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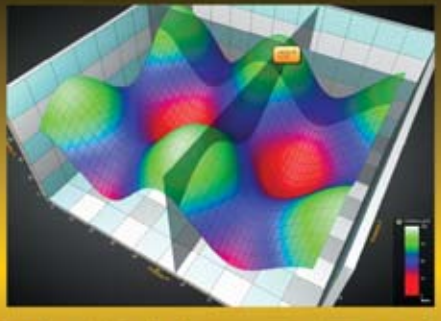

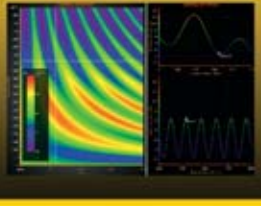

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NEWS WATCH

Rogue Wave releases major update to the Zend Framework

Rogue Wave is updating its open-source framework for developing Web applications and services. According to the company, this is the first major release in four years. Zend Framework 3 features support for PHP 7 and middleware runtime and performance enhancements.

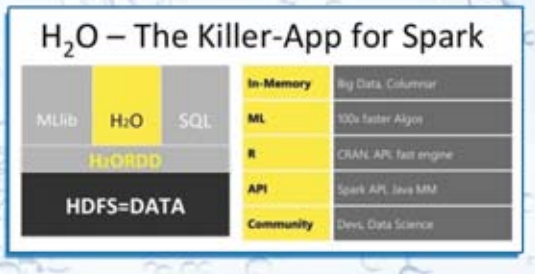
In addition, version 3 of the framework features an architectural structure that allows developers to use components within Zend Framework apps or any other framework in order to reduce dependencies, and to enable reuse within the PHP ecosystem.

Another key update to the solution is a new middleware runtime. Expressive is designed to focus on simplicity and interoperability, and it enables developers to customize their solutions.

H2O.ai releases Sparkling Water 2.0

H2O.ai announced the availability of Sparkling Water 2.0, an API for Apache Spark with new features and functionality. Sparkling Water now includes the ability to interface with Apache Spark, MLlib and Scala to give Spark user's more visual capabilities.

Sparkling Water 2.0 builds off of Sparkling Water, which was designed to give its users APIs, RDDs and multi-tenant context, as well as machine learning algorithms. Sparkling Water also allows enterprises to use H2O algorithms with MLlib algorithms on Apache Spark.



Other new features and improvements include the ability to run Apache Spark and Scala through H2O's Flow UI, support for the Apache Zeppelin notebook, visual intelligence for Apache Spark, and real-time machine learning for data products using Spark Streaming and H2O.

H2O.ai recently built a team of data visualization experts who focus on AI and machine learning algorithms. The team's progress will come to Apache Spark via Sparkling Water, which gives users an easy way to understand their visualizations of algorithmic results.

Microsoft updates give customers insight from their data

Microsoft customers will be able to use their data in combination with new updates and capabilities, such as the introduction of Microsoft Dynamics 365, Microsoft AppSource, and Power BI Embedded.

Microsoft Dynamics 365 moves Microsoft's current CRM and ERP cloud solutions into a single cloud service, including apps that are useful for business functions like financials, operations, and customer service.

AppSource is another way for customers to find new apps, and business users can now try out SaaS apps from Microsoft and its partners. AppSource contains more than 200 business SaaS apps, add-ins and content packs, including new business apps, according to a Microsoft announcement.

Other updates from Microsoft will enable customers to gain more insight from their data so they can build apps with embedded intelligence and analytics. Microsoft announced the general availability of Power BI's publish to web feature to help developers create visualizations and then publish them to a blog or website. Some features available in Power BI include free authoring tools, one-click publishing to the web, and cross-device support.

Infragistics allows developers to embed ReportPlus into apps

Infragistics is expanding its enterprise mobility business intelligence (BI) solution. The company announced a redesign to ReportPlus Mobile, as well as the addition of ReportPlus Desktop for Windows and ReportPlus Embedded.

ReportPlus is a data visualization service that gives enterprises the ability to see how their business is performing, and it runs either in the cloud or on-premise. Infragistics is now including an embedded SDK with ReportPlus in order to allow developers to take the solution and embed it into their applications.

The desktop version was created in response to customer requests. According to Jason Beres, senior vice president of developer tools at Infragistics, the company heard users wanted something that could publish reports from their desktops and laptops, so it created ReportPlus Desktop.

Other features include self-service BI through touch gestures, drag-and-drop capabilities, and immediate sharing abilities; the ability to access and connect directly to data sources such as Dropbox, Flurry, Google Analytics, Google Drive, Microsoft Dynamics CRM, Salesforce and Twitter; and more than 20 visualizations to create custom dashboards.

Rails 5.0 released with Action Cable, API mode

After four betas, two release candidates, and hundreds of contributors, Rails 5.0 is finally done. One of the most important features of this release is Action Cable, a new framework that handles WebSockets in Rails. Action Cable is an integrated solution for managing connections, with two layers: one for server-side processing, and a JavaScript layer for client-side interaction.

According to the Ruby on Rails team, Action Cable makes designing live features like chat, notifications and presence easier. For those developers who want to see a live use case, these features are currently a part of Basecamp 3, a private, secure collaborative space for developers.

The other big feature of Rails 5.0 is the API mode. Rails is useful for the new crop of

client-side JavaScript or native applications that need the back end to speak JSON, according to the team. Developers can see this in API mode.

BlackBerry to ditch its Classic smartphone

BlackBerry has finally decided to part ways with the BlackBerry Classic, the company's iconic keyboard device. According to the company, while the smartphone has been part of the BlackBerry portfolio for many years, it has run its course and can no longer keep up with today's market.

The company will now focus its efforts on providing customers with new devices that have better user experience and security.

While the BlackBerry Classic is one of the company's last models that provides a physical keyboard, the company will still continue to manufacture its other tactile keyboard models such as the Passport and Priv.

The news follows a United States Senate memo that it would no longer use BlackBerry devices. Instead, it will migrate to Android and iOS devices.

LokiJS reaches version 1.4

The open-source project called LokiJS has made it to version 1.4, and with this release comes new performance improvements, a number of bug fixes, and a NativeScript Adapter.

LokiJS is an in-memory document-oriented datastore for Cordova and Node.js. It supports indexing for document access, detects changes in databases, and recomputes itself to contain updated data that is readily available. LokiJS also supports collections like MongoDB, but it saves data to a disk in JSON so the data becomes portable.

With v1.4, a Loki NativeScript adapter is available for NativeScript apps, which can be found on GitHub. Also, with this version, there is a pure JavaScript full-stack framework.

Dependency CI reviews potential vulnerabilities

The founder of an open-source library discovery service launched a new project that can continuously test open-source dependencies for potential vulnerabilities and other issues.

The project is Dependency CI, an open-source tool that integrates directly into a GitHub workflow just like other CI systems. It runs a set of configurable tests on any dependency that it detects in a codebase, and checks it for incorrect licenses and deprecated or unmaintained libraries that a developer's code depends upon.

Using this project, developers can find out relevant security advisories for a whole dependency tree to avoid merging potentially insecure libraries. Additionally, Dependency CI can catch potentially insecure or unlicensed libraries before a developer even merges them, and it tests each dependency on every pull request.

Dependency CI currently supports dependency checks from 21 package managers. Some examples include Julia, Maven, NPM, NuGet, PyPI and RubyGems. It's free for open-source projects, and there is a 14-day free trial for checking private GitHub repositories.

LogiGear launches an all new Continuous Testing solution

LogiGear has announced a new Continuous Testing solution and service to help enterprises improve their test automation strategies, and to help them complete their transformation to a DevOps environment.

The LogiGear Continuous Testing solution and service will help companies with several testing challenges by including a single unified platform for quality reporting and collaboration.

One major piece to this new offering that aims to solve some of the test automation challenges is a framework that would work with the API layer of test automation. LogiGear has its own turnkey solution called Test Architect, which lets companies develop a large volume of automated tests, and it can be used in addition to the new Continuous Testing offering.

Typemock uses artificial intelligence to solve unit testing challenges

The complexity and lengthy process of unit testing is a bit of a challenge to some developers, which is why Typemock has launched Isolator v8 for .NET developers. It features an artificial intelligence bot that generates suggestions to test the validity of the code as it's written.

To keep up with other agile solutions, Typemock created the artificial intelligence bot Typemock Suggest. The company said it is able to suggest code that covers the parts and logic of any pre-existing code that does not have implement unit testing.

Suggest provides a template and offers a test with setup, isolation, mocking and verifications, delivering maintainable and readable tests that .NET developers can add to their own suite of tests.

Within the Isolator tool, the isolation/mocking component allows developers to isolate their code into smaller pieces from a bigger system, letting them more easily write the tests.

There is also a smart runner component that is integrated with Visual Studio. Lopian said that this allows developers to run tests automatically or manually, and it has incremental running, which means it knows what test needs to be run so a developer doesn't have to run tests on a whole suite.

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Brewing bitterness over

BY ALEX HANDY

Oracle's stewardship over spec leaves bad taste in community

When Oracle purchased Sun Microsystems in 2010, the immediate worry in the marketplace was that the company would become a bad actor around Java. Six years later, it would seem that these fears have come true—at least in part. The biggest new platform for Java, Android, remains embroiled in ugly litigation between Google and Oracle.

Despite outward appearances of a danger for mainstream Java, however, it's undeniable that the OpenJDK has continued along apace, almost at the same rate of change IT experienced at Sun. When Sun open-sourced the OpenJDK under the GPL before it was acquired by Oracle, it was, in a sense, ensuring that no single entity could control Java entirely, as with Linux.

Java EE, however, has lagged behind in its attention from Oracle. Java EE 7 arrived two years ago, and it's already out of step with the new APIs introduced in OpenJDK 8. The executive committee at the Java Community Process is ready to move the enterprise platform along its road map. Yet something has stopped Java EE dead in its tracks at Oracle. JSR 366 laid out the foundations for this next revision of the platform in the fall of 2015. One would never know that, however, by looking at the Expert Committee mailing lists at the JCP: Those have been completely silent since 2014.

'Our biggest concern now is if Oracle is even committed to delivering Java EE.'

—Reza Rahman

Is this indicative of Oracle stonewalling innovation in Java EE 8? In a statement to SD Times, an Oracle spokesperson wrote that "Oracle is committed to Java and has a very well-defined proposal for the next version of the Java EE specification—Java EE 8—that will support developers as they seek to build new applications that are designed using microservices on large-scale distributed computing and container-based environments on the cloud. Oracle is working closely with key partners in the Java community to finalize the proposal, and will share the full details with the broader Java community at JavaOne in September."

One person who's worried that JavaOne won't reveal any amazing new developments in Java EE is Reza Rahman. He's a former Java EE evangelist at Oracle, and is now one of the founders of the Java EE Guardians, a group dedicated to goading Oracle into action, or going around them entirely.

"Our principal goal is to move Java EE forward using community involvement. Our biggest concern now is if Oracle is even committed to delivering Java EE. There are various ways of solving it, but the best is for Oracle to commit to and deliver Java EE 8," said Rahman.

His concerns come from the fact that the Java EE 8 specification has been, essentially, stalled by lack of action on Oracle's part. The specification leads for the project are stuck in a sort of limbo, with their last chunk of work completed in December, followed by no indication of movement inside Oracle.

What exactly would Java EE 8 look like? Fortunately, the JSR 366 team has a massive survey at its fingertips, detailing exactly what thousands of users would like to see in a revised edition of the platform.

Road map

Those survey results give a clear picture of the priorities of Java EE developers. Topping the list of desired changes is JSONB, a new API for binding JSON in a manner similar to JAXB. Other high-demand changes are around simplifying security and improvements to JCache.

With such a clear survey of what

Java

users want, coupled with a completed initial specification proposal from the JCP, one would expect Oracle to be well on its way to updating Java EE. Rahman, however, said that Oracle has yet to respond to even the executive committee members of JSR 366's demands that the project move forward.

"Every EC member has told Oracle the same thing: If we don't get any concrete response from Oracle at JavaOne, or the response we get is that they won't do it, we can move forward with Java EE in the open-source domain with the vendors," he said. "The vendors are definitely interested in moving EE forward. In the short term, we want to move it forward, but maybe in the long term we will need to find another standards body."

That's because the JCP remains controlled by Oracle. Without the company's approval, the Java EE specification will be just that: a specification. Without Oracle's permission for others to build a Java EE implementation and test them against the Test Compatibility Kits it owns (and which is the gatekeeper to being certified as compatible with the specification), there's little that can be done within the JCP to push things along.

Two members of the Java EE 8 expert group, in fact, have signed on as supporters of the Java Guardians: Werner Keil, a member not only of the Java EE 8 expert group but also a member of the JCP's overall executive committee; and Jelastic founder Ruslan Synytsky. Along with the creator of Java, James Gosling, and Rahman, 166 developers and Java pundits have signed their names in support of the Java EE Guardians.

Java EE still matters

Rahman is not just kicking dirt at Oracle over EE to start a fight: He genuinely loves the EE platform. "There are people who used J2EE or Java EE 5 and they think Java EE is not capable of evolving. The stuff they're talking about is a good 10 to 12 years. How do you not think something has evolved in eight to 10 years? The reality is, I think Java EE is the most easy to use and productive platform out there. Few platforms can claim the feature completeness and ease of use of Java EE," he said.

John Rymer, vice president and principal analyst at Forrester Research, agreed with Rahman. "In tech, nothing as big as Java EE dies. People just move on to newer technologies and design approaches and application ideas," he wrote to SD Times.

It would seem strange, then, that Oracle wouldn't be eager to serve the community of businesses already using Java EE for mainline business processes. Indeed, with the advent of Android and Hadoop, Java EE is only becoming more useful to businesses.

'EE may not continue to go on to version 8, 9 or 10. We hope it does, but there may be other evolutions.'

—Craig Muzilla

Jim Scott, director of enterprise strategy and architecture at MapR, said that Java EE is still a major part of Java in big businesses. "Java EE covers a lot of APIs, and I haven't heard anyone anywhere say they are going to stop using those APIs," he said.

