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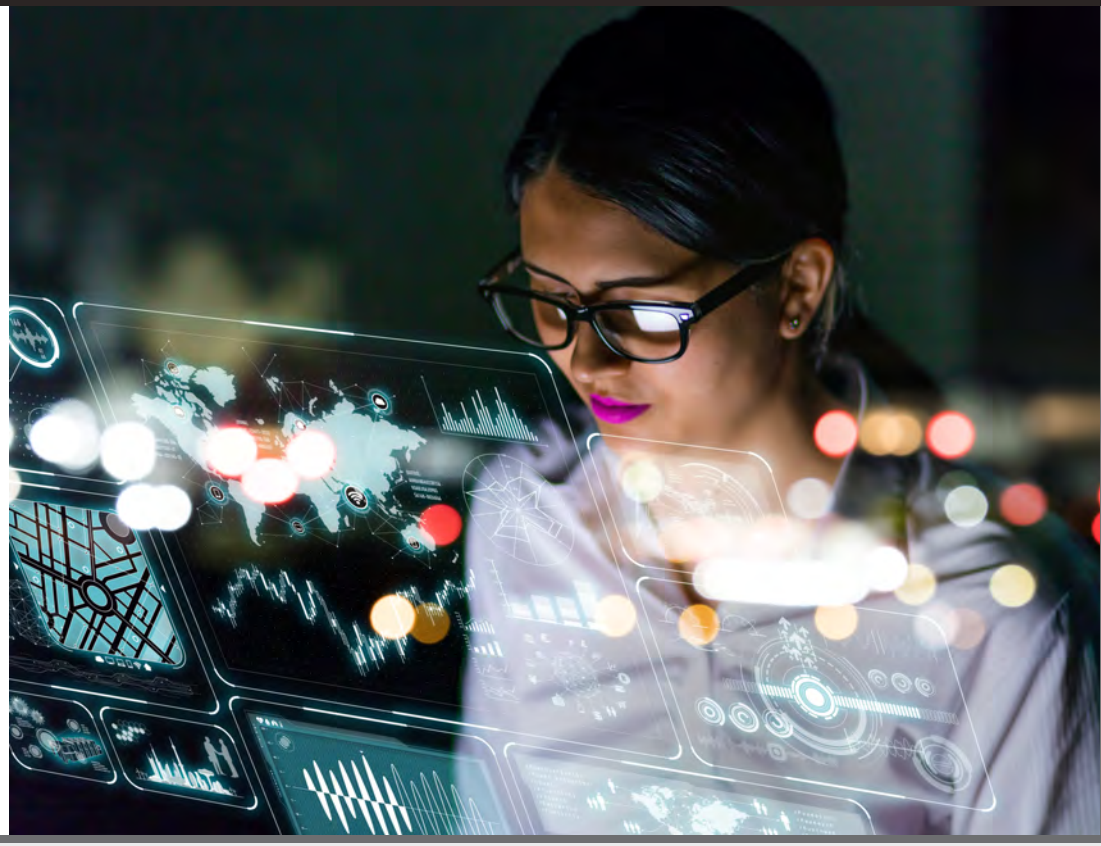
Business Agility via Cloud



Yes—cloud has gone mainstream. It's just too hard to ignore all its benefits: agility; closer collaboration between IT departments and business units; faster feedback loops; easier design of products and services. Cloud allows you to investigate machine learning, chatbots, the Internet of Things, and other disruptive technologies.

Are you on board too? Let us acquaint you with the voices of IT leaders who have gone down this road and have some wisdom to impart.

The evidence is in: The cloud's advantages are now clear to business

The business community is now seeing directly how the cloud is transformative for business, not something simply for technologists to use.

BY DAVID LINTHICUM | One of the likely outcomes of moving to the public cloud is altering how products are designed, a recent *Harvard Business Review* article shows. With cloud, there is closer collaboration between corporate IT departments and business units—sales, finance, forecasting, and even customer interaction. In fact, the HBR article shows that many IT departments have jointly developed products with their customers.

Many report that new ways of writing and deploying software in the cloud encourage new types of faster organizational designs. The feedback loops enabled by cloud computing seem to allow direct interaction with the product producer, no matter if it's a thing or software, and with the ultimate customers.

As the cloud technology advances, it's becoming easier for companies to design and build products and services in cloud-based systems. This extends to sales and marketing as well. The cloud, in essence, becomes a common repository for the collection and analysis of new data. And it lets you take full advantage of the possibilities of tools such as machine learning, chatbots, internet of things, and other cool technologies that many in corporate America view as disrupters.

What's significant about this finding is that it's in a mainstream business journal, and not from yours truly or other cloud pundits. It means the cloud has likely crossed the chasm between IT promises and actual results, and now produces real value for the business. Most important, the businesses know it.

As technologists, we quickly find the value of new technologies. We will deal with the next shiny objects because we're trained to do that to stay relevant in our careers. However, there is often a huge gap between what the technology actually does and its proven value to the business. Only when the business sees the value can the technology be used for its full potential.

