huge amount] of data being generated at the edge, data has gravity. Computational power will move to it. That means the AI you're going to create is by definition distributed. You'll have to have a new set of abstractions that spans both the edge and the cloud."

"The intelligent edge," he said "is changing everything we do." ∎

Live Player coding environment added to Xamarin tool suite

BY DAVID RUBINSTEIN

From the cloud to mobile, Microsoft last month announced important new additions to the Xamarin cross-platform development tools.

The company today released a preview of the Xamarin Live Player coding environment, which makes development and debugging of applications faster. It allows developers to create applications for Android and iOS in Visual Studio. According to Microsoft, you pair your device with Visual Studio and hit debug, and the application is deployed to Live Player on the device. Developers can use Visual Studio to develop and test changes to the application without having to recompile or redeploy.

"This brings the full debugging capabilities of .NET on iOS," Terry Myerson, executive vice president at Microsoft, showed. "You can build rich iOS applications in Visual Studio directly on your PC."

Live Player extensions for Visual Studio 2017 and Visual Studio for Mac, announced yesterday, are available today in the Microsoft Store, and Xamarin Live Player apps are available in both Google Play and iOS App Store.

For further cross-platform capability, Ubuntu is in the Windows Store, and SUSE Linux and Red Hat Fedora distros are in the works, Myerson said.

To manage mobile apps, Microsoft today introduced a preview of Visual Studio Mobile Center, which was announced in November. Mobile Center, designed for apps targeting Android and iOS, gets new features today, including the ability to automate builds and distribution, to gather user data and push notifications to Universal Windows Platform (UWP) users. ∎

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The web app model becomes progressive

Application developers are turning to Progressive Web App (PWA) development to create write once, run anywhere apps that actually work

BY FRANK J. OHLHORST

If you listen to the pundits, Progressive Web Apps (or PWAs) have come to represent all that is good about application delivery via the web, and are sure to rule the web today, tomorrow and forever more. While that may be a grandiose claim — or at the very least some very wishful thinking — the fact remains that PWAs are having a large impact on how users interact with their web-enabled devices.

PWAs were originally proposed by Google back in 2015, and were saddled with this all-too-simple description: "A Progressive Web App uses modern web capabilities to deliver an app-like user experience." However, there is a great deal more to a PWA than "modern web capabilities". At its core, a PWA is all about delivering a better, faster user experience, regardless of what browser or device they are using.

That said, there are several criteria that Google laid out to better determine if an app fits the PWA mold. To be considered a Progressive Web App, the app must be:

- **Progressive:** In other words, the app should work for every user, regardless of browser choice. The app must be built with progressive enhancement as a core tenet.
- **Responsive:** Adapt to any form factor, such as a tablet, mobile device, desktop, or any other device that consumes web content via a browser.
- **Connectivity independent:** Ability to work offline or in poor connectivity situations.
- **App-like-presentation:** The app should use the app-shell model to provide app-style experiences.
- **Fresh:** Always up-to-date, enabled by the service worker update process.
- **Safe:** Delivered via HTTPS to protect data from interception, snooping or tampering.
- **Discoverable:** Identified as applications, as defined by W3C manifests, and implementing a service worker registration scope, making them visible to search engines.
- **Re-engageable:** Users are able to re-engage with applications through push notifications and other informational display features.
- **Installable:** Allow users to have the freedom to install (or keep) apps on their device without having to rely on an app store.
- **Linkable:** Can be shared via URLs, without the need for a complex installation process.

Yet, those criteria seem to bring up more questions than answers, questions such as what is an "app-shell-model", or a "service-worker," and so on. Truth be told, a PWA can be classified as a standard for building mobile websites. In other words, a PWA is designed to behave like a traditional app, yet perform fast, and not require anything unique on the end user's part.

PWAs do not have to be a mystery wrapped in an enigma, but they do work somewhat differently than a traditional app does. In essence, a PWA works like a website, and PWAs are built using a framework. Like websites, PWAs are accessed using URLs, which means they can be indexed by search engines, allowing PWAs to be found on the pages of Google and Bing. Progressive Web Apps can be designed to look and feel exactly like existing websites or mobile apps, or they can be designed differently, so that users know that they are browsing the PWA. PWAs can also be seamlessly integrated into existing website/app structure and designs. It all comes down to flexibility, which PWAs seem to excel in.

PWAs are a true indicator of how the app market is changing , and are likely

to become a "go-to" technology if the current trends of diminishing application downloads and customer engagement continues. Ultimately, PWAs may kill off the need for most non-core apps (such as the big social media platforms, as well as major services such as Uber, Lyft and Air BnB).

PWAs may lead to many companies not worrying about building their own custom apps, but shift to the ideology of what a responsive web app can offer. What's more, users shy away from buggy apps, especially if they have to download them through an app store. And given the option of not needing to download an app and have it just work, users will flock to PWAs and eschew the whole app store experience. With that in mind, it makes sense for developers to learn what they can about PWAs and see how PWAs can deliver faster, better end user experiences.

Like with any new technology, there are usually hurdles to overcome. Arguably, the biggest hurdle for PWA comes in the form of its lack of support for Apple's Safari browser, which is the native browser for IOS devices, meaning that PWA may not work on the countless iPhones, iPads and other devices. What's more, Safari is the native browser on the OSX platform, meaning that the many flavors of Macintosh may not be able to use PWA.

Under the hood of the PWA Architecture

Basically, there are two parts to a PWA: service workers and application shell architecture. Service workers are bits of code that act like a proxy that sits between the website and the browser. Its job is to intercept what is asked of the browser and then hijack the responses given back. In effect, the service worker caches information, so the data is only fetched once for replay thousands of times. Service workers also exist to deliver extra features via browsers, which were impossible in the past. These include:

- **Push notifications:** Informs the user of an event, such as a new message, a page being updated and so forth.
- **Synchronization:** Updates data in the background, even when the user isn't using the web page or website.
- **Caching:** Stores information for offline use, allowing the user to have some functionality of a site while offline.
- **Pre-fetching data:** Identifies data that may be used in the near future, such as images or content not yet displayed, and pre-fetches it to speed up access.
- **Incorporating additional data feeds:** PQAs can query hardware such as geolocation, GPS, sensors, and so on using AJAX code.

The application shell architecture serves a different purpose, which Google defines as "the minimal HTML, CSS and JavaScript required to power the user interface and when cached offline can ensure instant, reliably good performance to users on repeat visits. This means the application shell is not loaded from the network every time the user visits. Only the necessary content is needed from the network."

The application shell can be thought of as similar to the bundle of code that you'd publish to an app store when building a native app. It is the skeleton of the UI and the core components necessary to get an app off the ground, but likely does not contain the data.

However, Google's less-than-stellar definitions do give a little more insight as to what is required to create a PWA, notably HTML, CSS, and JavaScript. Google also states that for single-page applications with JavaScript-heavy architectures, an application shell is a go-to approach. This approach relies on aggressively caching the shell (using a service worker) to get the application running. Next, the dynamic content loads for each page using JavaScript. An app shell is useful for getting some initial HTML to the screen fast without a network.

Working with PWA

For application developers, working with PWA takes a little bit of a different approach than building desktop applications or native applications. Creating a PWA requires much less work than building a traditional app. That is due to it being both a website and an app, operating across various systems at the same time. That also means the costs may be much lower, yet the PWA may provide an experience that is hard to differentiate from a native application. What's more, PWAs require hardly any storage space on the target device.

Getting started with a PWA project usually involves delving deeper into Google's code lab, (https://developers.google.com/web/fundamentals/getting-started/codelabs/your-first-pwapp/) which offers a step-by-step tutorial to create an app using the "app shell" method. Google lays out some basic requirements for getting started, including:

- A recent version of Chrome.
- Chrome DevTools to better understand what's happening at the browser level.
- Web Server for Chrome, or your own web server of choice
- The sample code
- A text editor
- Basic knowledge of HTML, CSS, JavaScript, and Chrome DevTools

From an educational standpoint, Google does an excellent job of introducing someone to the power of PWA and what the appropriate uses of the technology are. However, those looking to take PWA further should expose themselves to other sources of educa-

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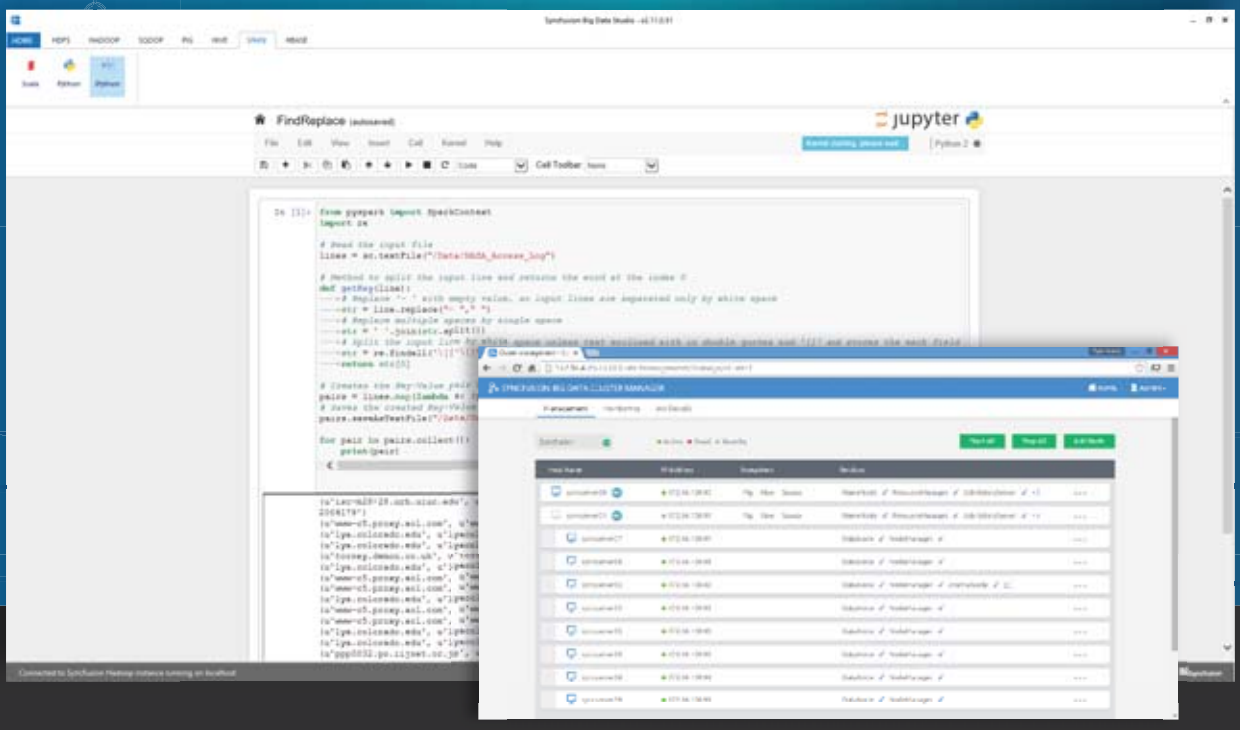

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tion, as well as polishing up on their JavaScript skills. That said, Google does provide several boilerplates to make getting started that much easier. Nevertheless, it would be wise to get development teams working on PWAs rather than continuing to push app downloads, which may well soon be irrelevant.