"For lightweight services, however, there has been a trend for a number of years toward Node.js and other similar frameworks and runtimes, but nothing that I would really consider to be replacing Java EE uses. Utilizing the Netty and Jetty frameworks from Java is getting much simpler, which could erode some use of Tomcat. But servlets in Java are still probably one of the most prevalent uses of Java out there."

And therein lies, perhaps, one of the ways forward for Java EE: microservices. The Java EE Micro Profile, proposed by IBM, Red Hat, Tomitribe and others at DevNation in June, could be the first step toward a community-driven Java EE.

While the Java EE Web Profile has been available for a few years now, the idea of multiple profiles—specifically slimmed-down Java EE environments—for other purposes has been kicking around for just as long. It would seem that without Oracle to lead the way, however, IBM and Red Hat are stepping out to take the reins outside of the JCP.

At present, the Micro Profile effort exists solely as a website dedicated to surveying the needs of the community, much like the survey done by Oracle for Java EE 8 in the first place.

Craig Muzilla, senior vice president of the application platforms business at Red Hat, said, "Java EE was never this monolith; people were using different frameworks anyway, like Spring or Struts, but you would still need a runtime environment. So the idea of Java EE not only coming with a programming model but with a service construct is still relevant, even if the form factor changes."

Muzilla said that Java EE (the specification) does seem to be in trouble, but he also said that Red Hat has customers who want to continue using and seeing advancements around Java EE. "There are a lot of vendors that want it to evolve and become more multi-tenant, more modular. Hence the idea of the Micro Services Profile. It has to become more modern," he said.

The only thing standing in the way of evolving Java EE right now, said Muzilla, is Oracle. "Basically, what Oracle does is they hold the keys to the [Test Compatibility Kit] for certifying in EE, but in terms of creating other ways of using Java, other runtime environments, they don't have anything other than their name on the language," he said.

"As long as you're adhering to the trademark of the language, you can create all kinds of different uses of the language. EE may not continue to go on to version 8, 9 or 10. We hope it does, but there may be other evolutions." ▮

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Software for the marijuana industry set to yield high returns

Growth in medical pot means greater demand for tracking apps

BY ALEX HANDY

Is there software in the burgeoning legal marijuana industry? Just a dab. With four states offering legal marijuana, and more than 20 with medical or decriminalized cannabis laws, the business of selling the plant and its derivatives is growing every year.

Naturally, software developers, vendors and startups alike are all looking to cash in on the boom. Silicon Valley, itself located in a state with legalized medical marijuana, has even produced a few pot startups.

BioTrackTHC's CEO Patrick Vo says interest in his software stemmed from medical cannabis.

Leafly, for example, offers an index of pot shops, crowdsourced information on the powers and effects of various strains, and coverage of the industry as a whole, no different than a wine blog or beer magazine.

Renowned startup incubator Y Combinator has even funded Meadow, a medical marijuana home delivery company. (Y Combinator is the incubator at which companies like Airbnb, Cloudkick and Dropbox were fostered.)

And a company called Flowhub, which provides cannabis companies with a "seed-to-sale" tracking platform, is developing APIs in the hopes of sharing knowledge within the marijuana industry.

In addition, Microsoft recently joined the legal marijuana industry with its announcement that it would be collaborating with Kind Financial. The two companies will work together to track and trace seed to scale cannabis. Kind will use Microsoft's Azure Government cloud platform to provide the tools necessary to manage a successful cannabis program.

While legally growing and selling pot is new, the software of tracking it isn't. BioTrackTHC is no glittering California startup. Rather, it's a serious software firm located in Florida that was originally created to offer a tool for tracking pharmaceuticals.

Florida was something of a capital for drugs like Fentanyl, Oxycodone, and Suboxone all controlled substances and commonly prescribed to senior citizens in pain who've made Florida their home. Patrick Vo, CEO and cofounder of BioTrackTHC, said that this original purpose was definitely needed, but quickly changed due to feedback.

"The company set out to develop software to combat drug diversion," he said. "Florida, years ago, was considered the pill mill capital of the country. Controlled meds were being diverted from their intended medical uses to non-medical purposes. We were demonstrating the software, and a number of medical cannabis dispensary owners asked for us to pivot the software to cannabis."

The pivot came in 2009, and since then, the company has launched two cannabis products: one for producers, and one for governments looking to track the sales and production of the industry in their states and local municipalities.

BioTrackTHC now runs marijuana tracking for Washington state, for example, and is able to easily digest the harvesting and transporting information from firms that use the software for their growing and sales operations.

Vo said that marijuana is different

continued on page 16 ▸

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QA TESTING
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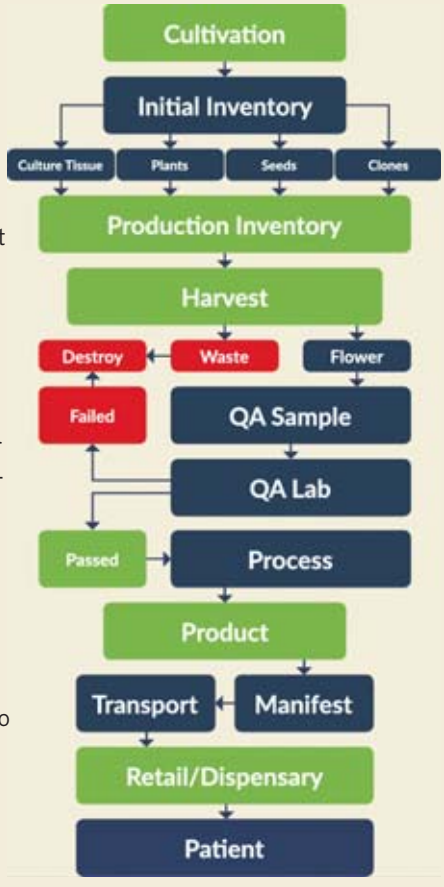
In addition to linking products to plant origin, each sale is tracked to the patient or customer. This completes the unbroken chain of custody from seed to sale.

MEDICAL PATIENT ID CARDS
The Traceability System generates a unique ID number for every patient, and can also integrate with hardware for patient ID card printing. Patient information and sales limitations are easily validated in real time.

TRACEABILITY PORTAL
The traceability portal is a secure, online data hub that provides detailed analytics for regulatory agencies and law enforcement. The data allows law enforcement to track cannabis transportation and inventory in real time. Detailed financial reports are available for the Department of Revenue or other agencies. This ensures compliance and adherence to industry standards and state laws.



Source: BioTrackTHC

◂ continued from page 15

from other grown products like flowers or corn, simply because it is so valuable. Ever a half-gram must be tracked from harvesting to processing to transportation, and keeping that info together and transparently accessible is what BioTrackTHC is all about.

David Terrell, BioTrackTHC's CTO, is about as far from a pothead as you can get. This elder statesman of software development cut his teeth at NASA working on the space shuttle program in the 1980s.

He eventually moved on to the defense industry, where he worked for Lockheed Martin, developing the software for black boxes, and he also did a stint at Siemens. He said the BioTrackTHC team is agile, and that despite dealing with slow-moving government contracts, he's kept things apace.

"Dealing with the government and any process, regardless of if there's government oversight or not, you still want to have a process in place," said Terrell.

David Terrell, CTO of BioTrackTHC, says agile is the main driving force in the company.

"At the tail end you want to have a feedback loop where you're able to correct your processes. We're able to use an agile process and have sprints within development, keeping those between two to four weeks."

Agile is an important part of their process, said Terrell. "Waterfall does not lend itself to what we're trying to accomplish. We're trying to have developers done in time enough to have end users determine whether it works or not," he said.

Terrell's tool chain is similar to that in any vendor or enterprise, he said. "One tool that lends itself to agile is JIRA. It allows us to have a system in place so we can plan our sprints and track our requirements. We use C and C++, and things of that nature."

All that process and attention to the requirements surely helped to win the state of Washington contract. Said Vo, "We came out as the winner mainly because of the expertise we had accumulated in the industry and the specialization of the platform. We deployed that to Washington, and it has been up and running for over two years. We track a vast amount of data for the state. A few months ago, we tracked over 2 million plants and over 200,000 events, from harvests, to transportation, to anything the state could need to have full visibility."

It's good to see someone keeping a clear eye on the pot industry. ▮

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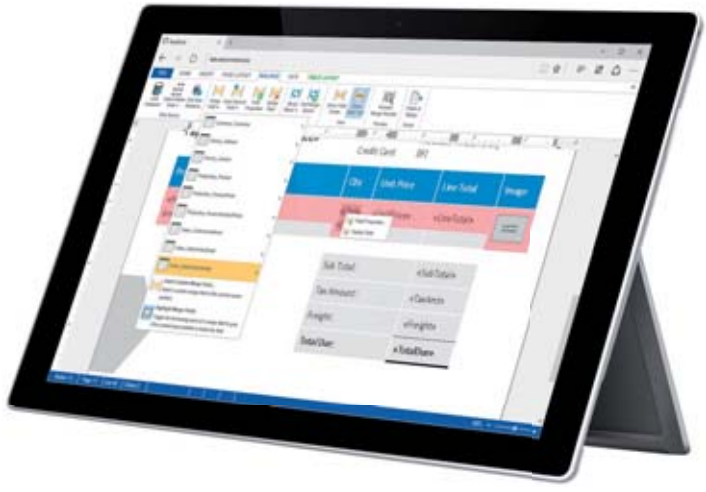

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Unicorns' days are numbered

BY NUNO FERNANDES

Like it's always said on "Game of Thrones," winter is coming, and with it come huge risks to investors and employees of the so-called unicorns.

Unicorns are broadly defined as startups worth US$1 billion or more. Once rare and mythical, there are now more than 100 unicorns, according to some estimates.

However, once these firms are faced with competitive pressure from public markets, their value goes down and creates some major disappointments.

We are now reaching a turning point, which will hurt many investors. Only some will survive, and a "back to basics" era needs to occur. High valuations are only sustainable to those with reasonable business models.

Valuations going down

The market is beginning to be more transparent, and that means valuations are going down. In the last few months, valuation levels for some unicorns have decreased from 10% to 50%. For instance, Blackrock, Fidelity and other institutional investors declared in public filings that their estimated values of companies such as Dropbox and Snapchat have dropped by more than 25%.

Many unicorns that went public now have their stock prices well below what they were at the IPO stage, and below previous rounds of funding. As an example, a share in Square, a payments company, was priced at $9 at its IPO, below the expected range of $11 to $13 and well below the $15 that some private investors paid for it in late 2014. At the IPO price, Square was valued at close to $3 billion, which is 50% below the $6 billion valuation for which it had raised money from private investors a year before.

It is important to realize that many of the so-called unicorn valuations above $1 billion are achieved through implied valuations based on smaller stakes being actually traded in the private market. In addition, these private transactions have very different types of shares being issued. It is common for privately held unicorns to have five or more types of shares, with different provisions.

What many investors don't realize is that some shares have extra guarantees. For instance, terms such as liquidation preference and ratchets are key. Liquidation preference, typically granted to later-stage investors who are already concerned with high valuation levels, protects these investors from losing money by guaranteeing they get their initial investments (plus a guaranteed return) back before any other parties. Ratchets grant investors new shares if the future valuations are below the price they paid.

In the case of Square, the last investors who bought shares (at $15 per share) were offered what's called a "ratchet." This means that they were guaranteed additional shares if the IPO price didn't reach a certain level. In this case, investors required a 20% return on their investment ($18, which equals $15 plus 20%). Since the IPO price missed the $18 by 50%, Square had to give investors millions of new shares to compensate for that. Overall, the value of the company was still lower post-IPO, and someone had to pay the bill.

Public versus private: The unicorn bubble

Let's say you own a warehouse in a deserted area, which has no real retail value. But you still want to have it valued at $1 million. Your father-in-law officially buys one-tenth of one percent of the warehouse for $1,000. Now you post this transaction information on your blog. Boom: a million-dollar valuation! Totally legal. Magnify this process and you've mastered the unicorn math.

Unicorn valuations are done based on private-market transactions. The same firm (or parts of it) are sold from the original founders to venture capital firms, then from VCs to private equities, then from private equities to institutional investors (fund managers), and some ultimately get sold in the public market through their Initial IPO.

For a while, there was a myth that public markets were irrelevant, and that companies would thrive in the private market domain. The evidence clearly shows this is not the case. And it cannot be, since eventually the private equity partners have to cash out and leave their positions in order to ade-

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Nuno Fernandes is professor of finance at IMD, where he directs the Strategic Finance Program.

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Unicorns' days are numbered

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quately remunerate their investors.

However, public markets and institutional investors are no longer buying into private market valuation inflation. And unicorns are already staying private for longer. This is not by choice. It is to delay the inevitable; only when they go public does the truth reveal itself.

It reminds me of musical chairs, where the number of chairs is less than the number of players: The last one standing loses.

Business model failures

The proof of the pudding is in the eating. And the evidence suggests that the eating of the pudding is getting closer. And for many companies this has already arrived. It is becoming clearer that the following factors are signals of companies that have unsustainably high valuations:

- They have little or no revenues.
- Their only conceivable revenues are through an advertising model. This is yet to be proven as a good model, and all of these companies are competing for the same consumer goods advertising dollars.
- They subsidize client acquisitions to artificially inflate the number of users, even if they are not profitable.

The Top 10 unicorns have supposedly combined valuations above $150 billion on less than $5 billion in revenues, and they employ around 25,000 people. In other words, a price/sales ratio of 30x. Some losses started to slow investments in these unicorns in 2015. And more will follow.

As always, high valuations are only appropriate for businesses that are able to convert their ideas into financial metrics such as cash flow and profit. And there are four kinds of successful business models:

1. Convert clients to revenues: Get users/clients to pay revenues.

2. Convert revenues to profits: Cover the costs of operation and client acquisition first and generate profits after.

3. Convert profits to cash: Generate positive cash flows, sustainably; the need for new investments, and the capacity of internally generated cash to sustain it, play a big role here.