Examples of PWA

PWAs are already having a major impact on how people are using the web. Features such as push notifications, offline web pages, and fast load times are attracting a large audience of adopters, with many in the Fortune 1000 introducing PWAs as a means to better service customers. Examples abound of successful PWA implementations and a few are well worth looking at before delving into creating PWA solutions.

- **Twitter Mobile:** Accessible at mobile.twitter.com, Twitter has created a PWA that is actually better than the company's traditional app. The PWA implementation is faster, works offline, and is responsive.
- **Washington Post PWA:** Offers a mobile experience that rivals the traditional web experience of the Washington Post. Offline access, caching and pre-loading create a fast experience. Also shows how effective the Server Worker Precache library and the Service Worker Toolbox library can be implemented effectively.
- **Flipboard:** Has created a mobile experience built around the capabilities of PWA. Several unique features abound and the company's implementation of PWA gives some solid hints as to what is possible with the technology.

There are numerous other examples of excellent PWA offerings. However, for developers, the biggest value comes from delving into how those examples work and using the browser's developer tools to see how that PWA implementation was done. Simply put, dissecting a good Progressive Web App is also a good way to learn new techniques!

The future of PWA

One thing is certain, PWA is here to stay, as evidenced by the number of enterprises that are deploying PWA as a way to better service customers. Furthermore, PWA development may very well be a skill set that will be in more demand. According to Gartner, "By the end of 2017, market demand for mobile app development services will grow at least five times faster than internal IT organizations' capacity to deliver them."

The truth here is that most IT departments aren't prepared to address this growing demand for mobile apps and are already bogged down with traditional application development, along with their other tasks.

Mobile application development requires new skills and time, luxuries that many businesses lack. As a result, technologies such as PWA and other low-code developer tools are bound to grow. The question remains though, will PWA and other fast dev tools remain in the realm of IT, or will those technologies give rise to "citizen developer", allowing business to create their own applications, without the help of IT or traditional developers.

While it's not too late to get on the PWA bandwagon, developers need to realize that the first wave of PWAs was created by content businesses, such as FT, Washington Post, and CNET rather early on. Those were followed by another wave of commercial successes, such as Alibaba, which saw a 76% increase in conversions after upgrading its site in the summer of 2016 to PWA technology. That is a strong indicator that the need for PWA pros will only rise.

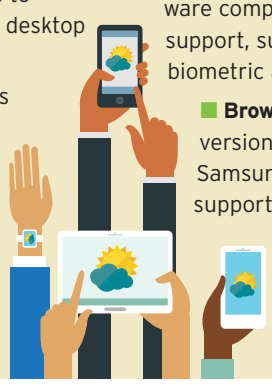
For PWAs, the future Is bright, driven by the fact that PWAs deliver next-level mobile customer experiences by combining existing technologies in a marketplace that is eager to invest, experiment, and reap the rewards. Growth in mobile technology as well as digital transformation is driving businesses to consider new ways of delivering applications and engaging with their customers. Those indicators show that developers embracing PWA development should be assured significant work for quite a while. ▮

PWA ADVANTAGES

- **No installation needed:** PWAs are basically just web pages; users can consume them directly from their browser and then decide whether or not to keep them for offline use.
- **Instant gratification:** PWAs load instantly and do not require extensive prerequisites to run on the end user's device.
- **Instant updates:** PWAs are updated on use, just like a web page, which means PWAs will always be current with the latest deployed features and code.
- **Eliminates the App Store:** Users do not need to access an app store to receive a PWA or add it to their desktop or favorites.
- **Portability:** As websites, PWAs prove to be fully portable, and do not require any type of special packaging and deployment models.
- **Secure:** PWAs are secure, hosted over HTTPS, using TLS between the endpoint and server.
- **Responsive:** PWAs use responsive web design (RWD) techniques, which allows them to work on all combinations of mobile devices, laptops, smart phones and tablets.

PWA DISADVANTAGES

- **Single sign-on and cross-application logins are not supported:** Third-party applications that require a login, such as Facebook and Google, will continue to require their individual login, as PWAs are unable to independently collect and store that login information.
- **Lack of hardware functionality support:** PWAs do not support all the hardware components that native apps support, such as cameras, GPS, and biometric accessories.
- **Browser compatibility:** Newer versions of Chrome, Opera, and Samsung's Android browser support PWA. However, IE, Edge, Safari and many custom and proprietary default browsers do not support PWA.



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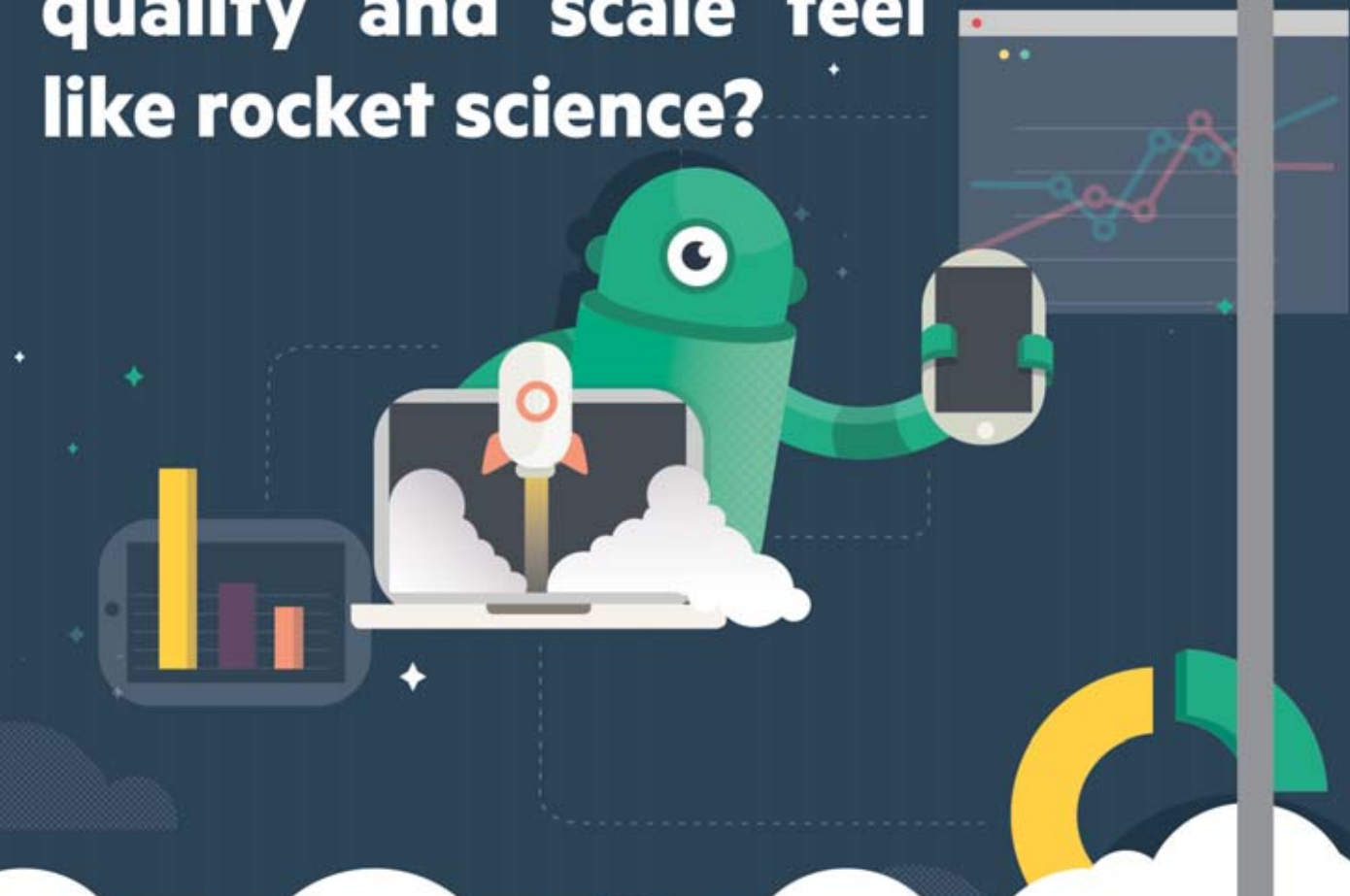

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Three disruptions to ALM and how machine learning could help

BY ALEXANDRA WEBER MORALES

Application delivery teams and the application lifecycle management tools they use are reaching a breaking point as they struggle to support continuous delivery of applications with an expanding array of architectures and form factors. According to Ashish Kuthiala, Austin-based senior director for Agile and DevOps portfolio offerings at Hewlett Packard Enterprise Software, three key disruptions are reshaping ALM and testing: DevOps, increasing application complexity, and Cloud and SaaS models. In response, enterprise development's next wave of productivity will be increasingly automated, collaborative and powered by big data.

SD Times spoke with Kuthiala about these disruptions and how predictive analytics and machine learning will be necessary tools for building quality software from the start.

What's your background and how has that positioned you to see these disruptions?

Kuthiala: I've held different roles across the software development value chain — a developer, on early Extreme Programming teams, and hands-on roles on the operations side of the house. When I found myself under pressure to accelerate this delivery chain due to business urgency and new technology, I could see that seismic changes were needed to keep up.

Since you mentioned Extreme Programming, do you feel that test-first programming and XP ultimately led us to DevOps?

Paradigms such as Extreme Programming were precursors and accelerators to DevOps, but a lot of those methodologies were more focused on just the dev-test teams. Agile focused on development, testing and users, but it fell short on delivering the value quickly to end users. You'd work fast and hard on smaller deliverables to get them right but then wait to bundle it up and and throw it over to production teams.

'These fundamental changes in delivery cadence...are increasing the complexity of lifecycle management, to the point of chaos. '

—Ashich Kuthiala, HPE

QA has a lot of ingrained processes and systems — and historically, that was the right thing to do. The QA organization's main charter was not to let shoddy code slip by, so processes, tool sets and teams were built not so much for speed, but more for quality. Now, there's a lot of pressure on the QA team to re-look at their processes, because quality processes that take long cycles cannot hold up the speed of delivery to the end user — and more importantly, quality cannot be achieved by a siloed team. Quality assurance needs to be pervasive throughout the software value delivery chain.

So DevOps is the first disruptor.

Today, application design, development and testing happen simultaneously, requiring test creation and execution earlier in the lifecycle, even before coding begins. This puts new pressures on QA to adapt or risk being cut out of the DevOps process.

First, test definition must start with user stories and requirements, before code is written, and facilitated with proven practices such as Business Driven Development (BDD) and Test-Driven Development (TDD).

Second, testers must skill-up to increase their use of automation at every phase: Unit, functional, regression, load and security, while using automation best practices to strive for good functional test design and re-usability.

Third, testers must align with the teams implementing the Continuous Integration (CI) toolchain so that unit/functional, regression, performance and security testing execute with the continuous build cycle, within a single sprint.