4. Convert cash flows into market valuations: Concepts such as timing, growth profile and, above all, the risk of those cash flows are relevant here.

And these principles have not gone away. We are not yet in a bubble like in the 1990s, but the recent dismal performance of many unicorns reveals we are back to basics with respect to business models, investing and valuations.

Dead unicorns will rise

A unicorn valuation in bubble times can be whatever one wants. But as Warren Buffett once said, "You only find out who is swimming naked when the tide goes out."

Investors who disregard the basic principles of valuation and say "This time is different" will get burned once again. ▮

Stack Overflow: crowdsourced documentation

BY CHRISTINA MULLIGAN

When Stack Overflow launched its annual 2016 developer survey back in March, it revealed that documentation was one of the biggest problems for developers. The organization is now trying to address that problem with the beta release of Stack Overflow Documentation.

Stack Overflow Documentation is designed to be a community-based, example-focused documentat repository where developers of any skill level and technology learn can contribute.

"Official documentation can oftentimes just be an afterthought; it's rarely updated and lacks good, concrete examples," said Jay Hanlon, vice president of community growth at Stack Overflow. "We committed to building Stack Overflow Documentation in order to—just like we did with Q&A—solve a real developer problem by collectively harnessing the sum total of good programming knowledge in the world, because nobody can write documentation as well as everybody can."

Stack Overflow has been known as a place where developers can ask programming questions and get answers from a community of developers. The organization is building on that platform by providing the same familiar elements such as Q&A, allowing developers to contribute and collaborate, as well as going beyond just providing a specific answer.

"Over the years we've learned that Q&A works best when you have a problem that's specific to the code in front of you," said Hanlon. "By focusing on this, we've become much better at Q&A, but as a result our structure and rules left some great programming knowledge out in the cold. Stack Overflow Documentation gives a home to a lot of this good content that has been turned away, or very hard to 'get right' in the Q&A format: namely, the canonical, general reference, instructional content."

According to Hanlon, instead of just giving technical definitions, the documentation solution also aims to give programmers the exact information and examples they are looking for. "Unlike existing documentation solutions, which often provide no or only a few examples, Stack Overflow Documentation requires examples and is designed to collect use cases for every situation," he said.

Users can upvote the most helpful documents, similar to answers on Stack Overflow. "Here, show beats tell. Anyone can add [an example], so good topics will eventually have several useful code examples," said Hanlon.

In addition, Stack Overflow's private beta partners contribute to the documentation solution. Partners include Dropbox, Meteor, Microsoft, PayPal, PubNub, Twilio, Twitch and Xamarin. ▮

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Bringing lessons learned at Facebook to a stocks startup

Namrata Ganatra is building a software team focused on collaboration and transparency

BY MADISON MOORE

As the new CTO of engineering at the tech startup Stockpile, Namrata Ganatra plans to take on the challenge of making stock investment accessible to everyone, while also building a strong, open and collaborative team that fosters innovation.

Ganatra didn't move to the United States just to stay at the bottom of the ladder. Ever since she finished her schooling in Mumbai, India, she's been committed to improving the world of financial services through technology.

The education system is different in India, according to Ganatra, but she said that in its own ways, it has progressed for females much like it has in the United States. However, in many countries (including India), getting women to pursue STEM careers is still a challenge.

"While I was graduating, there were a lot of men in computer science programs, so that's not a problem I guess in India," said Ganatra. "But after graduation, continuing that computer science and engineering work, that's the biggest challenge in India."

She began her schooling in India and received a bachelor's degree in computer science and information technology from the University of Mumbai, and then completed her masters in computer science at Stanford University. Ganatra said she always wanted to get an American education, so when she came to the United States, she made sure to take plenty of computer science courses and learn more about the technology industry.

Before she moved to Stockpile (a company that makes it easier for the average person to buy stocks), Ganatra worked at several large organizations like Microsoft, where she served as a software engineer. At Microsoft, one of her main tasks was integrating and developing custom solutions around a third-party billing platform to enable purchases using credit cards and invoices for online services.

WOMEN in technology
AN OCCASIONAL SERIES

She implemented the back-end billing infrastructure at Microsoft and also worked on the user interface for purchases using ASP.NET and AJAX, which communicate with the infrastructure. In a later role at Microsoft, she worked on multiple releases of Microsoft's online commerce platform's billing team for Wave 12 and Wave 14, where she tackled challenges in the platform's billing infrastructure.

Old lessons in new turf

Leaving the big company culture, she worked as a senior software engineer at Zong, which was later acquired by PayPal. Once acquired, she became the senior engineering manager and led the Digital Goods organization at the company.

"[Zong] was a very small startup, so it was a big change for me to move from a big company like Microsoft to a really small startup, but that was the culture in Silicon Valley," said Ganatra.

A major part of her career was spent at Facebook, where she was the head of engineering for payments. There she led the end-to-end payments platform and products, managing a large team of engineers and engineering managers. At Facebook, she participated in the open culture and worked in hackathons as well as hands-on Android development, which eventually became a successful product launch for a new way to buy or sell within Facebook groups.

Along the way, Ganatra learned plenty of lessons that she plans on applying to her role as CTO of Stockpile. To start, she wants to make sure that stock investment becomes accessible, affordable and easy for everyone to use because right now, only 14% of Americans own direct stock since "It's too expensive or complicated to open a brokerage account," she said.

"We are on a mission to change that and make it easy."

Her next goal is to assemble a great team, because without one, there is no

way to build a meaningful product that customers find valuable.

"We have a small team right now, so building and expanding that team and building a great engineering culture is one of my top goals here at Stockpile," said Ganatra. "First and foremost, I want to help build a meaningful product that our customers love."

She said a lot of these lessons were learned at Facebook because it is a company that is known to have a great, open and transparent engineering culture. She said applying some of these strategies will be a challenge since Facebook is large and Stockpile is a small startup, but one lesson she learned is to use quick experimentation while listening to customers along the way.

"Moving fast is one of the big keys of the innovation culture that Facebook has, so I want to apply that to Stockpile," said Ganatra.

Other lessons she is taking to Stockpile include learning how to minimize operational and manual work and automating as much as possible. Her third goal is to foster innovation, and to do that she plans on holding hackathons and listening to everyone, even those in the company who are not on a managerial level.

"I'm a big believer that great ideas come from the bottom up, so organizing and participating in hackathons is a key principle to building a great culture," said Ganatra.

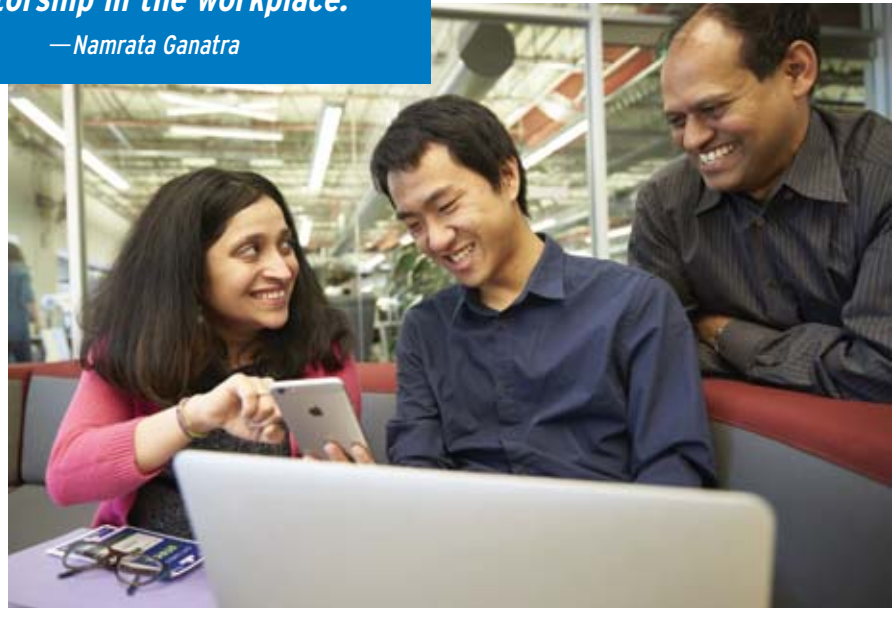
Besides the challenges of building a solid engineering team, Ganatra has also faced industry challenges along the way, like dealing with gender bias in a male-populated industry. According to "Double Jeopardy Report" by UC Hastings College of the Law, there are a variety of biases pushing women out of STEM. At least 36% of white women and 41% of Asian women report that at work, they find themselves pressured to play a stereotypical feminine role, which means toning down assertiveness or aggressiveness.

Ganatra has experienced this bias first-hand and said that while she has been building her career, she has faced hard feedback that her male counterparts have not received.

"I kind of always receive feedback like I'm too aggressive or too intimidating, because that's just how I am," said Ganatra. "I'm very focused and opinionated, and sometimes that's hard for people to see, and usually men don't get that feedback. So that has been challenging in my career."

The way she has approached this bias has been to ask for a more concrete example because any feedback in the work environment is "a gift," she said. At Facebook and PayPal, she had professional coaches where she was fortunate to be given strategies and help to work through these challenges. She still thinks, however, it is unfair for only females to get this type of feedback.

> ***'One of the biggest things is the lack of female role models and mentorship in the workplace.'***
>
> *—Namrata Ganatra*



Ganatra learned the value of listening to ideas from everyone, not just at the C-level.

"The problem is that it's really unintentional. It's not because they give feedback to me or any of the females *because* we are female, it's just how different the society is," said Ganatra. "Overall, I would say it's just that people don't realize that this is happening or this is a real problem."

Ganatra never had an issue going after what she wanted because she learned early in her career to advocate for herself. She noticed that women spend time underestimating themselves while their male colleagues seem to leap at opportunities.

"Women aren't advocating for themselves," said Ganatra. "Women don't come and tell me, 'Hey I want to get to the next level,' or, 'I'm ready for the next level,' while men do that a lot."

She said the biggest thing that women have achieved in the industry is recognition that there is an existing problem of getting women to continue their STEM education in both college and beyond.

"I think we have gotten better at each stage, but there is still a lot of implementing to do," said Ganatra. "One of the biggest things is lack of female role models and mentorship in the workplace."

She said women should seek role models from the group or environment that they work in, and if there are not that many, seek a mentor outside of the organization.

"Keep going and believe in your abilities. You can do it!" said Ganatra. "Never be afraid to take a leadership position—not just ones that are offered, but seek out these opportunities and aim high." ▮

Startup aims to transform the lives of the disabled with open source

BY MADISON MOORE

A small Brooklyn-based team is looking to solve the real-world challenges for those with disabilities. Furenexo debuted a wearable device, and it is encouraging developers to get involved in creating affordable solutions.

Furenexo (a combination of the Japanese word "to touch" and the Spanish word "connection") will use advancements in machine learning and sensory technology to develop devices that help those living with ADHD, autism, blindness and deafness.

Images courtesy of Furenexo

The startup's first product is called Sound Sense: an open-source device that people with hearing loss can wear to be alerted of loud sounds like police sirens or smoke alarms. This device can also alert the person if a friend is calling out to them or talking in another room.

Besides being fully open source, the device is made up of a microphone connected to a microchip and motor inside a 3D-printed shell. The motor will vibrate when it detects a noise above a certain level.

Furenexo is also creating a developer portal that will directly address the needs of those with disabilities. Developers with backgrounds in computer vision, machine learning and open source can help develop solutions that can be tested in real-world situations. The code and the testing results will be shared with the community so others will be able to build and learn new solutions, according to Eric Skiff, cofounder and CTO of Furenexo.

Furenexo's portal will also help developers who want to leave a mark on the world outside of their daily job. Developers will be able to check out the company's devices and provide feedback directly, as well as pose new solutions for other disabilities.

Brian Goral, cofounder of Furenexo, said part of the reason Furenexo wants a strong developer portal is because there are so many challenges out there people might not be aware of, and the team doesn't "need to take ownership in the idea of disability."

"We also plan on having an open forum where we share requests from the community of people with disabilities and ask the community to share potential solutions," said Skiff. "We're constantly striving to discover the real-world needs of people with disabilities and [to] design innovative and affordable solutions, and our hope is that this forum will heavily inform our future products and directions."

Tackling ADHD and more

Goral said Furenexo is already working on ideas for its next device. One project in its queue is a wearable or pocket-size device for those who have ADHD whose parents can't afford an expensive Apple watch, he said. It also tackles the challenge of getting kids with ADHD to pay attention in school without the teacher having to call on them, which often is disruptive and embarrassing, he said.

Instead, the wearable would vibrate as a way of bringing them back to focus if they appear to not be paying attention. The device can be connected to a teacher's iPad or computer so he or she can get the student back on track without calling them out in front of the class, said Goral.

He was inspired to begin this startup after he went to California to visit a therapeutic medicine company called Ekso Bionics, which was developing technology to help those in wheelchairs or those who needed rehabilitation. While he was there, he had the privilege of seeing a person who was in a wheelchair for a majority of his life stand up and walk.

Goral later moved to New York and connected with Skiff, a veteran programmer and hacker who helped create the NYC Resistor, a hacker space in Brooklyn. The two talked about the absence of innovation in technology for people with disabilities.

"We recognized that the technology hasn't been directed toward some of the challenges that have been outstanding for really decades," said Goral.

He and Skiff also recognized that the gap between existing technologies and those with disabilities exists because there hasn't been a strong expected return on investment for things like an innovative cane or a better-developed hearing aid, "let alone other solutions for other challenges that aren't immediately recognizable," said Skiff.

The Furenexo team hopes to provide solutions to these problems and bring together creative minds in the hacker/developer scene to solve the challenges people with disabilities face on a daily basis, according to Skiff.

"Our hope is that we can spark a movement of people working on these challenges by open-sourcing our work and encouraging others to do the same," he said. ▮

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Infragistics allows developers to embed ReportPlus into apps

BY CHRISTINA MULLIGAN

Infragistics is expanding its enterprise mobility business intelligence (BI) solution. The company announced a redesign to ReportPlus Mobile, as well as the addition of ReportPlus Desktop for Windows and ReportPlus Embedded.

"What we are really trying to do is help businesses build great experiences to their team with a complete out-of-the-box BI analytics solution that is available on the desktop, and the native devices for iOS and Android," said Jason Beres, senior vice president of developer tools at Infragistics.

ReportPlus is a data visualization service that gives enterprises the ability to see how their business is performing, and it runs either in the cloud or on-premise. Infragistics is now including an embedded SDK with ReportPlus in order to allow developers to take the solution and embed it into their applications.

The desktop version was created in response to customer requests. According to Beres, the company heard users wanted something that could publish reports from their desktops and laptops, so it created ReportPlus Desktop. "The growth opportunity in the enterprise was not solely on a mobile-first experience," he said. "We needed a desktop experience and a mobile-first experience."

In addition, the mobile solution was redesigned in order to make the viewing experience on ReportPlus easier to digest and get feedback from.

"We cover both the non-developers in the enterprise that need analytics all the way to the IT department who need embedded analytics in their apps," said Beres.

Other features include self-service BI through touch gestures, drag-and-drop capabilities, and immediate sharing abilities; the ability to access and connect directly to data sources such as Dropbox, Flurry, Google Analytics, Google Drive, Microsoft Dynamics CRM, Salesforce and Twitter; and more than 20 visualizations to create custom dashboards.

ReportPlus has a new desktop version as well as revamps to its mobile versions.

New users can take advantage of the company's recently released Dashboard Concierge Program to learn the basic concepts of ReportPlus and how to connect, merge and use custom data courses.

"The number of solutions being offered in the self-service BI and data visualization market is rapidly expanding," said Dean Guida, Infragistics Founder and CEO. "Our goal is to make ReportPlus stand out in this crowded market by delivering tremendous value with our simple pricing model, by rapidly improving the product's capabilities with monthly updates, and with our unique secure data handling model where we never store your data. ▮

In other component news...

■ File format solution provider **Aspose** announced the release of Aspose.Imaging for .NET 3.8.0 and Aspose.Email for Java 6.7.0. Aspose.Imaging enables developers to create, draw, manipulate and convert images. Version 3.8.0 for .NET features bug fixes, enhancements to its API, and the ability to provision the auto-determination of SSL mode. Aspose.Email allows developers to create, read and manipulate files with a programming suite of APIs. The latest release features support for WMF metafile, as well as the ability to get the last modified date of a raster image.

■ **LEADTOOLS** recently launched version 19 of its imaging SDKs for Android and iOS/macOS platforms. According to the company, this is a major release that provides OCR and barcode engines, a new Swift-compatible API for iOS and macOS, the company's new credit card recognition technology, and new mobile imaging technologies.

■ Presentation layer and data visualization components provider **Nevron** has announced the release of Nevron Open Vision for .NET 2016.2. The solution is a component suite for .NET application development. The latest version features NOV Grid for .NET as well as new features and enhancements. Features include new UI controls, diagram and text editor improvements, and a new data-management API.

■ **Syncfusion** has announced the latest version of Essential Studio. The 2016 Volume 2 release features enhancements to the company's Xamarin, UWP and JavaScript suites. The Xamarin edition now features a kanban control for visualizing a project's progression. Essential Studio for UWP features three new controls: a cell grid, a tree grid, and a spell checker. Essential Studio for JavaScript adds support for Angular 2 and Aurelia, and adds new sparkling, heat map and pivot tree map controls.

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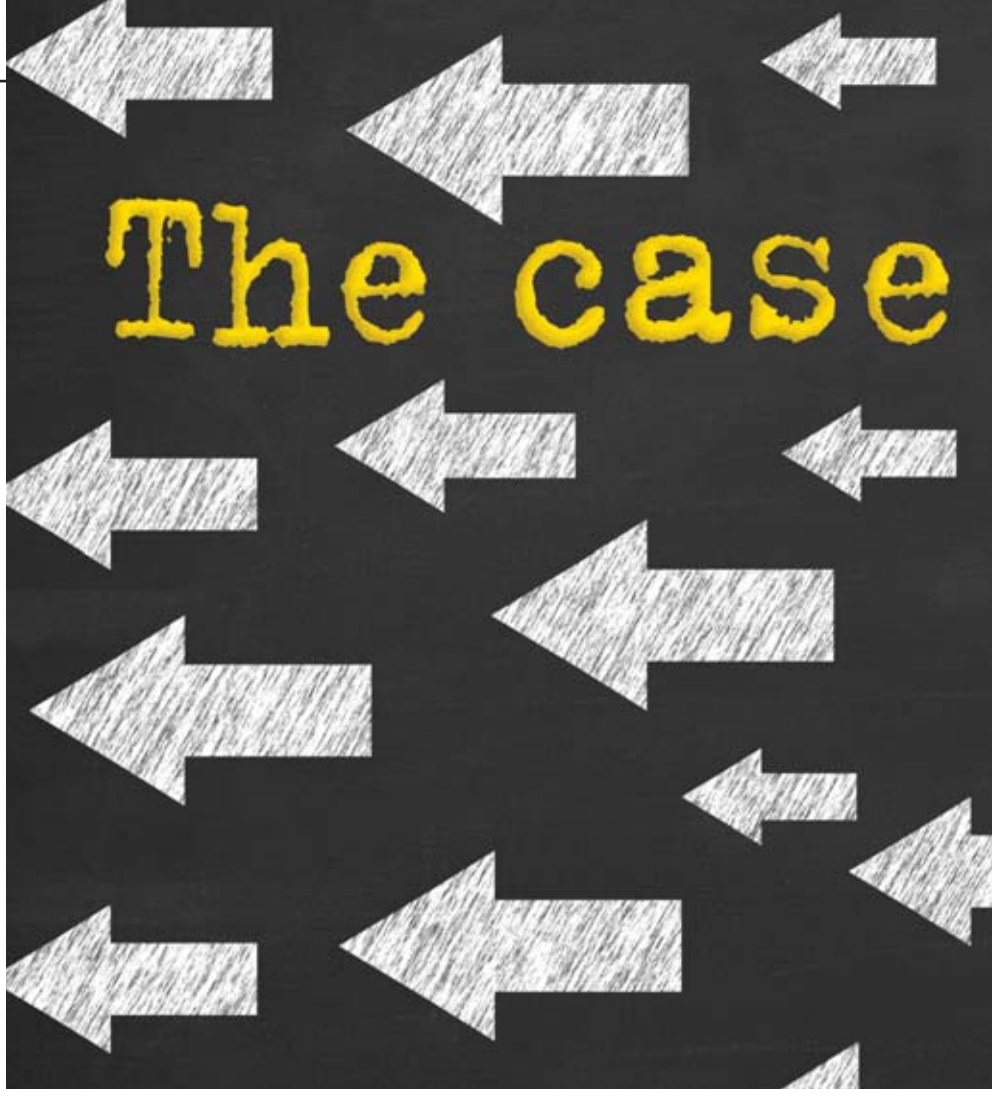

BY ROGER POON

JavaScript has exploded. It's everywhere: the browser, the server, your phone, IoT devices, and more. However, JavaScript can be brittle. The language was notoriously designed and developed in just 10 days, and its creator, Brendan Eich, has become JavaScript's most prominent apologizer.

JavaScript is controversial. Rarely have we seen a language divide software developers so much. I shared the stage with Geoff Schmidt, CEO of Meteor, in San Francisco in February. He asked the audience to raise their hands if they love JavaScript; surprisingly, moments later, he asked the audience to raise their hands if they hate JavaScript. It was a JavaScript conference, and I was surprised to see hands go up.

However, this illustrates the reality that besieges us: a rare moment that succinctly captures the zeitgeist of our times. There are developers who feel forced to use JavaScript. It's the only option in browsers. "Monopoly" is a strong word in technology, but it wouldn't be a stretch to concede that JavaScript monopolized the web platform. If the voices echoing in the corners are any indication, JavaScript did not achieve this monopoly through merit.

Yet JavaScript isn't without merit either. Scheme wrapped in a C syntax was serendipitously clever. Nevertheless, a line needs to be drawn between being clever and being pragmatic. There's a reason Scheme (and JavaScript) are not among the first-, second-, or even third-choice languages in modern complex software systems in organizations where engineering principles are valued.

If you didn't like JavaScript, it was because you didn't "understand" JavaScript. Voices and opinions were dismissed by the JavaScript community: You didn't "understand" prototypical inheritance, and you didn't take the time to learn JavaScript "properly." Developers were saddled with blame; it wasn't because the language was lacking, it was because you weren't good enough. Speaking as a developer that understands JavaScript deeply enough to develop a robust type system on top of it, I know it's possible to understand JavaScript well... and still be unsatisfied with it.

Roger Poon is founder and CEO of Onux, a compiler company.

As a result of being ignored and demoted to second-class citizens, the "other" developers (often having to use JavaScript out of necessity) have had their problems unaddressed. Fortunately, these problems are being solved.

JS++

JS++ is a web programming language built for software engineering. It is built with engineering principles: strong, solid foundations via a type system that can leverage the full JavaScript ecosystem while guaranteeing your types will be correct at both compile and runtime. It's a programming language designed over multiple years, not 10 days.

JS++ incorporates object-oriented programming (OOP) with classes, despite how much JavaScript developers riot against this, and enforces a rigid structure that guarantees maximum compile-time analysis so the compiler can detect errors early before you ship into production.

JS++ is a superset of JavaScript. (In fact, it was the first superset of JavaScript when it initially went into alpha in October 2011.) What this means is that all valid JavaScript programs are valid JS++ programs. JS++ is designed with three key uses in mind:

- Upgrading existing JavaScript code
- Usage in conjunction with JavaScript (e.g. leveraging existing JavaScript libraries)
- JS++ by itself

JS++ compiles to JavaScript and can run anywhere JavaScript is supported: in the browser, on the server, on mobile devices, and so on.

There are other JavaScript supersets available, but JS++ is different through its core engineering values. Engineering fundamentals are the same across industries and disciplines. Whether you are building a program, bridge or skyscraper, it's fundamentally the same:

build on a strong foundation and enforce a rigid structure.

In a similar spirit, one of the key innovations behind JS++ is "type guarantees." Whereas we've previously had to content ourselves with type checking, as engineers, we want guarantees: a guarantee the variables you declare as strings don't become numbers, a guarantee the variables you declare as numbers don't become objects, and a guarantee your class instances don't become strings at runtime. This is what is known as type preservation, a byproduct of a "sound" type system.

Type guarantees: Beyond type checking

"Well-typed programs cannot 'go wrong,'" said Robert Milner. Programs have data, and data have types. Although it seems like JavaScript has no notion of "types" in its syntax, JavaScript programmers still need to be cognizant of types because curiosity inevitably leads to such operations as the subtraction of a string from another string. This has no real-world logical equivalent or explanation and results in errors. However, this is never enforced by JavaScript until it finally happens at runtime.

Type checking has grown in popularity for JavaScript in recent years precisely to counter these runtime type errors. Ideally, if we can run our source code through a linter or type checker, we should be able to identify and fix these errors before we ship our programs. However, the concern is that, at runtime, the types we declared in our source code are not reflected in the types for the actual data during program execution. This can be especially true when the generated code is JavaScript, which has very lax rules when it comes to data types.

To illustrate this point, let's examine a basic variable declaration:

```
bool x = y;
```

This typically compiles to:

```
var x = y;
```

This is known as "type erasure." In other words, the types were "erased" at runtime, and the compiled JavaScript has no knowledge of the types that were declared in the original source code. Popular projects that are known to perform type erasure are Microsoft TypeScript and Facebook Flow.

Erasing types introduces a tricky predicament. We have no assurances the variable "y" is indeed a Boolean at runtime. Remember, this is JavaScript. A variable that was once a Boolean can quickly become a string, number, object, or even the arcane "host object type." Consequently, a vocal minority of developers remains unconvinced: If it's still JavaScript in the end, we inevitably run into the same problems.

Fortunately, there are solutions. Slightly more sophisticated systems use "runtime contracts":

```
assert(typeof y == "boolean");
var x = y;
```

Runtime contracts can ensure types are correct at runtime. However, they have a glaring weakness: They take down the entire application on a single error. With runtime contracts, you risk having exponential points of failure. In software engineering, we want to reduce the potential points of failure.

We've worked on the JS++ type system since 2011. We explored every type system under the sun: Hindley-Milner type inference, gradual typing, soft typing, and more. The JS++ type system is optional and sound. In other words, you do not need to declare types for your variables and functions. Type annotations are completely optional. However, if you do decide to declare the type for a variable, it is guaranteed to be correct at both compile and runtime. This is the breakthrough in JS++, as previous systems could only achieve correctness at compile time or runtime, but never both.