Finally, with the complexity of today's application landscape, there is always more to test than time allows. Testers should get comfortable leveraging production analytics to understand how apps are actually being used in the wild and use that insight to focus their test activities.

Then the second disruptor is complexity — but this is where your approach gets

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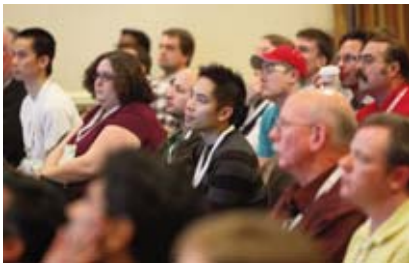

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Three fundamental disruptions to ALM

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interesting, because you advocate using predictive analytics within QA.

When we talk about software complexity, the whole model of how software is now being built and delivered is radically different than it was one, two or even three years ago. Development teams are adopting new architectural models to create and deliver applications in the continuous delivery model. We are also seeing an explosion in the sheer number of distinct platforms and forms such as web, mobile, and Internet Of Things from which software is consumed.

These fundamental changes in delivery cadence, software platforms and software architecture are increasing the complexity of lifecycle management, to the point of chaos. Heterogeneous dev processes, apps built with shared services and APIs, widespread open source in code and tools, different protocols and characteristics of IoT and mobile application delivery, challenge app delivery teams. Even the smallest code change has so many ramifications — it's a network effect.

For example, even changing one line of code can have severe impact beyond the module within which it is contained in. How do we analyze and track these impacts? Tapping into and analyzing the vast amount of data that lies across your software development ecosystem can provide you with the insights and alerts you need to make fast and intelligent decisions.

What kinds of predictive analytics and machine learning would you look for?

Today, if I make a change, it may take five hours for me to see if it passes all the quality tests — that's if you're doing things really well today. Sometimes, it takes a week or even a month in many organizations. To deliver at the speed at which business wants to move, this is increasingly unacceptable.

If I were to embrace data-based machine learning and analytics driven testing, the metrics I would like as a developer or a tester would be the number of tests I have to run for my code changes — do they seem to go down with each cycle? Do the test cycle times get faster? What is my confidence level in accepting the machine learning recommendations about my tests? Is there learning from each cycle? Perhaps the first time I ran 120 tests, and the next time I only have to run 25 based on the past learning.

Your third disruptor is cloud and SaaS (software-as-a-service). What effect does that have on the lifecycle?

There's an increasing adoption of infrastructure models that can be instantiated at the click of a button — scalable Cloud and SaaS models that are fundamentally changing the way applications are both composed and consumed.

Meanwhile, legacy systems aren't going away — they have a long half-life. When you start to manage a mix of such models, how do you rapidly provision or consume services from these different platforms? How do you scale up and down based on your needs? How do you test and replicate all the hybrid platforms: Amazon, Azure, on-premise, mobile, web…?

The proven cost savings garnered from moving to the cloud and the elasticity of cloud delivery are enabling teams to rapidly deliver against business requirements and meet un-predictable consumption loads, but there are huge challenges in harnessing these models to your benefit.

What is HPE's solution to these problems?

We believe that application delivery teams need to prepare for a hybrid-cloud world by investing in skills and tools to test and manage software composed of on-premises and cloud services, and investigate a hybrid-cloud approach to application delivery management as well.

HPE's ADM software suite supports hybrid cloud delivery with a highly elastic, cost effective choice of consumption models. First, we provide a choice of on-premises or cloud-based automated lifecycle management, functional, performance and security testing and the ability to set up a flexible, on-demand test lab in the cloud.

Second, HPE's ADM suite can rapidly provision and scale all forms of testing globally across on-premises, private and public cloud footprints with your choice of where the application under test, the integrated services and user devices are present—on-premises or in the cloud.

Third, we build in service and network virtualization, which enables continuous development and testing across teams even when services are not ready yet, or in the cloud and difficult if not impossible to access, because global network behavior can create obstacles to quality and performance.

Given these three disruptors, what is a simple yet bold move a development organization can take right now?

Businesses — and therefore their IT colleagues — are under relentless pressure to innovate faster than their customers. This transformation needs to cut across the teams, processes and the tooling underneath it. It cannot be an overnight change; it's an ongoing journey to continuous improvement. Start by attack your biggest problem or bottleneck in the system. Be ready to experiment, fail and learn fast. Analyze your data to learn and get better.

Once you solve this problem, you're going to move on to the next bottleneck, and so on. Having this mindset is what we see in organizations that are very successful. ▮

Atlassian uses Specs to see into build plans

BY MADISON MOORE

Atlassian is reinforcing the flexibility of its deployment options with several new updates. This includes advancements to its self-hosted products, tighter integrations, and a new feature in Bamboo 6.0.

At Atlasssian's first end-user conference in Europe last month, the company announced that its suite of self-hosted products and all major platforms are available in Data Center editions. In order to address compliance requirements, Atlassian also introduced a new feature called committer verification hook in Bitbucket Server and Data Center 5.0.

According to the company, this feature lets teams meet security and compliance requirements, with strict access controls and audit trail for code changes.

"Bitbucket will enforce that the developer that authored the code change can commit that code to the master repository," said Alison Huselid, head of Bamboo at Atlassian. "This is happening in the context of the workflow, so you don't have to think about it afterwards."

Huselid said that Atlassian also updated the smart mirroring capability in Bitbucket Data Center 5.0 with frequent authentication caching to ensure high availability.

According to Huselid, a mirror is a local version of a repository of code that would sit in a main server, and the benefit of having a local mirror of the code is developers that are in a specific locale can have better performance, reduce latency and have access to the code from the mirror itself, she said.

With this specific change, Atlassian introduced cache authentication into the mirror. That way, if the mirror loses connectivity with its main repository, developers can still have access to it, she said.

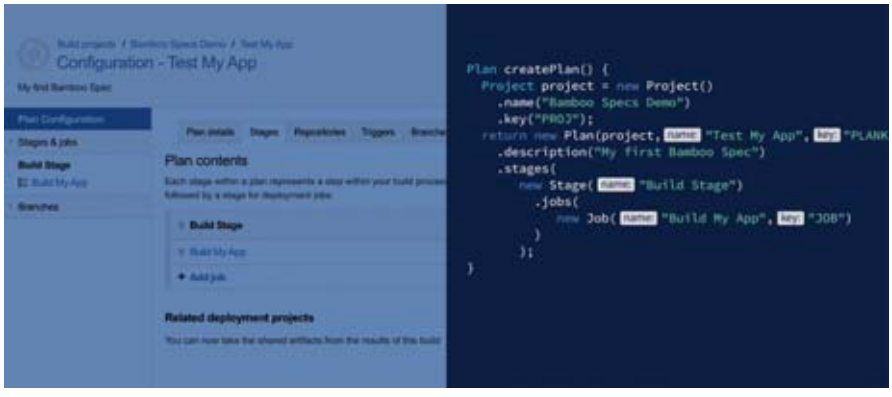
In order to break down company silos between development and operations teams, Atlassian also introduced a new feature in Bamboo 6.0, its Continuous Integration and Deployment tool. The feature is called Bamboo Specs, and it allows developers to configure their build plans within code, giving them more control over the process so they can create the builds themselves, said Huselid.

"[Bamboo Specs] is something our current customer base has been asking for and it's also a trend we are seeing within the Continuous Integration/Delivery space to have your plans defined within code," said Huselid. "We are really excited about the possibilities that open up around not only compliance, but scalability."

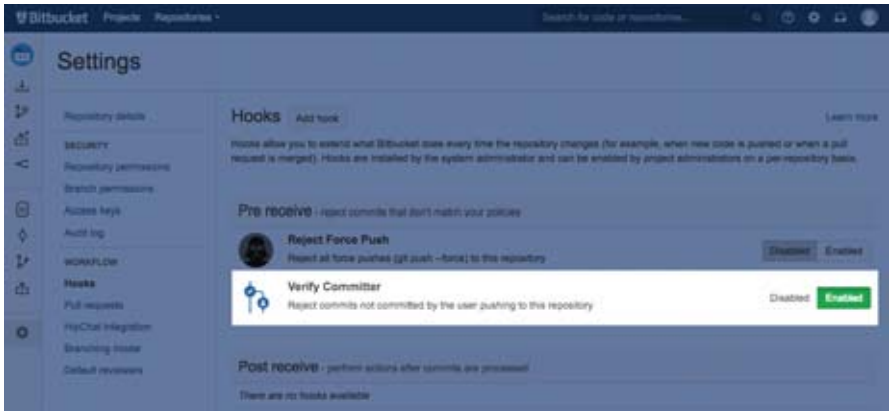
She added that Bamboo Specs will give developers the opportunity to manage their build plans more effectively, reuse patterns across their build plans, and ultimately put more control into developers hands in order to manage the build plans alongside the code.

Tighter integrations among Bitbucket Server, Bamboo and JIRA Software Server will also allow developers and teams to speed up their development processes. In Bitbucket Server 5.0, Atlassian announced that it is adding repository shortcuts to any related asset, like a JIRA project. It's also adding visibility into the in-progress build status in Bitbucket Server and pull request-aware builds in Bamboo.

Lastly, Atlassian announced two new public betas for HipChat Data Center and Crowd Data Center, which provides more integration and centralizes the user management across the Atlassian suite of products. ■



Plan configuration screen within Bamboo (left) and configuration as code within Bamboo Specs.



Committer verification hook in repository settings in Bitbucket Server and Data Center 5.0.

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SD TIMES 100

THEY'VE ARRIVED.

BY DAVID RUBINSTEIN

It takes something special, something unique, to make a mark in this world. Elegance (of code). Style (of programming). (End-to-end) Richness.

This year's SD Times 100 honors those companies, consortia and projects that have put their stamps on the industry through innovation, leadership and — dare we say it — panache!

Some of the honorees are classics, like a fine timepiece. Others are just bursting onto the scene, from new designers, architects and engineers. One thing they have in common, though, is that their work is valued by others in the industry, vaulting them onto this coveted list. They are talked about, they are desired and they are respected.

Our industry does not stand still, and that is reflected in this year's selections. We've added a category — IT Ops — to reflect the industry's tearing down of the final wall that siloed developers from QA and deployment. We've split testing from performance and security, as the latter issues have become front and center in our ever-more interconnected lives.

Let us know what you think of this year's list by joining the conversation on Twitter at #2017sdtimes100/.