JS++ achieves "soundness" in its type system by unifying all JavaScript types into a single type known as the "unified external type." Type-checking JavaScript correctly and accurately is an incredibly complex problem, but JS++ solves the problem via simplification. Once the logic is simplified, JS++ "isolates" JavaScript. When data crosses from JS++ to JavaScript and vice versa,

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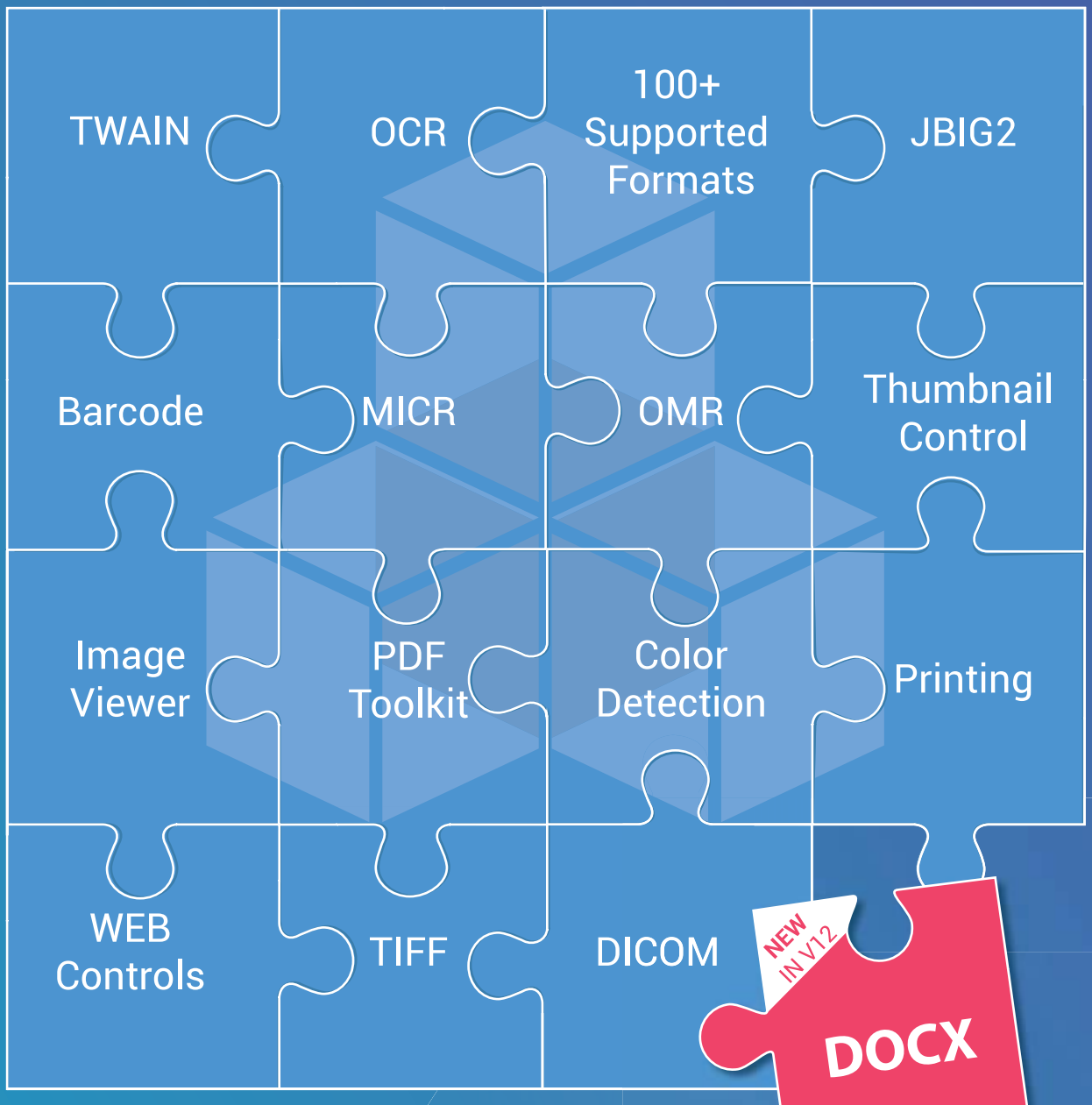

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it needs to be safeguarded and converted. Therefore, JS++ is able to "preserve" types by preventing JavaScript from tampering.

In JS++, types are guaranteed. At compile time, the type system is "sound"—in other words, the JS++ compiler's type checker can never be wrong because it's not approximating. As an example, if the JS++ type checker determines at compile time that an expression will evaluate to Boolean, it will evaluate to Boolean at runtime. This is aided by runtime "enforcement."

Runtime type enforcement is lightweight and straightforward. When we declare a Boolean, the compiler ensures the data always remains a Boolean via conversions:

var x = !!y; // Convert 'y' to Boolean via double !! operators

As illustrated in the example, JS++ will force runtime conversions to the type you declared. This example oversimplifies what JS++ is doing differently, but it demonstrates one of the key innovations for achieving "soundness" and type safety. It turns out JS++ isn't just compiling to JavaScript; it's compiling to typed JavaScript.

Conversions on primitive data types like Booleans and strings are implicit, automatic and straightforward. However, another challenge we faced in our design was how we could guarantee the types to be correct for constructed types. For instance, one "Employee" class within an organization may differ from the "Employee" class defined for another organization. In this case, JS++ enables developers to define custom conversion rules and logic.

Conversions are lightweight. They only need to be performed on variable assignments, function calls and function returns. If a conversion fails, you simply get the default value for the type, such as an empty string for the "string" data type. Furthermore, the compiler can optimize conversions so that they only occur at runtime when necessary. Thus, you get the benefits of type safety without sacrificing performance.

```
     * @param index The index to set the lastIndex to.
     * @return The specified index for the last index.
     * @example Basic Usage
     * import System;
     *
     * System.RegExp re = new System.RegExp(/a/g);
     * re.lastIndex = 11; // set the last index AFTER the first occurrence
     * Console.log(re.exec("There is a way.")); // ["a"]
     */
    public property int lastIndex(int index) {
        this.re.lastIndex = _lastIndex = index;

        return index;
    }
    /**
     * Returns the regular expression pattern without the forward slash
     * delimiters and flags. Thus, `/abc+/i` will return `abc+`.
     *
     * Although the JS++ grammar is an augmentation of the ES3 JavaScript
     * grammar, `source` conforms to ES5 and will return `(?:)` if the
     * regular expression pattern is empty. Furthermore, as in ES5, line
     * terminators are escaped.
     *
     * @summary Returns the regular expression pattern.
     * @return The regular expression pattern without delimiters and flags.
     * @example Basic Usage
     * import System;
     *
     * System.RegExp re = new System.RegExp(/abc+/i);
     * Console.log(re.source); // "abc+"
     */
    public property string source() {
        // Despite JS++ being an augmentation of ES3, conform to ES5 and
        // return (?:) for empty regexes
        if (re.source === "") {
            return "(?:)";
        }
        // Again, conform to ES5 and escape line terminators
        else {
            return re.source.replace(/(.)\\n/gm, function(matched, $1) {
                if ($1 !== "\\") {
                    return $1 + "\\n";
                }
                else {
                    return "\\n";
                }
            });
        }
    }
    private char[] _flags;
    /**
     * Returns whether the regular expression will has the "g" flag and will
     * perform a global match.
     *
     * @summary Returns whether the regular expression will perform a global
     * @return `true` if the regular expression will perform a global match
     * @example Basic Usage
     * import System;
     *
     * System.RegExp re = new System.RegExp(/abc/g);
     * Console.log(re.global); // true
     */
    public property bool global() {
```

JavaScript++ takes advantage of runtime type enforcement.

OOP with classes

JavaScript developers are philosophically opposed to classes. JavaScript's most vocal defenders have long argued that JavaScript does support OOP via prototypes. Perhaps justified, they feel liberated from Java's structure and rigidity. Yet, structure is one of the most fundamental aspects of engineering.

Structure is how we know an Employee class has a getName method. Structure is how we determine that getName was a typo that could crash the program by calling an undefined method. Structure is how the linker knows which modules were unused so we can perform dead code elimination.

Yet, the most painful verdict against JavaScript's inheritance goes beyond structure. It's not the computer science concept of prototypical inheritance versus class-based inheritance that we need to be arguing about. It's the spaghetti code that is necessary to fully utilize prototypical inheritance in JavaScript due to its syntax. JavaScript was designed in 10 days, and it shows.

As developers tried to compensate for JavaScript's shortcomings, the problems became exacerbated. Ad hoc inheritance, ad hoc module systems and so on began to appear. Bad came to worse. While JavaScript's thought leaders were defending prototypical inheritance, the major libraries weren't even using it. OOP in JavaScript became a melting pot of prototypes, objects, third-party retrofitted class systems, third-party module loaders, inconsistent namespacing patterns, and then some. It sounds like an enumeration of an engineer's worst nightmares, except this is the reality we face.

If you can't appreciate the years of work that went into JS++, you have to at least appreciate that we've managed to take all these diverse factors and universally simplify them to the point that JS++ is able to achieve "correctness" while enabling you to leverage any and every JavaScript library in existence.

For a superset of JavaScript, if structure is important in engineering, we want to know that the structure cannot

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be modified by accident. This is especially true on the web where it's not uncommon to load resources from external web servers and, thus, introduce third-party and potentially untrusted code. This ventures into another concept of the JS++ type system: isolation. Essentially, JS++ "isolates" JavaScript, and we can imagine JS++ source code to be divided into "regions": the JS++ region and the JavaScript region. Once isolated, JS++ is able to guarantee that the unsafe and untrusted JavaScript can never tamper with JS++ code and data.

Still, it needs to be understood that "classes" go beyond superficial syntax and runtime semantics. Object-oriented programming with classes brings with it knowledge capital and a wealth of experience. The talent pool expands to include experienced software architects and battle-hardened developers that can quickly add value to a project. Design patterns developed for classes no longer need to be clumsily adapted for prototypes. JavaScript developers still testing UIs with Selenium and headless Chrome will benefit from new and better techniques that have been known in structured languages for a while now. Software engineering is every bit a people problem as much as it is a technology problem, and class-based OOP brings some of the best people and brightest minds.

The end of the prototype debate is that real-world systems ranging from banking to rocketry are built with classes. Maybe prototypes enable greater "expressiveness." Maybe prototypes enable greater "composability." However, no amount of fear mongering can refute the fact that classes are working and working well. Lest my statements be taken out of context, JS++ was not designed for rocketry; however, if its underlying principles can be used to explore the cosmos, it can certainly be used to ship higher-quality web and mobile applications.

The little details

JS++ was designed over many years. We think programmers will appreciate the finer details that show great care in the design and a deep understanding of the domain. For example, the popular syntax for declaring a typed variable in most JavaScript supersets looks like this:

```
var x : boolean = true;
```

There's a little secret behind this: It's much easier to parse a JavaScript superset with this syntax. Yet, this is a lot of extra typing. It's frustrating. Programmers coming from a background in C++, Java or C# will appreciate the JS++ syntax:

```
bool x = true;
```

Additionally, the JS++ compiler is written in C++. As projects grow in complexity, we think developers will appreciate the extra engineering effort we invested in order to achieve the fastest compilation times. Compilation times are only one aspect of programming language performance. Runtime performance is arguably even more important, and we're working on this too. Maximum speed is important.

The little details add up over time. JS++ wants you to have the smoothest development experience possible.

Previous type systems could only achieve correctness at compile time or runtime, but never both.

On patents

There has been some concern over my company, Onux, filing patents on the JS++ type system. The patent filings are a defensive mechanism. We don't charge royalties for using JS++. We've sunk a lot of resources into R&D, and the result is the most reliable type system in the industry being provided to you for free. Lost in the chaos is that some of the most popular programming languages are patented. Microsoft's C# is heavily fortified with patents but remains unencumbered.

I can't speak for other programming languages, but, typically, when patents are used defensively to protect R&D investments, it's used to stop competitors from copying rather than tormenting users. The JS++ compiler is free to download for a reason. Nevertheless, for the remaining skeptics, we think having type "guarantees" over type "checking" will interest early adopters and developers that value our same values and rock-solid reliability.

I've written extensively about the theory, problems and corner cases that need to be solved for static types to work with JavaScript. It takes a lot more than just adding "types" to JavaScript's syntax. At least one of Microsoft, Facebook or Google would have figured that out by now if it were so simple! Yet, there's a reason they have collectively failed to achieve "soundness" for so many years.

When you really begin to dig deep into the problem, you realize that the JS++ type system works in virtually every case. This takes experience, this takes time, and this takes effort. We've worked hard to come up with an innovative solution. When people ask us to lift our patents and make it open source, they are asking us to forfeit years of hard work to Microsoft et al.

It's never too late for us to pivot on our patent stance because we understand it's unpopular, but, presently, we are choosing to remain pragmatic even if it costs us die-hard anti-patent purists. JS++ was only just announced and is still in the developer preview stage, so a lot can change over time. However, Onux is not and will not be a freebie research arm for Microsoft, Google and Facebook. They have the resources and bright minds to find another way to achieve type guarantees.

For now, if you want type "guarantees" rather than just type "checking," you use JS++. If you want to compile to "typed" JavaScript rather than just JavaScript, you use JS++. ■

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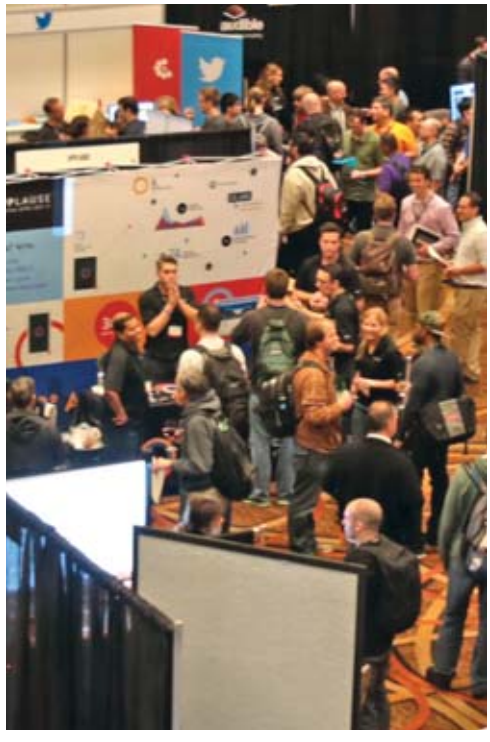

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Don't let testing stop your agility

You need to do it, but you also need to be fast and stick to high standards. How do you do it?

BY CHRISTINA MULLIGAN

Agile is no longer a long sought-after dream for businesses. It is no longer a secret weapon for organizations that wish to stay ahead of the curve. Agile, for the most part, is the modern way of working. By now, most organizations know the purpose of agile: to build higher-quality software faster. But in order to ensure that quality, businesses have to make sure their testing processes can keep up with this new pace of working.