ALM & Development Tools

Altova
CollabNet
JetBrains
JFrog
Micro Focus
OutSystems
Sparx Systems
TechExcel
VersionOne
ZeroTurnaround

Database and Database Management

Couchbase
DataStax
Melissa
MongoDB
Neo Technology
Oracle
PostgreSQL
Progress
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APIs, Libraries & Frameworks

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Amyuni
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LEAD Technologies
Meteor
MuleSoft
NodeSource
SmartBear Software
TIBCO Software
Zend

The Cloud

Amazon
Google
IBM
Microsoft
Rackspace

Big Data and Analytics

Cask
Cloudera
Confluent
Databricks
Hortonworks
MapR
Revulytics
Splunk
Talend

DevOps

Ansible
Atlassian
CA Technologies
CloudBees
Electric Cloud
HashiCorp
Hewlett Packard Enterprise
OpenMake Software
Tasktop
XebiaLabs

IT Ops

Chef
Citrix
CoreOS
Dell EMC
Docker
Fugue
Puppet
Rancher Labs
Red Hat
VMware

Security & Performance

AppDynamics
Black Duck Software
Dynatrace
Neotys
New Relic
Rainforest QA
Synopsys
SOASTA
Veracode

Testing

Applause
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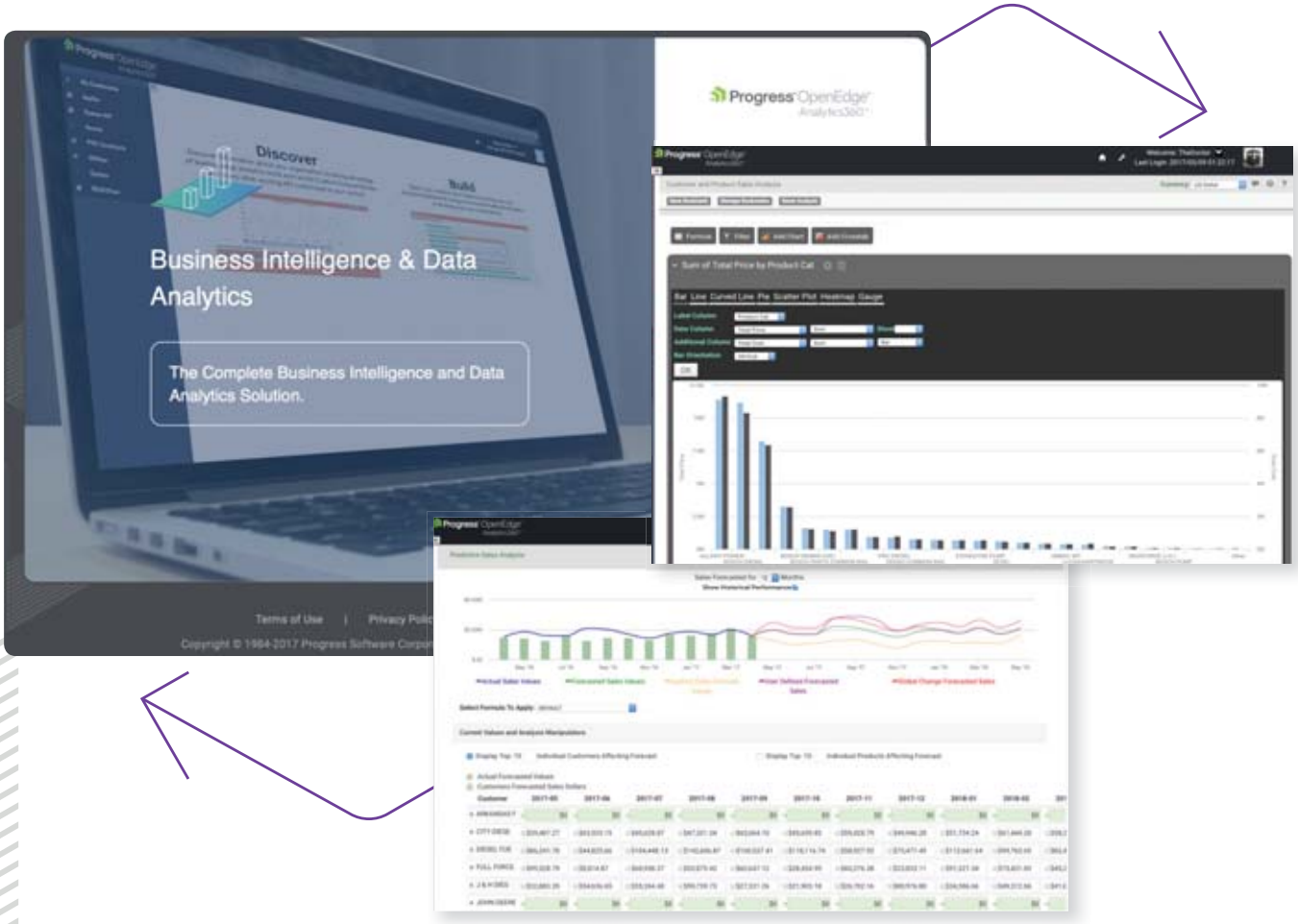

For more information and a demo of the product, please visit **www.progress.com/A360Demo**

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Extracting data from inside the app

Embedded analytics knock down wall between transactions and data analysis

BY ALEXANDRA WEBER MORALES

As data streams threaten to drown companies in too much information, the trend in business intelligence is now to house analytics smack in the middle of applications, where they can quickly and securely surface actionable information to developers, users and businesses.

With Progress OpenEdge Analytics360, Progress has a solution for both ISVs and IT departments that don't want to make the common mistake of purchasing a standalone BI solution that they can't implement, or endure the frustration of developing their own. For an understanding of how analytics can help businesses, we spoke with Progress senior principal product manager Mike Marriage, a data warehousing and BI expert in Atlanta, GA. Also in Atlanta, Barbara Ware is a Progress senior product marketing manager responsible for Progress Services, including business intelligence and data replication.

'We're going to see a marriage of cognitive applications to analytics as these analytics solutions begin to make more decisions.'

—Mike Marriage, Progress

Are most organizations even doing embedded analytics?

Marriage: A lot of people that I come across, if their analytics are not embedded, they address their analytics need in one of three ways: One, they have no analytics whatsoever. Two, they report off of Excel spreadsheets that they use to manually merge data they're exporting from various operational sources. Three, they have a standalone business intelligence system where they're taking information from those sources and keeping it outside of the application.

Ware: Also, people often confuse analytics with straight reporting — what's more, the report might be several days old and has been turned into a chart. That's not analytics.

Marriage: Yes, data gets stale. Analytics is about making data actionable to the user. Many of these other systems work against stale information, which can lead to incorrect business decisions.

Embedded analytics is really a matter of taking those analytics and making them part of the transactional application. By embedding analytics, you maintain context for the user and allow them to take immediate action where it makes sense, and when it needs to happen. To the end user, it's all transparent. We have the ability to give the analytics solution the same look and feel as the application — because you don't want it to be a completely different experience. A seamless user interface is very important.

What's a common misconception around embedded analytics?

Marriage: A lot of vendors claim they can embed within an app, so they take a chart or graph and embed it. That's just a report working against a snapshot of data. A real embedded analytics solution has to provide workflow integration and respond to events and triggers within the host application. Likewise, the interaction that the user is having with those embedded components should affect what happens in the parent app. Maybe clicking on that order number will open up the order page while adhering to any security rules that have been set. That's an example of complete integration.

Ware: We like to say we're breaking down the wall between transactions and analytics. We leverage the Progress OpenEdge database to not only provide measurements and results based on extracted data, but also relevant operational data directly from the application for real-time decision making.

How do you make sure the results aren't just ignored? Do push notifications get it to the right set of eyeballs?

Marriage: Analytics solutions are only valuable if the user utilizes them. With an embedded solution, we have the capability to provide push notifications. We can automatically send out a text message or email alerting the user — maybe even sending that content to them — and guiding them back to the application.

Do you use Analytics360 yourselves to figure out what types of data are most valuable to your own customers?

Marriage: Yes, we're using our own analytics to analyze our solution as users work with it. We want to make sure the content is being utilized — and also that it's performing as well as it should be. Maybe some content is not used often today, but down the line it becomes more popular. We want to know when this happens so that we can optimize whatever content is now in demand.

What's another "gotcha" in analytics?

Marriage: It's important that when you look at your data to determine why an event has occurred, that you look at data blended from many sources. For example, working with one of our customers in manufacturing, if I look at defects occurring in certain components, I might find 20 instances of doorhandles coming loose and three instances of transmission slippage. To the untrained eye, the greater number requires my attention. But if I start lining that data up with cost information, I can see the trans-

continued on page 34 ▸

Embedded analytics bridge transactional data

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mission issue is more important.

Taking this example one step further, you can also factor in social media. Maybe for most of my customers their transmission slippage is being rectified at the dealer, but they're reporting the shoddy door handles negatively on social media. Too often, companies only respond to one data point. It's important for a company to obtain and review data points from all sources, and analyze the data from many different angles.

To what extent are people using public or external data, say mapping or weather, for context on analytics dashboards?

Marriage: If it has an API (application programming interface) or a web service, you can use it. We've worked with organizations that plot assets on a map to see where they are and how they're operating in real time, through satellite feeds.

It's not always against stored data; we can also take data streams, say in a manufacturing capacity, to show scrap, defects, quantity produced — and kick in with push notifications and alarms as monitored events are triggered.

Do you see big data usage coming into the mainstream?

Marriage: On the big data front, I believe we're starting to see greater adoption. Historically, we've only seen the largest of organizations embrace that. Setting up a Hadoop stack is a challenge — but within Analytics360, we have connectors to Hadoop, MongoDB, Cassandra, etc. So as companies embrace big data technologies, we're ready for them.

Also, the skill set for big data is not easy to find.

Marriage: One issue that our customers have is the lack of experienced resources to perform predictive analytics. We've realized there aren't a lot of people in the data science space. There's a shortage — and it's only going to get worse. So we've included functionality within Analytics360 that will push the information back into the hands of the more casual analytics users, applying formulas to data and forecasting how it might look in the future.

Are there any legal risks when it comes to analytics and have you seen any customers take them?

Marriage: The most important thing is the security of data, whether it's to comply with HIPAA (Health Insurance Portability and Accountability Act) or European privacy rules such as the GDPR. A lot of companies are simply moving data by exporting in clear text files, dropping it onto a server and importing into an analytics solution. Make sure data is encrypted when you transport it and store it. It's something we take very seriously.

Does embedding the analytics help or hurt user productivity?

Marriage: A study found that 84 percent of business users want access to analytics within the applications they're already using, but nearly 70 percent found themselves switching from their usual business apps to separate analytics tools to get the data or analysis needed. In their report, "Augmenting Intelligence with Embedded Analytics," Nucleus Research estimated this wastes up to two hours of productivity per worker per week. Think about that. In a year, that is about 100 hours of time saved per user. When you factor that over an entire organization, saving that time and cost is another huge benefit of embedded analytics.

Who are you primarily reaching with Analytics360?

Ware: The trend now is not just business intelligence within packaged apps; it's also in IT organizations and their internal apps.

We have two main audiences, direct and partner. Embedded analytics provides value to both. For our ISV partners, embedding business intelligence and data analytics into their applications offers new revenue streams — and keeps them from losing customers to other apps with this functionality. For companies that use the app internally, it increases users' participation and adoption rates and keeps users satisfied. Users aren't going to use an app when they don't understand the value they're gaining from it.

How does your solution compare to others on the market?

Ware: There are a lot of things that differentiate Analytics360: The fact that it comes with pre-built content makes it easier to implement and gives a faster return on investment. Also, if you don't have in-house business intelligence expertise, we have a services team that is well-versed in business analytics and can help you.