Without testing, agile initiatives will never be truly complete or succeed, according to Eric Taylor, director of agile software delivery for AgileTrailblazers, an agile consultant firm. "With the speed that agile brings, the only way to really achieve that speed is to actually get your testing in order," he said. "You have to really put testing first, and change testing to be the mindset of the entire organization as opposed to being this thing you do at the end."

Organizations that don't address testing upfront when they go through an agile transformation will experience bottlenecks in their processes because testing needs to keep up with the pace of development and the rate of change. Therefore testing shouldn't and can't be an afterthought, according to Zubin Irani, CEO of cPrime, an agile service company. "It is a very difficult transition to make, and it is a very painful one that often doesn't get done until later. Usually what happens is you go through a transformation, you realize it isn't working and then finally you address testing."

Since this is a complex transition, many organizations fall into the trap of pushing it to the side. But according to Wayne Ariola, chief strategy officer of Parasoft, they will soon realize testing can't be ignored.

"Unfortunately, any kind of process impact or technical initiative that businesses have engaged in, the last group to truly be considered associated with the transformation is test," he said. "But if you look at agile processes, the biggest impact associated with the change is testing."

And it is not only agile pushing the importance of testing. We are in a new world where businesses are now digital, and software is your business. "I believe that most companies look at testing as a necessary evil more than a value-add activity," said Thomas Murphy, research director at Gartner. "Agile ties into this because generally if you are going to survive in the digital world, you must utilize agile and DevOps practices to achieve the pace and maintain the quality that is required to remain agile as a business."

Testing in an agile world

No longer do testers have the luxury of waiting until the end of the cycle and taking their time to test the code. "Testing is less a phase and more a set of activities now," said Ian McLeod, chief product officer of Rogue Wave.

The entire team and life cycle has to become "test infected" in order to ensure the success of agile, according to AgileTrailblazers' Taylor.

"You can't really have these periods of introducing a lot of bugs and going back and fixing them," he said. "The role of the tester really being on the team is sort of the guardian of quality, and their job is to make sure the quality of the work everyone is doing is staying high and really enabling the developers, product owners [and] Scrum master to all care as much as they do about quality."

In order to succeed, teams should:

■ **Devise a plan.** "This is the standard pablum…start small, establish your goals/objectives first, assess your current position and challenges," said Murphy. "It depends on the starting point. Make sure you see quality not as someone else's job but everyone on the team."

To do this, there should be open communication between the business, development and quality assurance, according to Brad Stoner, senior sales engineer at AppDynamics. "If an organization wants to succeed, they have to understand that they are going to change the process from front to back, so business to development to QA," he said. "There has to be a strong feedback loop and QA has to be empowered to be able to say, unless we make this app testable, we are always going to be your bottleneck."

Stop asking "Are we done testing?" That question is more associated with a sprint and scheduling or a burndown perspective, instead of being associated with the business, according to Parasoft's Ariola. Instead, teams should be asking, "Is the risk of the release candidate acceptable?"

"This is a massive change associated with how someone approaches the whole concept of quality," said Ariola. "When we talk about risk, we talk about if we are mitigating the true business risks associated with the organization."

■ **Automate.** Automate simple tasks that can easily tell you if the release is performing as expected. This will help QA focus on good builds and getting instant feedback to development if there is a problem, according to AppDynamics' Stoner. "Instead of having QA look at these bad releases multiple times a day, they don't have to waste their time," he said. "This is the first way to accelerate the process, and it is very low cost and easy to implement."

To get started, testers can automate test environments, leverage cloud environments, automate E2E scenarios, monitor app performance, and leverage scripting skills, according to Anand Kamat, group program manager at Microsoft.

Rogue Wave's McLeod believes it is easier to do automation if you are starting from a blank slate rather than converting your process. For organizations that decide to convert, they need to invest in quite a few sprints, he explained.

According to Kamat, there will still be a need to manually test. For instance, teams will still need to do a bug bash against the solution; product managers will have to play with the product; and early adopters will use the solution in real-world scenarios.

Kamat explains that in order to get a full comprehensive view about the quality of a product, automation test metrics, manual testing, exploratory testing, user acceptance testing and testing in the real world are all essential.

■ **Exploratory test.** One of the common pitfalls of automating your tests is thinking that because 100% of the automation tests pass, that guarantees 100% of the use cases, according to Kamat. "That can give you a false confidence," he said. In order to avoid this, testers should also be performing exploratory sprints.

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"Exploratory testing is really having subject matter experts test end-to-end scenarios. They will test for user experience, test for usability, and they need to provide quick feedback," he said.

AgileTrailblazers' Taylor adds that exploratory testing is one of the most important parts of testing because "It gives an analytical individual the time to go through the site and think of all the kinds of odd scenarios that others might not have been thought of."

■ **Unit test.** Unit testing must be in place in order to validate user stories as fast as possible and understand the impact of changes, according to Parasoft's Ariola. "Without that baseline level of visibility, you are basically going to defer a lot of quality tasks to much more expensive times, and it is going to lead to failure or outages," he said.

This helps in reaching a test-first design, according to Rogue Wave's McLeod. "You don't write code unless you have a unit test to test it, or in some cases you don't write code until you have a unit test to test it," he said. "I write the test for my code first, then I write the code to make sure it passes."

Unit tests should include a range of inputs and outputs, the functional requirements of the component you are testing, all the false or false conditions that may be encountered, and the full range of data, according to McLeod. "It is not unlike writing a spec for the component; it is just the spec is in the form of tests. Rather than having a spec, you are writing a test saying here is the test to make sure this component does everything it is suppose to, then you write the component to pass the test."

Microsoft's Kamat endorses doing all the automated testing you can early in the cycle.

■ **Perform static code analysis.** Quality is the No. 1 priority of software, and it needs to be looked at early in the process, according to McLeod. "Quality is cheaper if you do it early in the process because you can make sure your stuff is right the first time you check it in, and it doesn't break the build." One way to do this is to perform static code analysis on your software. Static code analysis gives teams an overview of vulnerabilities, defects, security weaknesses, and code errors so they can fix problems faster.

■ **Test-driven development.** TDD is the foundation of good development, testing and writing unit tests, according to cPrime's Irani, but it can also be one of the most difficult things for a tester to learn. Being able to perform TDD takes a level of maturity, but when it is performed correctly it can be very powerful.

"It puts quality first. It is just prioritizing quality, and allowing you to think about it in a different way because you had to think about it from a testing perspective, which is more of a user perspective. You tend to have better-quality stories that are a little more thought out ahead of time so you go into your development with a better mindset and a view of what you are building," he said.

■ **Have independent test groups.** Having independent test team members acting as full-fledged members of the development team while maintaining independence will help organize and manage the development team, according to Rex Black, president of consulting firm RBCS.

This should not be confused with keeping testers as a separate team, according to AgileTrailblazers' Taylor. Testers need to be fully committed to a given team.

In addition, there should be a separate group as part of the independent test team responsible for building and maintaining a regression test suite over a long period of time, Black explained. "Have an outside group look at things like usability, security, performance, and reliability because those are all very difficult to integrate into sprint teams especially if you are dealing with scale. Properties like performance, reliability and usability are emergent behaviors of the system as a whole as opposed to

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A lesson from Amazon Prime Day

It is one thing to talk about the importance of testing and quality, but it is another to experience it out in the real world and suffer consequences because of it. Having a software failure, bug or defect released into production can erode a business' brand, according to Wayne Ariola, chief strategy officer of Parasoft.

Amazon recently held Amazon Prime Day, its biggest online shopping event. Since the company holds these lightning deals once a year they had plenty of time to prepare and plan, but yet even the biggest technology companies are capable of making mistakes. The company ended up suffering from a software glitch that prevented customers from being able to put items into their shopping carts, making customers very frustrated.

Users took to Twitter to voice their complaints with the hashtag #PrimeDayFail.

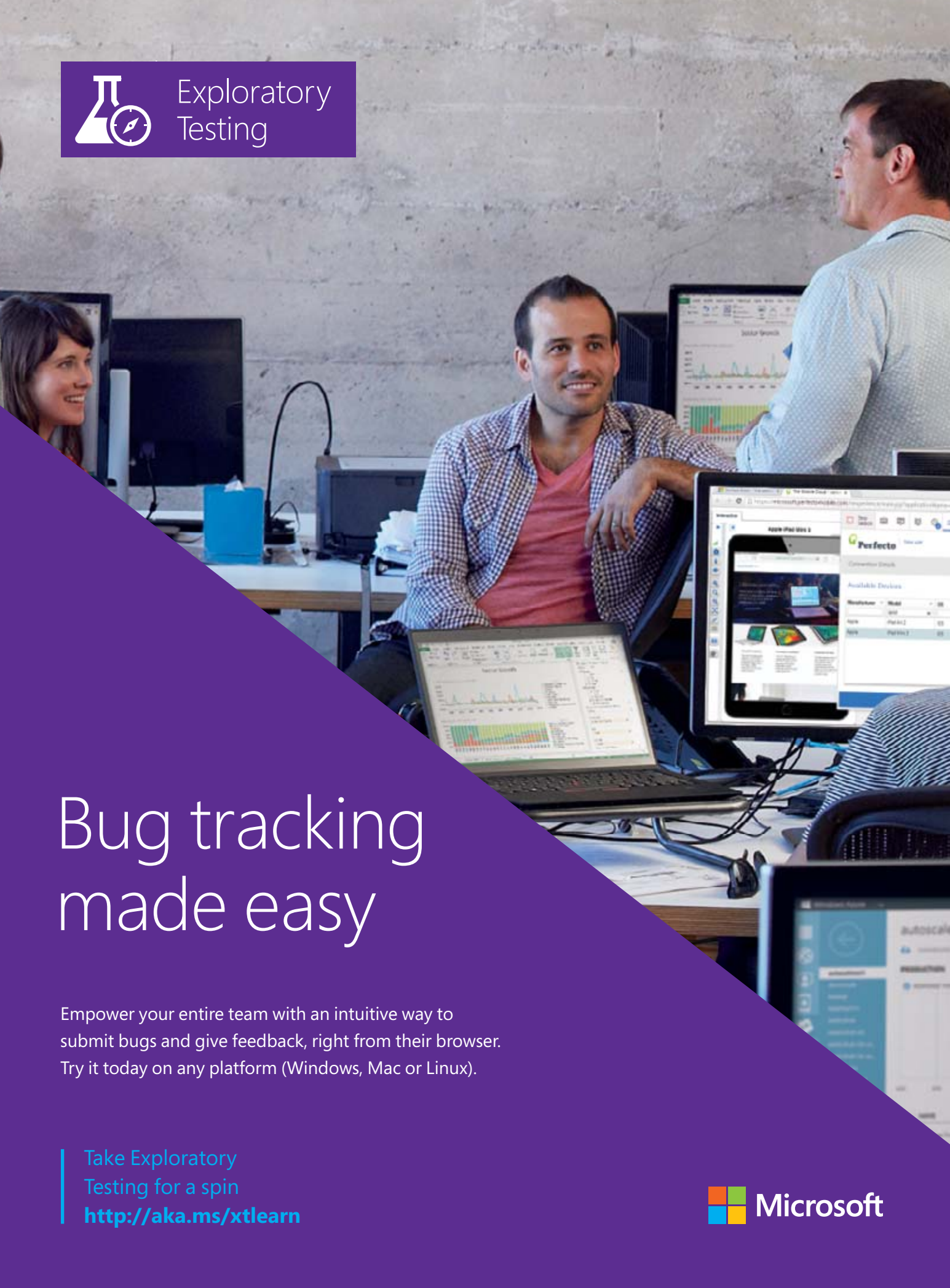
Twitter user @pcg79 wrote: *I removed my two #PrimeDay items from cart. Now I can't re-add them. "You have claimed this deal". Get it together, @Amazon. #PrimeDayFail.*

While @PreroDesign wrote: *#PrimeDay is giving me nothing but add-to-cart fails. Nice job @amazon. Another #PrimeDayFail.*

According to Ariola, the lesson to take away from Amazon is that software quality is no longer optional. The cost of quality and the cost of failure continue to rise.

"It is funny to see things that I would consider or the industry would consider to be a minor software issue just blow up in social media. It is a good example of how social media and how the general public observes and who has the right to criticize the quality of software," he said. ■

—Christina Mulligan



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◂ continued from page 36

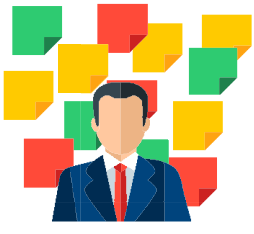
behaviors associated with a single feature or user story. It makes sense for those test task to be taken outside the scope of development teams."

■ **Focus on the testing pyramid.** According to Taylor, the pyramid puts unit tests at the bottom, integration tests in the middle, and user interface tests at the top. The hardest automation tests to write are for your UI because they change the most and can be pretty complicated. Unit tests are easiest to write. "Put most of your investment in unit tests and integration tests, then just a little in UI because it is brittle, hard to manage and hard to maintain. You need some, and you can build over time, but start small," he said.

Microsoft's Kamat adds that having a service or API testing strategy with exploratory testing is a better alternative to UI automation.

■ **Utilize beta groups.** One practice testers can use to ensure their product is working without sending it into production is to have it tested internally to a limited amount of users. "What that allows you to do is get field testing and real-world testing back so the developers can react quickly and then fix defects, bugs or any kind of confusion that occurred from that testing," said John Basso, CIO and cofounder of Amadeus.

Additionally, instead of rolling out to 100% of your users, teams can roll out to only 10% so that if anything happens it only impacts a subset of the population and can be fixed and re-deployed quickly, Basso explained.



■ **Test less, but fix faster.** Since testers no longer have the luxury of waiting until the end of a development cycle to test, Rogue Wave's McLeod believes it is sometimes easier to test less, and then live test. Of course, he notes that it all depends on if your software is mission-critical. "If your software keeps airplanes in the air, it is probably not the best approach," he said. "But if your software is hosted, fast, easy to update, and maybe isn't too mission-critical, I think to some degree you should take a little more risk in your release. And since you are working in smaller increments you can fix it much more quickly." The idea is to deliver value to your customer and to be in a position where you can respond if something doesn't work, McLeod explained.