Another difference is the fact that it's built for our database and platform, Progress OpenEdge, so that it can extract operational content quicker and more accurately than any other product. Having an integrated extract, transform and load process increases the efficiency quite a bit.

Marriage: And we do have customers using it in real-time — controlling manufacturing flows, or tracking assets moving on a map.

Q: Business intelligence has gone from standalone services to becoming embedded in every application. What's next in its evolution?

Marriage: As the velocity and volume of data continue to increase, it's going to become more and more unmanageable. We're going to see a marriage of cognitive applications to analytics as these analytics solutions begin to make more decisions. It might be automatically adjusting prices to maximize profit margins, or making an adjustment to a manufacturing line, or predicting when there's going to be component failure. Our vision for Progress is that cognitive applications are coming next. ▮

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Service virtualization ensures quality

Testing each and every component will help dev and deployment schedules remain on time

BY LISA MORGAN

Using outside components? If so, you better test them, even if they came from the most reputable open-source project or commercial component provider you know. If you're not testing components, especially within the context of other components required for your application and the environment in which your application will run, expect to find defects in production that could have been avoided easily and cost-effectively.

"We did some research recently [about] release management and what we found is people are more concerned about quality than they are time to market," said Theresa Lanowitz, founder of analyst firm voke. "This is the first time we've seen the switch."

In the voke 2015 Service Virtualization Snapshot Report, most of the par-

ticipants said that dependencies were delaying releases. Eighty-one percent said dependencies slowed their ability to develop software, reproduce a defect or fix a defect. Eight-four percent said dependencies negatively affected QA's ability to begin testing, start a new test cycle, test a required platform or verify a defect.

Such delays can lead to quality issues if elements of testing are skipped to save time or if testing is executed inadequately.

"If a development team is dependent on a component yet to be built, they're not going to test it," said Marc Brown, CMO at Parasoft.

Service virtualization solves that issue and many others.

What about mocks and stubs?

In the absence of service virtualization, developers can create mocks and stubs to simulate what will likely happen in production, but the tactics don't always yield accurate results. As the sophistication of components and interactions increases, the accuracy of what's being emulated can decrease and it becomes increasingly expensive for the team to create and maintain the mocks and stubs.

"Mocks and stubs are one way to deal with some of the basic elements, but it's not going to scale. It creates more overhead and potentially more risk for teams," said Parasoft's Brown. "You're not going to be able to do certain things that you could do with service virtualization."

Harsh Upreti, product marketing manager at SmartBear, said the main reason his customers want service virtualization is to move beyond basic mocking.

"What happens is you have a lot of dependencies on other teams, other products and their APIs," he said. "Some of the APIs may not be relevant because they are still under development or they're a little bit costly because maybe you're hitting a Google Map that costs you $50 for every 1,000 calls," he said.

The benefits of service virtualization increase when development and testing are using it to access the same systems.

'People are more concerned about quality than they are time to market. This is the first time we've seen the switch.'

—Theresa Lanowitz, voke

Specifically, developers can prevent more defects in the first place, and QA can perform end-to-end testing.

voke's survey found that dependencies were negatively impacting software release cycles and quality. On average, respondents had 53 dependencies. However, 67 percent reported unrestricted access to only 10 or fewer dependencies.

"The reason why you need service virtualization is that it completely cuts dependencies across the board," said Aruna Ravichandran, VP of DevOps Product and Solutions Marketing at CA Technologies. "Developers no longer have to wait for systems to be available because each of those back-end calls can be automated."

Get access to more resources

Service virtualization enables developers and testers to test against resources that either are unavailable, rarely available or incomplete. For example, access to a mainframe may only be possible during certain hours. Service virtualization enables developers and testers to avoid all that.

"What it enables you to do is run a complete end-to-end test at any time throughout any aspect of your software lifecycle so a developer can say, 'Let's see what this looks like end-to-end if we had all these things,' " said voke's Lanowitz. "What does it look like for performance, functionality and anything else we're trying to test against, so the ability to access components, services, systems, architectures, sensors, mainframes, databases and the list goes on."

Even if resources are available, time and cost can get in the way. For example, if a developer is building an application that requires connections to an ERP system and a credit card system, the developer has to work with IT to make sure the systems are properly provisioned and that testing can be done with the credit card system. Testing that involves third-party systems can cost money, whether its testing fees or setting up a real-world test environment.

Still, teams trying to cut costs have been known to adopt service virtualization, cut it in an attempt to save money and then readopt it because cost of service virtualization was outweighed by the economic and time-saving benefits it provides.

Blind faith is dangerous

Developers' testing responsibilities have continued to grow as more types of testing have "shifted left." Meanwhile, many commercial component providers have gone out of their way to deliver stable components so developers can use them with high levels of confidence. Still, the reliability of a component doesn't depend only the component itself.

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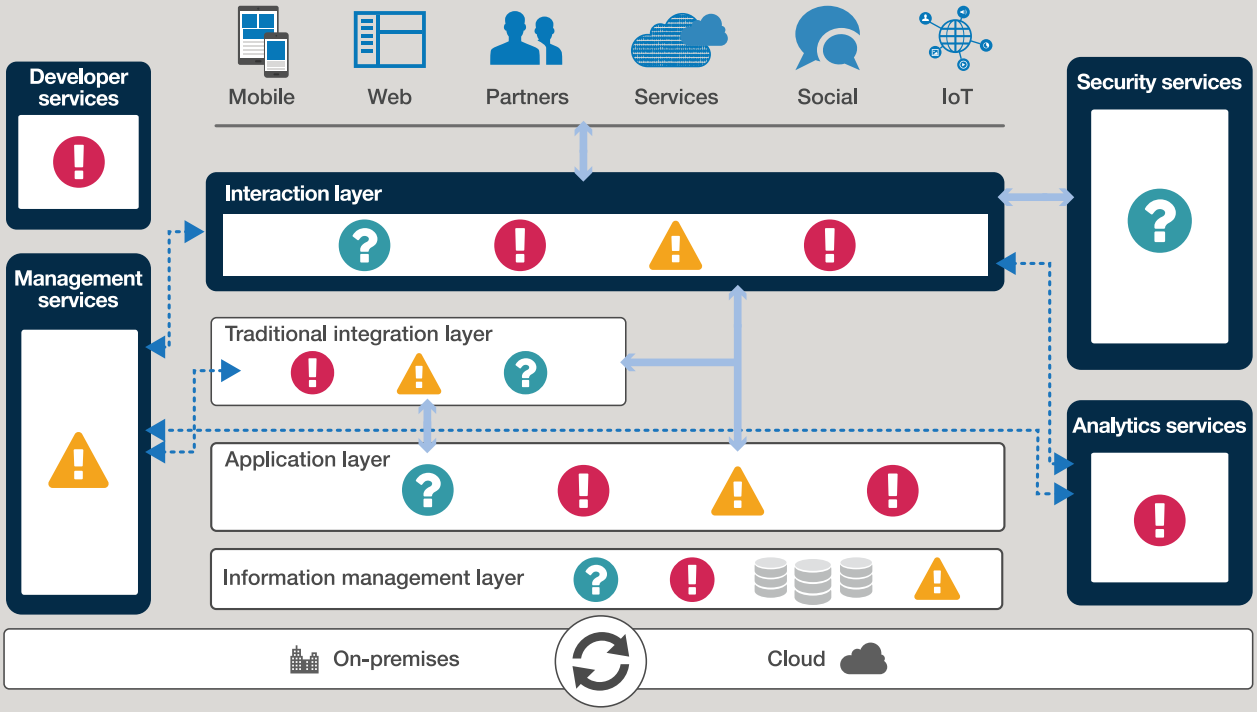
ARE YOU MISSING KEY PIECES OF YOUR API STRATEGY?



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"A component may work fine independently, but what if they're not tested together?" said voke's Lanowitz. "What if you have Component[s] A, B and C and Component A has been tested 100%, Component B has been tested 80% and Component C has been tested 80%, but when they're combined they don't work together?"

Using service virtualization, developers can emulate such conditions so they can better understand how a component would actually behave in production.

"Many components provided by the open-source community or third parties can have security, performance or load-related issues. Just look at the number of systems that have gone down and created some sort of cost," said Parasoft's Brown. "There's a business cost or liability or a brand-tarnishing issue. I wouldn't trust anybody right now."

In the absence of service virtualization, production data also may be impacted in some unintended way. Brown said Parasoft has seen some issues in the banking industry where people were testing against live production data and some of the production data made it to development. The data also found its way to other areas, which meant that customers' credit card numbers weren't actually secure.

Security is a very real issue and one that continues to become more important every day. Components built in the past may have been built at a time when security threats were not as pervasive, severe or varied as they are today. Although people want to trust the components they use and avoid coding something they can get from a commercial vendor or the open-source community, there's no substitute for testing. Hackers continue to devise more sophisticated ways to compromise software.

"If I adopt a component, I really need to make sure that I've got some reusable assets that can help me validate those components fully so I can have the level of confidence I need without slowing things down," said Brown.

Accelerate delivery, maintain quality

Fast access to virtual resources is better than slow access or no access to actual resources. With service virtualization, development and testing teams can work in parallel, which saves precious time.

"Our customers tell us they used to wait almost a third of the time for the development teams to get APIs [to testing]," said SmartBear's Upreti. "Now they're available immediately so [the testing team] doesn't have to follow up with [the development team]. They work faster and there are better relationships between team members. It's creating better conditions to work in software development teams."

Vodafone New Zealand, a Parasoft customer, found it harder to deliver reliable software due to increasing customer expectations and software complexity. Part of the problem was the company's acquisitions of other businesses, which resulted in more systems and dependencies that further complicated software updates.

To ensure the new functionality operated properly and it didn't damage existing functionality, development teams needed to test their work and third-party components in realistic test environments, which was too costly and time-consuming to do using actual systems.

AutoTrader mimics reality, saves money

AutoTrader, one of CA's customers, was able to test across devices and avoid $300,000 in test hardware and software costs. Its website, AutoTrader.com, is used by more than 18 million people per month who are researching, selling and buying cars. A decade ago, the company was releasing just four web services per year. Now the company is under pressure to deliver a release a week. Meanwhile, the number of devices and versions of devices and operating systems customers are using has grown, complicating testing.

"When I talked to them about their application strategy, one of the key things they shared with us [was the desire] to provide a seamless service across devices," said Ravichandran. "Service virtualization gave them the ability to test new features, apps, and third-party components across multiple devices."

AutoTrader was also able to reduce software defects by nearly 25 percent and it reduced testing time by 99 percent.

Generally speaking, service virtualization is a good way to reproduce and reduce defects.

"One of the biggest problems is that something will work fine on a developer's machine, but then it gets into production or test and there's a problem. The defect can't be reproduced," said voke's Lanowitz. "With service virtualization, you have access to that production-like environment so you can accurately and realistically reproduce the defects and you can do economical testing of realistic behavior such as performance which is one of those non-functional requirements we overlook."

Using service virtualization, software teams can reduce the number of defects pre-production and in production while increasing test coverage and reducing testing cycle time and release cycle time.

"Ideally, you want to get to the point where when it comes time to check in your source code, you're checking in virtualized assets with it," said Lanowitz.

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The IoT is giving rise to even more complex ecosystems that need to be tested and because they're so complex, it's impractical if not impossible to test all the possible scenarios without using service virtualization.

"Service virtualization allows you to virtualize components in the world of system of systems, which is critical," said Parasoft's Brown. "You can virtualize an embedded device, services, sensors and [outside] components."

Beyond that, service virtualization allows developers to contemplate abnormal conditions that wouldn't otherwise be apparent without access to the actual physical systems. Because so many things can go wrong in an IoT or IIoT scenario, it's critical to understand normal and abnormal behavior, such as what effect different types of loads have.

"As we move into the Internet of Things, if you're not using service virtualization, you're not going to keep up with everything we need to do," said voke's Lanowitz. "You have to be constantly testing, making sure things are performing. You need to make sure you have the availability and everything you need to test what's going on inside that thing."

Where to start?

Some companies haven't adopted service virtualization yet because they don't know where to start — development or QA? On the other hand, that may not be the right way to frame the problem.

"I always recommend starting with those fee-based systems you have to pay to access for testing or start with a small project where you have a good rapport between your developers and your testers because your testers are going to benefit from service virtualization," said voke's Lanowitz. "There are a few things you can do. You can say anything we're using in the enterprise, anything in our core logic we should use virtualized assets for."

In one case, service virtualization worked so well that virtual assets were accidently deployed instead of real assets. However, the problem was found and fixed immediately, Lanowitz said.

Component testing is just the beginning

Today's developers need on-demand test environments for continuous testing and on-demand testing.. Already, service virtualization has become a foundational element for Agile teams and DevOps teams that need continuous testing capabilities.

In line with that, Parasoft's Brown expects more SaaS vendors to create test components and perhaps a reusable virtual service that goes along with them.

"We'd love to power people developing software components because it will make their applications better, high quality and less prone to security exploits," he said. "At the same time, they might be able to differentiate their own products by shipping a component or virtual service that goes hand-in-hand with it that people can test against."

Component testing is just one of many things service virtualization enables. In the voke survey, participants were asked what they were virtualizing. Participants said they were virtualizing web services, APIs, mobile platforms, embedded systems, IoT-types of sensors and components.

voke views service virtualization as a subset of lifecycle virtualization, which includes service virtualization and virtual or cloud-based lab technology so the environment is as close to a production environment as possible. A third elethatment is test data virtualization that can be shared across a software supply team so companies are not impacting the safety and security of customers by sharing real-life production data and they can avoid shipping terabyte-sized files across the network to teams that may need production data for testing. Network virtualization is also included in the mix so teams can simulate a network and different use cases, such as what happens to a banking transaction if a user goes into a subway. The final element is defect virtualization.

"We're always going to have defects and we either discover those defects in pre-production or we discover them in production. We need a way to know what defects are in our source code or legacy source code," said Lanowitz. "Using defect virtualization software in the background, you can understand the point of application failure and where the defect is so you can fix it."

Meanwhile, current users of service virtualization should endeavor to drive more value from solutions by ensuring that virtual assets are available throughout the software lifecycle, which will result in additional time savings and costs.

Using service virtualization can give you more confidence in the components you're using in your software and you'll be more confident about the quality and stability of the software you're building. ▮

The benefits of service virtualization

Just as automated testing is not required for all organizations that develop software, service virtualization is also not a required technology. However, service virtualization will deliver significant benefits for organizations that have the following characteristics:

- Transaction critical industry
- User experience is paramount
- A complex, legacy infrastructure
- Dependence on internal and/or 3rd party APIs
- Growing number of interfaces and system dependencies
- Time to market for new releases is critical
- Regulatory or industry compliance requirements

Why? Service virtualization offers three distinct benefits. The first benefit is access to incomplete or complex test environments. The second benefit is that service virtualization allows you to consistently test beyond the boundaries of the applications. The third, which I feel is the most beneficial, is simulation. Service virtualization gives you the ability to alter the behavior of dependent systems or interfaces, giving you the ability to exercise your application beyond fixed parameters.

—Wayne Ariola, Tricentis

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Get insight into application usage

BY LISA MORGAN

Developers building SaaS applications have many analytics options that can help them understand feature usage, but they struggle to do the same thing with their on-premises software. Yet, collecting usage data from existing on-premises software is critical for their SaaS roadmap and initiatives. Revulytics bridges the gap by providing insight into packaged software, allowing developers to get direct feedback on their product enhancements and functionality.

"Developers have been using crash logs, Windows events logs, and some of their own monitoring but still don't have visibility into what's happening at the feature level," said Vic DeMarines, VP of products and strategy at Revulytics. "Usually, they've done some level of integration to gather usage data, but have no easy way to visualize the data nor the resources to spare to develop their own analytics solution."

> *'It's one thing to visualize the fact that people had trouble adopting a feature in a particular release and another to educate users on that capability.'*
>
> *— Vic DeMarines, VP of products and strategy*

Most developers and product managers want detail about product feature trends, but they're not sure how the back end should be implemented, how information should be organized, and how it should be presented. When considering on premise software, additional requirements add to the complexity of building a solution — caching data, providing an AI that other product groups can consume, building a scalable reporting infrastructure and providing a dashboard that allows visualization and sharing of the resulting trends.

The Revulytics platform handles all that. It also enables developers to add custom attributes to the default data collected which allows even more detailed filtering and segmenting of the data to isolate the trends that they did not know to look for in prior data collection.

"We make it extremely easy to integrate usage analytics into an application and visualize the key adoption trends automatically," said DeMarines. "You can streamline your development effort, deprecate features of no value and make strategic decisions about the product roadmap without differences of opinions between development and product management."

Turn analytics to action

Software analytics allow developers to determine how product features are being used and the extent of use. However, developers also want to positively impact adoption.

"It's one thing to visualize the fact that people had trouble adopting a feature in a particular release and another to educate users about that capability. Our analytics enable you to take action," said DeMarines. "You need to get the data, visualize the solution, fix the problem in the next release and then educate users about the enhancement."

The Revulytics platform also includes in-application messaging, so developers can notify end users about new features or capabilities they're not using within the context of the application. Developers have the option of notifying all users of a particular version or even all users across all versions of a product. Alternatively, they can target messages to specific users using filters such as license key, product edition or feature category.

Revulytics helps ensure that notifications don't negatively impact an application's functionality.

"In the B2C space, it's tempting to trigger a pop-up with each click," said DeMarines. "We have a policy engine for messaging workflows so you can notify users without interfering with a great user experience."

Ensure requirements, features align

Great applications fall short of expectations when they don't function well in the user's environment. Using Revulytics, one ISV discovered that 50 percent of its dentist office customers were still running 32-bit platforms and Windows XP.

"They realized half their users wouldn't be able to take advantage of the new features," said DeMarines. "With data in hand about their users' environments, they were able to roll out a beta and track KPIs. One of the key KPIs was feedback from users saying the new features were well-integrated and the end users were able to use the capability."

Get up and running fast

Developers can create a Revulytics account and get access to all of the platform's capabilities, free. The trial is limited only by the number of installs.

"Developers appreciate the ease of integration," said DeMarines. "You can just log in and see data presented — no SQL queries or complex reporting tools."

Learn more at www.revulytics.com. ▮

Buyers Guide

API management:

The glue holding the app economy together

BY CHRISTINA CARDOZA

The world is becoming more digital, intelligent and connected — and the driving force behind all of this are APIs, or application programming interfaces. Developers have been using APIs as a building block for their applications for years. However, with the evolution of application and platform architectures, APIs are becoming more important than ever.

"Certainly the API economy is only just beginning to emerge, and the hype around it is still growing as digital strategies and the pervasive use of the Internet of Things (IoT) unfold. An organization's API strategy underpins its digital strategy — and is a sizable portion of it — so engaging with the API economy is an integral part of any digital strategy," Gartner wrote in its Magic Quadrant for full life cycle API management.

In order to successfully deploy, manage and gain value from API program, organizations need a proper API management solution.

"APIs have been around forever. It is how all applications have interacted with other services. What has changed is as the app economy has grown, and APIs have become more prevalent in the app economy, the need for how do you secure them, manage them, set policies and control them is becoming more apparent," said Bill Oakes, director of product marketing for CA API management. "The only way you can do that effectively, and that is the keyword is effectively, is through API management."

A successful API management strategy

Today's app economy is very different from the early 2000s. According to CA's Oakes, up until about 2010, the architecture used to allow things to interoperate at the enterprise level was a service-oriented architecture (SOA). When Apple introduced the App Store nine years ago, all of a sudden everyone wanted to build applications, and instead of creating huge monolithic applications they wanted to do it in a way that fit on mobile devices, Oakes explained.

"A lot of the apps you are using today used to be corporate apps that defined who got what where, when and how. Nowadays it is basically you better give me the information I need to do my job on this device. The user is in control," Oakes said. "The whole paradigm of who is in control has shifted, and all that is due to the app economy, which is being driven by APIs. That is only going to get bigger over the next few years."

To keep up with this evolution, the definition of API management has had to advance and expand overtime as well. Over the past 12 to 18 months there has really been an extension of what API management actually means, according to David Chiu, director of product marketing for CA API Management.

In fact, Gartner use to refer to full cycle API management as application services governance, but decided to replace this term in its 2016 Magic Quadrant to reflect the ongoing API growth.

API management has gone from being primarily about security to encompass planning, designing, implementing, publishing, operating, consuming, maintaining and retiring APIs, Chiu explained.

"Most organizations recognize that adding APIs to your enterprise introduces risks in some areas, but it also creates a lot of opportunities," said Ian Goldsmith, vice president of Akana product management at Rogue Wave Software. "What an API management solution does is it helps you speed up your ability to take advantage of the opportunity while mitigating a lot of the risks."

The two main risks APIs present to a business include security, and being too successful. According to Goldsmith, when you create an API that provides

direct access into your systems, you have to make sure that the API is really secured. To do that, you need access control auditing, logging, traffic management, and a way to ensure you are complying with regulations.

One you publish an API, the hope is that it will become popular. This will drive new business and more traffic to your back-end system, according to Goldsmith. Development teams have to make sure their systems are ready to handle all the traffic, so they need performance monitoring in order to understand how the API is being used, who is using it, how it can be optimized, and how to prepare for spikes and new loads. "All of these things are where a good API management platform comes in," Goldsmith said.

According to CA's Oakes, there are four distinct elements necessary for a good API management strategy: Alignment and usefulness, engagement and usability, scalability and evolvability, and manageability and security.

Alignment and usefulness ensure the APIs being implementing are actually the APIs the team really wants. "You have to have some kind of intelligent digital initiative where the APIs are giving you value. That means they have to be closely aligned with the objectives of the enterprise and overall strategy as well as do something for the end users," Oakes said.

Engagement and usability get partners and developers to integrate APIs into their solution. "This means you have to have a developer program. You have to have design principles for not only the API, but also the design and developer experience," Oakes said. In addition, the program should include documentation on how the API works as well as code generation tools and code samples.

Scalability and evolvability involves future-proofing your work, according to Oakes. APIs will continue to change and adapt overtime to meet change and demands, and a API management strategy should ensure you are on the right path, he explained.