This is taking a shift-right approach rather than a shift-left approach, according to Microsoft's Kamat. "If we can't do enough testing before you release, you have to complement the risk exposure by monitoring the application in production, so that if there are any issues, you are the first one to detect them, and you can rectify them quickly," he said.

It is important to note that this does not eliminate the need to shift left, Kamat explains. "The more testing you can do early in the life cycle with more automation, the better the results," he said.

Updating your skillsets to stay relevant

Understanding that addressing test is one of the most essential parts of the transformation is only the first step. Businesses need to figure out in this new agile world who is responsible for testing and what constitutes testing, according to Gartner's Murphy. "In an agile organization, everyone plays a role in quality and testing. Developers test, testers test, product owners test, and, yes, the users do certain types of testing," he said.

So when developers and testers are stuck in the middle of this transition, they need to understand their skillsets need to change immediately.

According to Parasoft's Ariola, testers need to have a clear understanding of the business and how software is going to impact the business. "This means your blinders associated with just writing tests need to be removed, and you are going to have to understand a much more global perspective of what you are doing as a tester," he said.

Instead of just testing parts of the application, testers also need to understand its breadth. "You have to understand how your application runs, but you are also going to have to under-

continued on page 40 ▸

Agile doesn't mean fail

Rex Black

There is a popular saying in agile and general software development initiatives: Fail fast and fail often. The point of this saying is that organizations will fail, but they will learn from their failures. While this saying might work for some companies, this is not a good mindset to have.

According to Rex Black, president of consulting firm RBCS, falling into a fail fast, fail often mentality is dangerous because it makes it sound like getting things right the first time doesn't matter. "I suppose this attitude is appropriate or at least tolerable if you are building the Kim Kardashian game to run on someone's mobile phone," he said. "It is not an attitude that is in any sense tolerable if you are building self-driving cars."

Black explained organizations often adopt the philosophy of just throwing stuff out there because if it is broken they can just release another update, but that can make the life of testers and developers difficult. "As software becomes more and more a critical part of the infrastructure of our lives, the importance of quality in software goes up, not down. Therefore sloppy and 'ready, aim, fire' approaches become less appropriate rather than more," he said.

Instead of rushing to get stuff out there quickly, developers and testers should ask themselves if they can rush their product out because it doesn't matter if it's broken, or is it something that is being implemented in self-driving cars, elevators, pacemakers, and other critical solutions, Black explained.

"Agile isn't just stuff that gets out fast. The compromise that is going to be made is almost inevitably quality because it is certainly less visible than budget and schedule, and people are very good at counting days and counting dollars. But quantifying what is an acceptable level of quality, organizations aren't always good at that, and that can lead to some bad decision-making," he said. ▮ *—Christina Mulligan*

◂ continued from page 39

stand the dependencies associated with the application," said Ariola. "Meaning, what does it connect to? Are there third-party connections from web services? Are there other APIs that this application is dependent on in order to do its job? Does it connect into a mainframe? You are going to have to get to know the architecture associated with that application quite well."

Having a thorough understanding will also help testers monitor and react better. "They need to be able to really understand how an application works so when it fails they can better make sure the quality is there because they understand how it works, and understand how it could break," said cPrime's Irani.

The expectation is that testers are going to be able to participate in not only the discussion about requirements raised as user stories, but also discussions about automation of tests associated with behavior-driven development and acceptance-test-driven development, according to RBCS's Black.

The job of a tester is no longer to figure out how to manually do things. Their job is to ensure the quality of a product, according to Amadeus' Basso. "It becomes less about the testing and more about how you can make this whole ecosystem of development, deployment and monitoring better in such a way you can make the quality higher," he said.

This new role is being seen as a quality engineer, according to AppDynamics' Stoner. "Quality engineers have to have some coding skills so they can sit with development and build test cases side by side," he said. "Quality engineering is increasing the quality of builds and developments so that less time has to be used finding these issues. To do this, testers need to get brushed up on their automation skills, Continuous Integration skills and Continuous Delivery platforms"

In order to brush up on those automation skills, testers need to become more technical. This means being able to write code and scripts in order to automate things. "Testers need a growing amount of ability to write code because most testing tools and the most effective way with most systems to automate is you must write code, you must understand the code you are testing, and you must feel comfortable treating your testing assets as code elements," said Gartner's Murphy.

According to Trailblazers' Taylor, it doesn't necessarily have to be any one language in particular. "What I look for is whether or not they have the ability to pick up some form of automated test scripting, which is really a lighter form of programming," he said.

For organizations that have hundreds of manual testers, they can't just hire someone to automate all their manual scripts, according to cPrime's Irani. "You have to spend the time and money to invest in architecting out how you should be automating testing," he explained. "You have to think about who you have that can learn those skills, and then acquire the gaps of skills you don't have."

In addition, you can't just train all your manual testers to become automation test engineers. "You have to architect a solution, figure out which of your people can make the transition, and then provide them with the training and skills they need," said Irani.

On the other side, as roles and responsibilities between testers and developers become more blended, developers need to be more familiar with tests. They have to understand the value of a good unit test. "Writing good unit tests around your code gives you a safety net to make changes down the road," said Taylor. "If you want to continue to go fast, you need to have that safety net so you can make changes without fear or without having to second-guess yourself, or without having to introduce a lot of defects into production."

And as developers become more "test infected," the importance of testers becomes greater. "Developers are typically more familiar with code and writing the unit test, whereas testers have an eye for details, they have expertise in terms of connecting with real-world customers, and they have a better understanding of application topologies in the real world."

In order to work in this new world seamlessly, developers and testers need to make sure they have good communication skills in place because they need to be able to work together to find and execute the right suite of tests. "The more testers understand, the more respect they are going to get from developers," said Irani. "The more respect they get from developers, the more they are going to work with testers, collaborate and teach them as well to help them get better." ▮

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Stakeholders need to change their mindset

Transitioning to agile is not only an initiative that happens at the team level. Stakeholders and executives need to be able to change their way of thinking to accommodate this way of working, according to Anand Kamat, group program manager at Microsoft.

According to him, stakeholders have grown up with a mindset that if they feel confident about releasing a particular solution, they should release it. "Stakeholders need to understand that just by throwing more people and more hardware doesn't mean they will be successful," he said. "The agile principles don't say that you are still going to do everything you have done before, but in a compressed timeframe."

The intent is to focus on what has changed, what is being used in production, use the data points to test, and have confidence in the testers that they understand what the business risks are.

"Testers in an agile world need to be supported by the stakeholders to say yes, we are going to understand the risk, and we are going to mitigate the risk by monitoring the application in production," said Kamat. ▮

—Christina Mulligan

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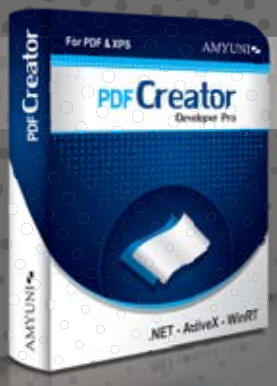

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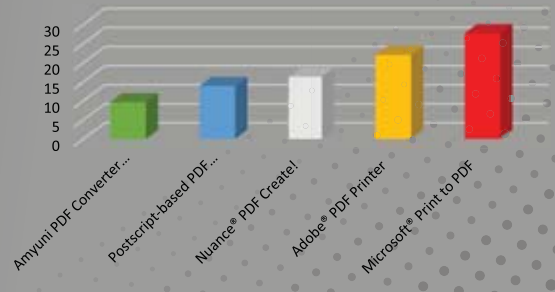

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Buyers Guide

How imaging SDKs can solve today's application development challenges

BY MADISON MOORE

In a mobile-first world, developers understand the importance of creating a next-generation app that fits in with client or user expectations. Developers should consider the myriad of SDK options if they want to improve functionality for the user, especially imaging SDKs. Although they are a niche market, these SDKs can add better imaging capabilities and target industry-related problems that companies are trying to tackle.

Typically, an imaging SDK consists of a code library that will allow developers to take or create images, compress them, visualize data, interact with scanned documents, and extract information. Imaging SDKs can handle a wide range of formats. These SDKs also come with many built-in capabilities like scrolling, zooming, animation, drag and drop, touchscreen support, and more, according to Greg Ross, technical marketing engineer at LEADTOOLS.

"Those are just the basics," he said. "Dive deeper into the world of imaging technology and you'll find optical character recognition, barcodes, forms recognition, PDF, annotations, DICOM, PACS, TWAIN scanning, multimedia streaming and video codecs."

Well-known features, according to Ross, are those like scanning a QR code with a phone or scanning a paper document and saving it as a searchable-text PDF. But, he added, "The average person has no idea what DICOM or MPEG-2 Transport Stream is, even though they likely use it on a daily basis. Imaging is a crucial component in UAV drones, CT and MRI scanners, x-rays, ATMs, social media, DVR and so much more."

A good imaging SDK is easy to evaluate and it will have a list of features that are easy to understand. However, implementing imaging algorithms is not so easy, said Eugene Kosmin, lead developer at Aurigma. It does require some mathematics, which many developers only deal with when studying at college, he said. Overall, SDKs should save developers time, not add headaches.

Companies and developers understand that learning new concepts and APIs can be time-consuming, which is why some SDK providers give plenty of code examples for those who are looking to implement an imaging SDK.

"A good imaging SDK should hide all the complexity, give developers intuitive APIs, and allow them to concentrate on their application rather than implementing algorithms or reading file format specifications," said Kosmin.

SDKs can solve general imaging problems that are familiar to web developers, such as creating thumbnails from JPEGs. They also can be useful in specific areas where image-processing algorithms are key, like medical applications, document processing, and forensics, according to Kosmin.

For apps that are doing more with image editing, barcode, OCR, and annotations, "You would be crazy to not use a third-party SDK," since many of these features take months to develop and years to perfect, said Ross. For applications that require comprehensive PDF technology, developers should consider their PDF SDK options.

Jose Pimentel, sales and customer support manager at Amyuni, said it specializes in PDF SDKs, and all of its software is built around the PDF specification. One of its SDKs is built to manipulate or create PDF documents, while the other allows developers to create PDF documents from printing applications. All of the SDKs focus on PDF functionality, the creation of documents, and extracting content.

"Our SDKs are geared toward creating PDF documents, whether you are creating a document from programmatically adding objects to a PDF canvas, or creating PDF documents from a printing application," Pimentel said. ▮

A guide to imaging SDK offerings

Accusoft: Accusoft's **PDF Xpress** empowers developers to boost application functionality with easy PDF creation, editing, and the highest level of PDF compression available on the market—as much as 90%. Quickly compress one PDF (or an entire library) with just one parameter change to boost display and transmission speed while dramatically reducing archival footprint. Leverage PDF Xpress to build a PDF portfolio of multiple documents and document types.

Aspose: Aspose offers a powerful set of **file-management APIs** with which developers can build applications that can create, open, edit and save the majority of popular business file formats. The Aspose product range includes Microsoft Excel spreadsheet APIs, Microsoft Word-processing APIs, Microsoft PowerPoint presentation APIs, PDF document creation and manipulation APIs, image file APIs, and many others.

Atalasoft: Since 2002, Atalasoft provides imaging SDKs to help developers build document scanning, viewing and image processing into their applications. **Atalasoft DotImage** for Microsoft .NET powers thousands of document-management applications, and it supports everything needed for digital document collaboration plus barcode and OCR support. **Atalasoft MobileImage** for Android and iOS turns mobile apps into smart document capture machines, complete with eVRS cleanup and UI controls to capture perfect images.

Aurigma: Aurigma **Graphics Mill** and **Customer's Canvas** is a family of imaging .NET SDKs designed for the printing industry and vendors of GS1-compliant DAM systems. They support various image formats, convert colors with true color management, have advanced text support, generate hires PDF output, and handle image metadata. Also, they allow for building HTML5 user interfaces and APIs for creating personalized products, as well as variable data printing in web-to- print software.

Foxit Software: Foxit is a leading provider of fast and secure PDF solutions for end users and the enterprise. Businesses and consumers increase productivity by using Foxit's cost-effective products to securely work with PDF documents and forms. Additionally, Foxit's **Software Development Kits**, which share the same underlying technology that powers Google's PDFium project, help developers reduce costs and time to market by allowing them to easily integrate its industry-leading PDF technology into application workflows.

OnePager: OnePager has developed a tool used by project managers that takes their project data and turns it into a customizable summary graphic. **OnePagerPro** is an add-on to Microsoft Project and OnePager Express to Microsoft Excel.

ORPALIS: ORPALIS specializes in automating large-scale document-based processes and imaging. ORPALIS has developed **GdPicture.NET**, an SDK for WinForms, WPF and web development; and **DocuVieware**, an HTML5 document viewer and document-management SDK for ASP.NET.

Qoppa: Qoppa Software offers an extensive suite of **PDF libraries and visual components** that cover all PDF processing needs. PDF functions include creation and modification, assembly, conversion to images and HTML, automated printing, encryption and digital signatures, form fields, viewing and markup, optimization, and a lot more. Qoppa products provide the highest level of performance and reliability, and they are 100% Java.

RasterEdge: RasterEdge.com is the professional provider of **document, content and imaging solutions**, available for ASP.NET AJAX, Silverlight and Windows Forms, as well as WPF. Raster Edge is dedicated to provide powerful and professional document-imaging controls and components for capturing, viewing, processing, converting, compressing, and storing images and documents.

SmartDeploy: SmartDeploy is computer imaging software that allows IT administrators to easily deploy Windows OS and applications to users through a simple, guided process. **SmartDeploy** requires little to no training, making it suitable for technicians of any skill level. SmartDeploy's intelligent architecture allows one hardware-independent image to be deployed to any computer model using a unique driver-management technology.