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What happens when you don't have a good API management strategy in place

Last year, the application Pokémon Go took the mobile industry by storm. With its geolocation knowledge, augmented reality features and popular concept, it changed how mobile games are expected to behave. But while it was all fun and games for the players, the company Niantic faced some difficulty on the API side. Niantic used APIs to allow users to go and hunt Pokémon in their locations. According to CA's Oakes, the company tried to hide the API, but did not secure it or put any type of policy engine in front of it. The problem with this is that people on the Internet are smart and they were able to very quickly reverse engineer the API and basically cheat the system to find the most desired characters. "What that did is put massive load on Niantic's servers, which in turn created user experience issues and caused individual systems to crash all because they didn't protect the API or didn't put anything in place to make sure that didn't happen," said Oakes. "The whole idea of how do you make sure that endpoints are really who they are, and the right users on the right devices get access to the right data is only effective and possible through API management." ▮

Driving forces behind APIs

There are three classes API development fits into, according to Rogue Wave's Goldsmith. They include:

- **Internal application integration:** The next generation of service oriented architecture. This area encapsulates microservices to an extent.
- **B2B:** Or partner enablement. "If you need to find a way to help onboard partners more rapidly, or allow partners to more rapidly use your technologies, APIs are a great solution," said Goldsmith.
- **External development:** External development is what people tend to think of as the more traditional API space. Here you publish a set of APIs for anyone to use, and people create innovative and new solutions around your core capabilities using APIs.

According to CA's Oakes, while the mobile and IoT trends will continue to move the API industry forward, the hottest trend right now is microservices because everyone is trying to roll out high quality and secure solutions quickly.

CA's Chiu explained the mobile and IoT wave actually goes hand in hand with microservices because organizations are trying to cut down the effort it takes to create integrations, and make them secure and scalable. Organizations are modernizing their systems using microservices and APIs to become more agile, Chiu explained. "Organizations are taking their monolithic applications, their conventional SOA services, and breaking them down into smaller, more agile microservices. They are doing that because once the applications are broken down, it becomes easier to align with their agile initiatives," he said. "There are a variety of reasons why there is a modernization trend going on, but the best practice everyone is doing is using API management and microservices to transition the life of an architecture into something that is more applicable for today's apps, IoT projects and mobility." ▮

A guide to API management tools

■ **Apigee:** Apigee is an API management platform for modernizing IT infrastructure, building microservices and managing applications. The platform was acquired by Google in 2016 and added to the Google Cloud. It includes gateway, security, analytics, developer portal, and operations capabilities.

■ **Cloud Elements:** Cloud API integration platform **Cloud Elements** enables developers to publish, integrate, aggregate and manage their APIs through a unified platform. Using Cloud Elements, developers can quickly connect entire categories of cloud services (e.g. CRM, Documents, Finance) using uniform APIs, or simply synchronize data between multiple cloud services (e.g. Salesforce, Zendesk, Quickbooks) using its innovative integration toolkit. Cloud Elements provides a one-of-a-kind **API Scorecard** so organizations can see how their API measures up in the industry.

■ **Dell Boomi: Boomi API Management**, provides a unified and scalable, cloud-based platform to centrally manage and enrich API interactions through their entire lifecycle. With Boomi, users can rapidly configure any endpoint as an API, publish APIs on-premise or in the cloud, manage APIs with traffic control and usage dashboards.

■ **IBM: IBM Cloud's API Connect** is designed for organizations looking to streamline and accelerate their journey into the API economy; API Connect on IBM Cloud is an API lifecycle management offering which allows any organization to create, publish, manage and secure APIs across cloud environments—including multi-cloud and hybrid environments.This makes API Connect far more cost-effective than limited point solutions that focus on just a few lifecycle phases and can end up collectively costing more as organizations piece components together.

■ **Mashape:** Mashape powers Microservice APIs. Mashape is the company behind **Kong**, the most popular open-source API Gateway. Mashape is based in San Francisco but has a presence in Europe and Japan. Mashape successfully operates in the API market for more than seven years and offers a wide range of API products and tools from testing to analytics. The main enterprise offering is Kong Enterprise, which includes Kong Analytics, Kong Dev Portal and an enterprise version of the API Gateway with advanced security and HA features.

■ **MuleSoft:** MuleSoft's **API Manager** is designed to help users manage, monitor, analyze and secure APIs in a few simple steps. The manager enables users to proxy existing services or secure APIs with an API management gateway; add or remove prebuilt or custom policies; deliver access management; provision access; and set alerts so users can respond proactively.

■ **NevaTech: Nevatech Sentinet** is an enterprise class API Management platform written in .NET that is available for On-Premise, Cloud and Hybrid environments. It connects, mediates and manages interactions between providers and consumers of services across enterprises for businesses or end-customers. Sentinet supports industry SOAP and REST standards as well as Microsoft specific technologies and includes an API Repository for API Governance, API versioning, auto-discovery, description, publishing and Lifecycle Management.

■ **Oracle:** Oracle recently released the **Oracle API Platform Cloud Service**. The new service was developed with the API-first design and governance features from its acquisition of Apiary as well as Oracle's own API management capabilities. The service is providers an end-to-end service for designing, prototyping, documenting, testing and managing the proliferation of critical APIs.

■ **Red Hat: Red Hat 3Scale API Management** is a hybrid cloud based platform designed to help organizations build a more successful API program. It includes access control, security, rate limits, payment gateway integration and developer experience tools. Performance insights can also be shared across an organization with clear API analytics and reporting mechanisms, so that APIs can play a more strategic role in helping to deliver new services quickly, easily, and in a secure, scalable and reliable manner.

■ **TIBCO Software: TIBCO Mashery Enterprise** is a full life cycle API management solution that allows users to create, integrate, and securely manage APIs and API user communities. Mashery is available either as a full SaaS solution, or with the option to run the API gateway on-premise in a hybrid configuration. The offering enables digital transformation and API initiatives that expand your market reach by exposing and sharing data and services with developers. ▮

■ FEATURED PROVIDERS ■

■ **CA Technologies:** CA Technologies helps customers create an agile business by modernizing application architectures with APIs and microservices. Its portfolio includes the industry's most innovative solution for microservices, and provides the most trusted and complete capabilities across the API lifecycle for development, orchestration, security, management, monitoring, deployment, discovery and consumption."

■ **Rogue Wave:** Rogue Wave: Rogue Wave acquired the API management, SOA governance and API security platform Akana last year. The comprehensive Akana suite of API management, API security, and microservices solutions helps businesses accelerate digital transformation by securely extending their reach across multiple channels. Some of the world's largest companies use Akana to harness the power of their technology and transform their businesses.

THE FORRESTER WAVE™: API MANAGEMENT SOLUTIONS, Q4 2016 REPORT

See how the top 14 vendors stack up

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- 5 major buying scenarios to understand and classify needs
- The top features used to evaluate API management solutions

AKANA RANKED AS A **LEADER**

*"Akana's solution fits very well with **enterprise strategies** for broad-based, mature, well-governed API strategies."*

*Rogue Wave Software acquired Akana in Q4, 2016.

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And finally, manageability and security is perhaps the most important element to any good strategy, according to Oakes. "To really secure and manage your API platform, you have to have API analytics and monitoring. You have to have a security and identity model in place, and you need a management platform," Oakes said.

In addition, Rogue Wave's Goldsmith explained an API management solution should include a gateway and a developer portal. "And then as a thread running through all of that is the ability for both the app developers and the API developers to view traffic, look at logs, understand patterns, and provide analysis around the use of the API and how a developer apps are using it. All of that comes together because it is collected by the gateway and displayed to the developers via the portal," said Goldsmith.

Goldsmith also noted APIs don't require organizations to purchase an API management solution per se, but without one it would be very difficult to encompass all of the necessary capabilities.

"It doesn't make any sense to try to build those capabilities natively into your applications because you will have to duplicate them again and again for every single API you build. Buying an API management solution that deliver all those capabilities helps the organization take advantage of that as a centralized service of the enterprise," he said. ▮

Why should development teams choose your API management solution?

Bill Oakes and David Chiu, directors of product marketing for CA API management:

Full lifecycle API management from CA is the most efficient and secure way to modernize your application architecture with APIs and microservices to create an agile business. Our portfolio includes the industry's most innovative solution for microservices, while continuing to provide the most trusted and complete capabilities across the API lifecycle for development, orchestration, security, management, monitoring, deployment, discovery and consumption.

Consider CA's advantages:

- Speed and agility
- The only vendor with automated, low-code development for microservices and APIs
- Create microservices and APIs with business rules instantly from existing data via an efficient point-and-click interface — unique to CA
- Accelerates innovation and time-to-market without sacrificing scale or manageability

Breadth of functionality

- The only vendor with a robust capability set that spans the entire API lifecycle
- Enables every step of digital transformation with APIs — development, orchestration, security, management, monitoring, deployment, discovery and consumption

Security and scalability

- Has proven security and scale for the largest, most demanding organizations
- Is a leader in security, market presence, analyst evaluations, and customers in key industries such as finance, healthcare, retail, transportation, government, telecom, and others

CA API Management can generate microservices and APIs up to 10x faster than other approaches, and customers experience a 97% improvement in time-to-market for API-based digital transformation initiatives from 3 months to 3 days. And finally, CA has military-grade security and Common Criteria certification, meeting the demanding requirements of the U.S. DoD and other governments around the world.

Ian Goldsmith, vice president of Akana product management at Rogue Wave Software

One of the easiest way to answer that is when you look at the analysts who do in-depth studies of these products such as Forrester, who provides one of the most detailed analysis of the products out there, they consistently rate us as one of the top leaders in the space.

They would say it is because we are a very mature platform. We are functionally extremely rich and we are also broad. We deliver a comprehensive solution. We have a very strong developer portal offering, and we have a very strong gateway offering. We enable all of the integration scenarios. We have a fully integrated and fully functional OAuth platform.

Functionally, we deliver all of the things that every other vendor delivers, but in a single solution. You might be able to get a good gateway from one vendor who doesn't have a good portal. We have a great portal and a great gateway.

The deployment options is also a really big deal. We have the SaaS platform, we have on-premises, and we have hybrid. Hybrid is becoming more and more of a driving requirement. From a straight out security perspective, we are a PCI DSS 3.2 certified provider. We have an external auditor that we go through every year, and that means customers can use our SaaS platform to handle payment services and it means customers who are using the on premise environment are confident that they can use our products to build out their own PCI compliant environment. PCI is a pretty big deal. It is required if you are doing anything with credit card data, and it is also one of the more stringent regulatory environments so if we can comply with that we can comply with just about anything.

We are the vendor that offers the strongest security capabilities as part of the broadest solution with a very strong set of deployment options. ▮

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Read more at rainforestqa.com/continuous-testing

The pursuit of continuous testing

BY RUSSELL SMITH,
CTO, RAINFOREST QA

Techniques such as pair programming and peer code reviews, among others, can improve the quality of software, but defects will always slip through the cracks. The aim of QA is to help your development team move faster while delivering accurate, actionable test results, and ultimately ship a higher quality product more quickly. This is a guide to what should be important in a QA process and what shouldn't.