Snowbound Software: Snowbound's **VirtualViewer HTML5** is the premiere HTML5 viewer for the enterprise. View, annotate, redact, and manipulate hundreds of documents and images through a browser without downloading anything to the client. **VirtualViewer** integrates seamlessly with your ECM/repository using our APIs and connectors. Snowbound's **RasterMaster** Imaging and Conversion SDK enables developers to incorporate viewing, conversion, manipulation, annotation, redaction, printing, scanning and more for PDF, Word, Excel, AFP, and more. Both products are available for Java and .NET. ▮

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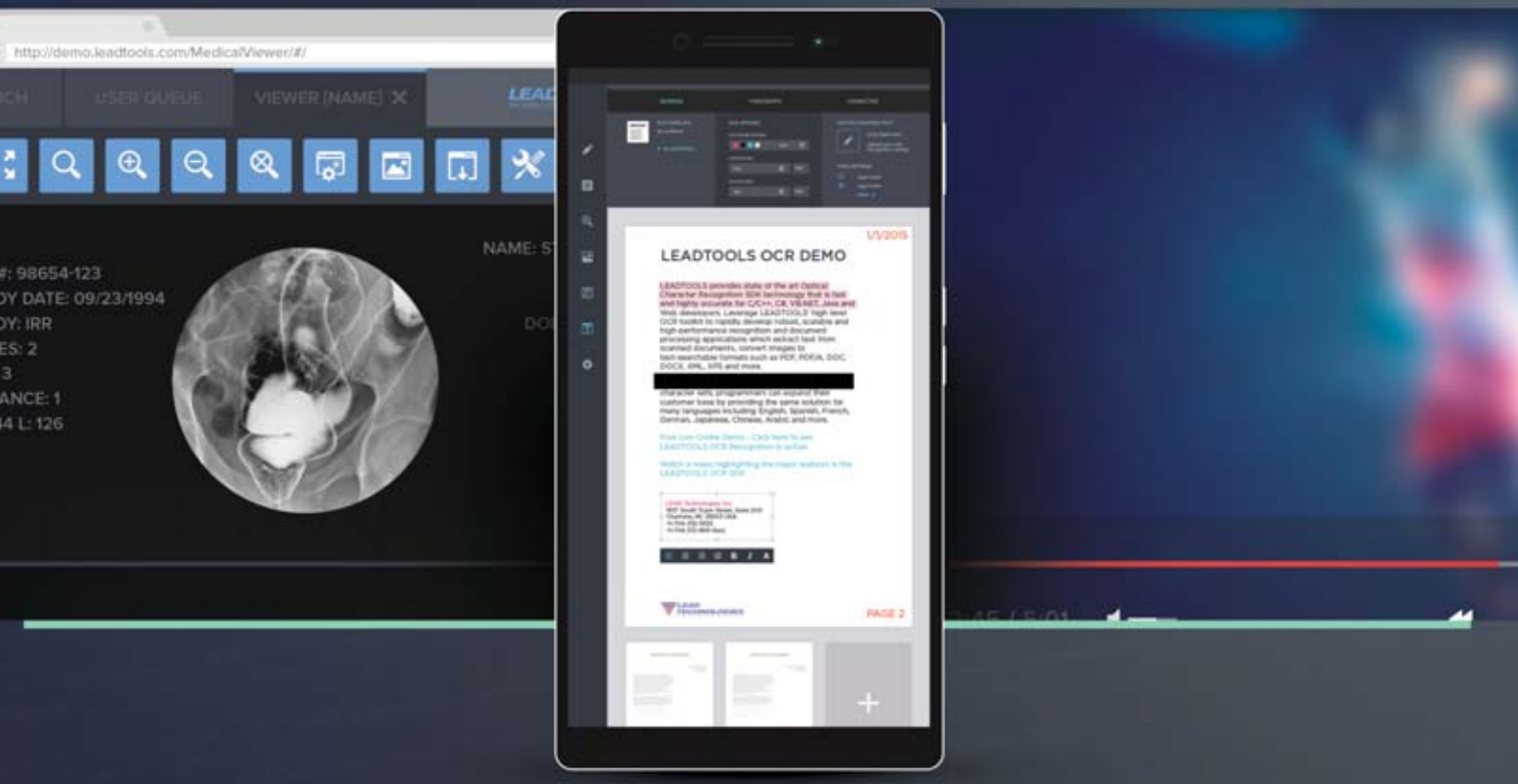

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Guest View

BY WAYNE ARIOLA

How much risk is too much for an RC?

Wayne Ariola is Chief Strategy Officer of Parasoft, where he leads the development and execution of its long-term strategy.

Today's DevOps and "Continuous Everything" initiatives require the ability to assess the risks associated with a release candidate—instantly and continuously. Yet, as the release date looms, development teams are still focused on answering the question, "Are we done testing?"

Fundamentally, this is the wrong question. It ties the concept of "quality" to static tests that produce multiple, independent and primarily binary data points of pass or fail. This approach results in a lot of data points, but not the information needed to help the business understand the real impact to the end-user experience.

Understanding the specific risks associated with each release candidate becomes mission critical as organizations attempt to accelerate the release cycle. Without this visibility and knowledge of the impacts to the business, managers are unable to make the appropriate tradeoff or timing decisions for releasing software.

Instead of "Are we done testing?" we should be asking, "Does the release candidate have an acceptable level of business risk?" This new question is much more complex than it seems at the surface. It carries a few critical assumptions:

- The inherent business risks associated with a given application and the particular release candidate are well defined.
- There is an understanding of how to measure each of these defined business risks.
- A baseline and thresholds are established for defining what constitutes an acceptable level of risk. Some business risks might have zero tolerance and no thresholds for acceptance.
- Automation is in place to continuously assess the state of the application versus these defined risks.

This is why the concept of Continuous Testing is so critical. Continuous Testing provides an automated, unobtrusive way to obtain immediate feedback on the business risks associated with a software release candidate. It balances the traditional bottom-up tasks associated with software development and testing with a top-down approach focused on safeguarding the integrity of the user experience while protecting the business from the potential impacts of application shortcomings.

Continuous Testing is not simply more test automation... nor is it a "plug-and-play" solution. As with all process-driven initiatives, it requires the evolution of people, process and technology. We must accommodate the creative nature of software development as a discipline, yet we must face the overwhelming fact that software permeates every aspect of the business—and software failure now presents the single greatest risk to the organization.

Continuous Testing (when executed correctly) provides four major business benefits. First, it results in clearly delineated business risks associated with each application in the organization's portfolio, including measurement standards for assessing the level of risk. It guides business and technical teams to collaboratively close the gap between business risk and development activities.

Second, Continuous Testing establishes a safety net that allows developers to bring new features to market faster. With a trusted test suite ensuring the integrity of the related application components and functionality, developers can immediately assess the impact of code changes. This not only accelerates the rate of change, but also mitigates the risk of software defects reaching your customers.

Continuous Testing provides an automated way to obtain immediate feedback on risks in a release candidate.

Third, Continuous Testing allows managers to make better tradeoff decisions. From the business' perspective, achieving a competitive advantage by being first to market with innovative software drives shareholder value. Yet, software development is a complex endeavor. As a result, managers are constantly faced with tradeoffs in order to meet the stated business objective. By providing a holistic understanding of the risk of release, Continuous Testing helps to optimize the business outcome.

Fourth, when teams are continuously executing a broad set of tests via "sensors" placed throughout the SDLC, they collect metrics regarding the quality of the process as well as the state of the software. The resulting metrics can be used to reexamine and optimize the process itself, including the effectiveness of the tests. This information can be used to establish a feedback loop that helps teams incrementally improve the process. Frequent measurement, tight feedback loops and continuous improvement are all key DevOps principles. ▮

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Analyst View

BY AL HILWA

Al Hilwa is an industry analyst at research firm IDC, specializing in application development research

Rise of the elusive citizen developer

The need to engage in digital transformation and build new processes and systems, coupled with severe developer shortages, has created an opportunity to promote model-driven platforms to bring the value of high abstraction to a broader audience not trained in software development. The idea is that there are many intelligent knowledge workers who are very comfortable with technology in the workplace and are thus are able to create business applications if given the right tools.

We need to unpack the "citizen developer" buzzword in light of the true nature of modern software development.

Abstraction is key

Going back to the origin of these development technologies, we find much was inspired by the difficulty of software engineering. The traditional 4GL or RAD tool of the last few decades typically focused on developers looking to solve business problems. Modern BPM tools are more focused on process analysts and experts who often have a rigorous understanding of the business processes and workflows they want to automate or re-engineer.

The most powerful commercial packaged applications have been enhanced with custom objects and abstracted programming models. It is in this context that Salesforce originally got into the platform world with AppExchange more than a decade ago, pioneering this model of app extensibility to build an ecosystem that made its applications more valuable.

For most of the last few decades, abstraction has been used in software engineering to build platforms that shift the application model from the domain of the machine to the business. This has been a defining feature of application platforms, and has shaped software development as we know it.

The rise of knowledge worker skills

There are knowledge workers who are using more automation in their work on a daily basis. And more analysts use data science tools of various types for building models and crunching data coming from web, mobile and IoT edge systems.

Many who would not be categorized as data scientists use elaborate computational models in spreadsheet programs that are tantamount to programming. Habituation to this type of personal automation is increasing even in the consumer space with emerging services like IFTTT. Fundamentally, life has become much more "programmable" than it used to be.

While the coding of applications is a critical and creative activity, work on requirements analysis, design, quality assurance and, more recently, deployment management is at least two-thirds of the cost and effort of software development. In his seminal long blog on agile technologies, Martin Fowler estimates that only 15% of the time spent in software development is coding.

Knowledge workers must be able to analyze requirements for new systems, design and architect them, test them effectively, and roll them out to their users. Increasingly, an iterative process is needed to cycle through requirements and redeploy the app. Effectively, knowledge workers, if successful at building business apps, face a shift to becoming developers.

Abstraction is a defining feature of application platforms and has shaped software development.

The citizen product manager

Recently, companies like Airbnb and Uber have revolutionized hospitality and transportation in ways we are only beginning to digest. This disruption is making its way to companies focused on mechanical engineering, with Tesla disrupting the auto industry and SpaceX, Blue Origin, and Virgin Galactic disrupting aerospace.

The heart of these shiny new mechanical objects is invariably software. Almost all modern disruption uses software, putting developers at the heart of transformation competency. Yet the varied business problems and solutions are typically not the domain of professional developers alone. This means that product development is increasingly dominated by software development and knowledge workers must engage in the process.

Knowledge workers may be programming more in their life, but they are also engaging more in cross-disciplinary agile software and product development teams. In many cases, knowledge workers are taking product leadership roles around software products or components that are key to business transformation. This has been the true rise of the citizen developer movement. ▮

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Industry Watch

BY DAVID RUBINSTEIN

In SUM, applications are alive

"Cogito ergo sum." — Rene Descartes, 17th century French philosopher and mathematician.

"To me, software processes are a kind of intelligence, and that means to me that every program is alive. This is how I really see it." — Benjamin Shapiro, founder of Thinking Software.

You'll get the connection soon. But first...

Long story short, Shapiro, a teenaged student at an engineering military academy in St. Petersburg, Russia, had a math professor suggest he look into Boolean algebra. He went on to do some work in the computer department, where he published "Formula of Algorithm." After deciding not to graduate as a military officer, and spending time "banished to a very cold place," Shapiro got his diploma from a technical institute before migrating to the United States in 1979.

With Race Catcher, applications automatically analyze themselves. They think, therefore, they are.

By 1981, he was building a debugging package based on his "Formula of Algorithm," working in Fortran and then COBOL. The debugging package morphed into a dynamic code analyzer, which is implemented in his Software Understanding Machine. The goal is to ensure business-critical software is reliable. From this work, and with his brother, Roman (who came from Russia in 1990), the company Thinking Software was founded in 1995.

"I had a contract with Google, and I showed this work to their director of R&D Peter Norvig...and I told him what we built is different because we don't work on data, we work on cause/effect, which makes us faster and much more efficient and secure," Shapiro recalled. "We don't expose people's data.

"We then moved to work on the Java language," he continued. "One of the questions at that time, by another director, was how are you going to deal with race conditions? I went home and then realized this is not a missionary technology like a Software Understanding Machine, but it's a well-known issue, and it was in addition to what we do in SUM. By the way, SUM happened to be a good acronym, because 'Cogito ergo sum,' by Descartes, means, 'I think, therefore, I am.' I really liked this combination, because the Software Understanding Machine understands cause/effect and propagates knowledge. It's knowledge deduction."

From all of this has come Race Catcher, the company's flagship product for ensuring software reliability. Race Catcher does dynamic analysis of code to find and understand contentions within the code. These race conditions are a well-known issue in software, but are not so easily defined. As Shapiro put it, "Stack Overflow has about 12,000 questions about what race condition is, and each question has several answers. I checked a year later, and there were 13,000 questions."

The most common definition is that race conditions occur when multiple application threads are accessing memory, and one thread alters the memory being used by another, rendering the application unreliable. Static analysis tools cannot analyze everything and return too many false positive and false negative results, Shapiro said. Dynamic tools give results as they happen, but he said they usually come with large overhead.

Shapiro explained how Race Catcher works. "The first element of the Software Understanding Machine is the user interface. Some user interface builds models of software in order for a programmer to understand what the issue is. The second element is Race Catcher. It analyzes executable code, which means we don't need source code. But the programmer, of course, needs to see source code to understand the issue. So when our product locates issues automatically during program execution, since Race Catcher is dynamic code analysis, as opposed to static analysis, issues have to be explained to programmers, and we do this automatically by dragging the issue onto the model of the code we built automatically, which comes from the Software Understanding Machine."

A third element is what Shapiro calls ARM-CM: Application Reliability Management via Collaborating Machines. He calculates that approximately 1 billion virtual machines are in service today, with the overwhelming majority running Java. ARM-CM allows multiple Race Catcher instances to become part of a local network—what he described as "conscious machines running the same applications" and ensuring reliability through a social network machines that have "common interests" and create knowledge of the applications that are running.

In short, with Race Catcher, applications can automatically analyze themselves. They think, therefore, they are. ▮

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