1. BUILD TESTING IN CHUNKS

Make your tests as composable as possible by working out commonalities in your suite. If starting from scratch with a new process, start with small manageable chunks.

Build your test suite in the following order for greatest effect:

1. Smoke tests, covering the top three to five flows through your application. An example of an e-commerce site would be, login, sign up, checkout. Choose whatever might cause a headline in a newspaper or email to the CEO if it broke.
2. Happy path tests. Generally they are the most common paths through your application.
3. Bugs people have reported before should never happen twice. Add a test to your suite — whether a unit test or not — to make sure it doesn't.
4. Edge cases don't fit in the above categories and generally aren't in the common user flow. They have less value, so leave them until last.

2. BALANCE YOUR APPROACH TO WHAT TO COVER AND TEST

It is very common to want to test every test as well as every combination of browsers. Sometimes even every variant of a page. This isn't practical for long or necessary once you have a large application.

If you do not have a fixed list of devices you support, you may use common tooling such as Google Analytics to aid you. From this, you should end up with a list of the most used devices or browsers by your customers.

Tip: Focus on the top 95% of these, or 99% if you have a higher budget. Having an official policy on which browsers you support can also help you here. Make sure you revisit this at least once per quarter, as the needed coverage may change.

Developers often use error reporting software. This is a great source to use to focus testing efforts inside QA. Tracking defects by area of the product, developer, team and source of spec is a good start. This will often lead to patterns emerging. Any patterns found can guide process improvements and retrospectives with developers.

3. MEASURE TO IMPROVE

If you don't measure results, you won't be able to show improvement. QA's main aim is to help the organization ship a higher-quality product.

Primary measurements for QA:
The number of bugs reported by or that affect customers. Log any reported issue by date, and if you can, by product area, developer and team. Every week you should summarize this and look for patterns.

You should be tracking the time-to-fix — the time between a failed build and the next passing build. Measuring this answers how a development team is able to use the output from QA to triage and fix a bugs. If you wish to go further, split the tracking out by source of the issue. Examples are: external (i.e. customer), internal (i.e. missed by QA), or test-case failures.

Secondary measurements for QA:
The number of tests added to your suite, versus the number of regressions that failed in your suite.

Flakiness. Especially when using automation, you should track tests that pass and fail intermittently. This is an indicator of one or more of poor test quality, poor choice of system or poor execution.

Note: there are no good leading indicators for production quality — only trailing indicators.

4. SHIFT LEFT/TIGHTEN THE FEEDBACK LOOP

Traditionally QA gets involved later in the software development life-cycle. The earlier you can move it, the easier most issues are to fix. Why? Slower feedback cycles create distance from the problem. Developers become forgetful and shift to other tasks, losing context, plus code can change from under them.

Some common ways of moving QA earlier in the release cycle are:

Pull-request-based development combined with automatic environment creation. Every pull request automatically has its own environment setup. This allows human-powered QA, or automated integration tests, access to changes earlier in the SDLC.

5. LEVERAGE UNIT TESTING

To get greatest leverage from your unit tests, run them in the following order:

1. The tests for files changed
2. The entire feature changed. Structure or tag tests by feature to help here.
3. All tests. Usually this should be for every push and run via CI only, due to speed.While this isn't usually done by QA, unit testing is a great way to improve your products quality. ▮

To dive more deeply into these steps, and to learn more, read this story in its entirety at:

Jeff Williams is CTO and co-founder of Contrast Security.

Guest View

BY JEFF WILLIAMS

Innovate without compromising security

Companies face a terrible choice. Either transform their business into software and accept rampant vulnerabilities and breaches, or lose the innovation race with their competitors. Companies have chosen software — there will be 111 billion lines of new code written in 2017, according to a report by Cybersecurity Ventures and sponsored by Code Dx. And our traditional approaches aren't able to prevent vulnerabilities at that scale.

That sounds bad. But actually, it's worse. Applications are changing. Fast. The "website" you used to know was a single application running on a server in a datacenter somewhere. Today, that same website might look the same to the user, but under the hood it's completely transformed. The user interface is now written in JavaScript that runs the browser. The server-side has morphed into a set of REST APIs. And the code runs in containers like Docker, expands elastically based on demand, and is deployed multiple times a day!

Application instrumentation is the only way contextual information can be accessed easily and accurately.

Legacy security tools from the early 2000s, like static code scanners, dynamic scanners, and web application firewalls were never great protection for applications. But containers have removed the physical constraints of servers and hardware, allowing software development to automate and accelerate. These old security tools require extensive configuration, tuning, and triage by experts, so they just can't keep up. This leaves companies with no good alternatives for securing their applications.

Our only hope is to migrate from monolithic environments with perimeter protection into a new architecture with individually protected applications. Ed Amoroso, former CISO of AT&T, depicts the transformation this way. First, you "explode" the applications into microsegments. Then you "offload" them to the cloud. Finally, you "reload" security into the environments.

How do we achieve this transformation at the application layer? When we deploy complex technologies, like planes and nuclear power plants, we instrument them for visibility, safety, and security. But software – the most critical and complex thing man has ever built – has essentially no instrumentation. We're flying blind.

Software instrumentation has been used for many years for performance and logging. This is the same approach companies like New Relic and AppDynamics use to improve performance in thousands of companies. Security instrumentation has numerous advantages over traditional analysis and protection approaches. Legacy tools fail because they are too far from the applications they protect — they have no "context" to inform their analysis. Imagine the advantages of instrumenting security directly into applications, where it can take advantage of all the information available from the inside.

Accurately detecting vulnerabilities and attacks requires a lot of "context." Some vulnerabilities are only obvious in HTTP traffic. Others can only be detected in source code. And some by analyzing open source libraries and frameworks. And the majority can only be detected accurately by watching how the application actually runs. Instrumentation of applications is the only way this contextual information can be accessed easily and accurately.

Security instrumentation is available. Technologies called "Interactive Application Security Testing" (IAST) and "Runtime Application Self-Protection" (RASP) are helping organizations transition to a real-time approach to application security. IAST detects vulnerabilities and RASP blocks attacks. Simply by adding IAST and RASP to your applications, you'll have complete and continuous vulnerability and attack telemetry across your application portfolio.

The result is security that works with modern software development, or "DevSecOps" as it's called. Imagine an entire portfolio of applications, all with defenses like IAST and RASP instrumented in at runtime. Security is distributed and happens in parallel, everywhere.

The application of the future can diagnose its own vulnerabilities and protect itself against attacks. Done right, security can accelerate software development as opposed to being a blocker. Developers, testers, and operations should all consume application security notifications in real time, through the tools they are already using. And as network and host security become dominated by cloud and container environments, it shouldn't matter how or where applications are deployed.

When software is self-protecting, companies can embrace software without sacrificing security. ▮

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Industry Watch

BY DAVID RUBINSTEIN

Context is key to customer interaction

In this world of capturing huge amounts of data from individuals — from the headphones we wear understanding our listening habits and moods, to geolocation, to how we drive — many fear the loss of personal privacy.

Michel Feaster, CEO of a startup called Usermind, sees it differently. All of this data collection and analysis "is kind of inevitable in a world that's gone digital. After all, the web is 20 years old. You can't put that back into the Pandora's box."

The Internet world is a world in which we all have a massive digital footprint. "Some call it breadcrumbs," Feaster said. She used the "Peanuts" character Pig-Pen as an analogy. The character is so dirty that he walks around in a perpetual cloud of dirt. "In our world, it's a cloud of data, and it's only going to become more rich."

'Peanuts' character Pig-Pen walks around in a perpetual cloud of dirt. In our world, it's a cloud of data.

Feaster says there is so much benefit to the user if a company can tailor its interactions with that user. "The flip side of the privacy issue is that there are a lot of really good things that can come out of that. I'm a good example. I like Pandora, and part of why I like Pandora is that I don't really have the time to discover new artists… I love the fact when I like a bunch of things on Pandora, they curate music for me. I listen to music when I run or exercise; I enjoy that, and I've discovered so many amazing artists through Pandora's curation. So to me… there's so much benefit to the user if the company can tailor the interactions and add value through the data. A lot of data will fall into the world of value add, and the companies that mine that, and use that, are going to win."

Underlying this is machine learning and artificial intelligence. Devices, and the applications that power them, need to be able to detect those usage patterns, collect and analyze them, and give the organization's decision-makers visualizations of the insights that can be gleaned from that data so they can deliver these unique experiences to their customers.

Which illustrates Feaster's belief that context and personalization will become king. Today, however, context does not follow us around like Pig-Pen's cloud, because of the myriad ways we connect with companies: call centers, mobile apps, website bots and more. And today, not all of these systems are connected, because each of the people on the back end is connecting with the user on a different platform. The technology landscape is too fragmented at this point to get the context companies need for the kinds of personalized interactions Feaster sees as the future of business.

"There is a megashift in how buying and selling works," she said. "When we think about what a buyer might do, we think about context. [We] think about the future of the way companies are going to communicate with customers. It's going to be all direct. We're not going to go to stores and buy through a third-party. We're going to go online to schedule our appointments, or we're going to have mobile apps where we're directly interfacing with our banks and uploading pictures of our checks. All of those company-customer interactions are going direct."

What it really means is that CRM is in transformation. "When you engage with a bank, and you're online, or I'm in my app, or I call the call center to tell them I'm traveling … none of those things connect together," she said. "My context doesn't follow me around. When I call the call center, they don't really know what I've been doing on the web, they don't have any history of my interactions. Even something so simple like, I'm a high-travel customer. I fly a lot. And I continuously have to call my bank and say I'm traveling. They don't have a way to say, 'Michel is a high-travel customer, we should treat her differently.' So I think the future of CRM is this notion of context and personalization."

As companies connect all their points of data collection, businesses start to get a picture of the user. "Over time, you can see patterns," Feaster said. "You sent me 20 emails and I never opened one, but every SMS you sent was responded to. Ideally, they will tag me as a user who prefers SMS. They can learn about me and engage me how I want to be engaged. You can't change how you engage without connected data."

Oh, and about that loss of privacy? Feaster said: "Someone will invent a business where you and I can opt out of our communication channels, or say 'We prefer texts, we don't like phone calls.' " ∎

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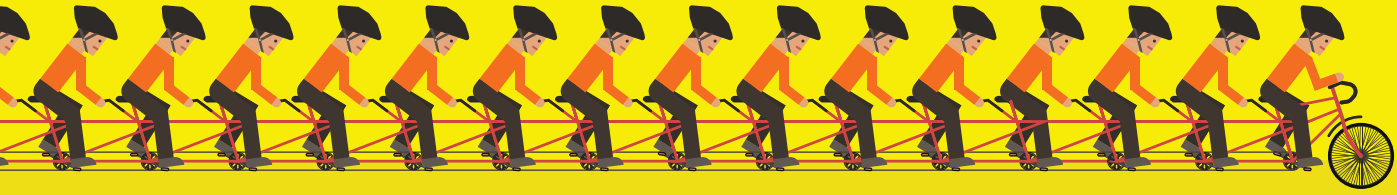

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