The cloud has proven itself to the business, for the most part. It's now a systemic technology that is part of many business systems, and it now can move companies from followers to innovators—thanks to the agility and speed of cloud computing rather than any other aspect of this technology.

The fact that businesses have started to use the cloud as a means of incorporating customers and partners into design, production, and sales processes means that customers feel integrated with the company's systems and so are more likely to stay on as customers, as well as spend more money. We technologists saw that coming, but now the business does too. Prepare for the next wave of deepened cloud adoption as a result.

The cloud has crossed the chasm between IT promises and actual results, and now produces real value for the business.

Public cloud: Real-world lessons of strategic success

The public cloud is fast becoming a strategic tool for companies opting for infrastructure-as-a-service (IaaS) over running workloads on-premises. IT leaders share their experiences and lend advice to CIOs migrating to public cloud services to drive innovation, agility and revenue growth.

BY CLINT BOULTON | Public cloud services are evolving from cost-cutting technologies to enablers of business agility. More than a way to cease operating data centers, the public cloud affords CIOs the ability to focus on more strategic projects—namely, digital transformations aimed at boosting the bottom line.

Whether that means building a mobile app or analyzing data to strengthen customer engagement, these shifts signal how strategic the public cloud has become. But CIOs also view the cloud as a way to build software faster by embracing agile, DevOps and design-thinking philosophies. Fueled by these technology trends, the global public cloud market will grow at a 22 percent compound annual growth rate this year to $178 billion, according to Forrester Research.

IT leaders shared with CIO.com their business drivers, experiences, and lessons learned in moving to the public cloud. Many also offered some practical advice or lessons learned for CIOs looking to make a strategic shift to the public cloud.

Document management moves to the cloud

When Liberty Mutual employees complained that downloading large documents from a legacy file system was a chore, CIO Mojgan Lefebvre adopted a cloud-based content management system running on Amazon Web Services.

Now 1,600 underwriters, actuaries and other employees spread across 46 offices in 18 countries download and share roughly 500,000 digital files anywhere in the world, Lefebvre says. Liberty employees access the content from cloud document management system Alfresco, which runs on AWS regional data centers. Such localization serves up the documents with little to no latency, while saving Liberty Mutual roughly $21 million in paper, printing and storage costs.

"This was about creating global productivity teams that could collaborate and leverage our scale around the globe, do it effectively in a digital manner, and have the technology be the enabler rather than get in the way," Lefebvre says.

Liberty is expanding its Alfresco on AWS implementation to other parts of its underwriting and claims organizations. Lefebvre anticipates Liberty will store approximately 300 million documents in this fashion by the end of 2018.

Lefebvre's lesson learned: Inform employees about the change in advance and provide training as needed. Also, she adds, be sure to provide a "consistent message to end users, set expectations, and have the processes in place to support end users."

Cloud is the ticket for Live Nation

It's rare that a cloud migration happens because the CEO mandates it, but that's where Jake Burns, vice president of cloud services for Live Nation, found himself in late 2015 when the CEO ordered the company to move 100 percent to a public cloud. "He wanted us to be this modern, agile company," Burns says.

It was refreshing for Burns, who was already contemplating shuttering data centers and moving to, at the very least, a hybrid cloud. Emboldened by the CEO, Burns reskilled roughly 20 engineers in cloud solutions before moving Live Nation's corporate operations, including Oracle databases and SAP applications, to AWS. "The planets aligned and we were able to cut through the bureaucracy," Burns says.

Many people have come to view the cloud as salvation from infrastructure hell. But Burns says the cloud courts new complexity, including managing virtual machines, snapshots and backups, to ensure costs don't spiral out of control. "Be careful what you wish for, because once you're there, you have a whole host of new problems that you have to deal with," Burns explains, adding that he's seen failed cloud migrations because people couldn't rein in the costs. "That being said, going all in on the cloud in a cost-effective way can be done—and we're the proof."

Burns' recommendation: Consider hiring someone with technical and business chops who can understand the costs associated with consuming cloud technologies. That will save you from bill shock. "You need to have somebody who understands the technology and who is accountable for costs," says Burns. This is the role he currently serves for Live Nation.

Process control in the cloud

Honeywell International has embraced public cloud solutions from IBM to manage process control systems in oil and gas production, a move that reduces costs for customers without sacrificing reliability, says Jason Urso, CTO for Honeywell's process solutions business.

Previously, Urso's IT team managed software running on premises at manufacturing plants. Today, his team "wraps" control system applications in VMware, which in turn runs in IBM's cloud. "By deploying our control system in the cloud for them, we can give them the tools to operate those wells safely, reliably and efficiently, while eliminating IT infrastructure they would have needed," Urso notes.

Honeywell also uses Microsoft Azure to collect and analyze data from a variety of processing plants. This information helps advise customers on how to improve yield, uptime and staff deployment.

Challenges faced: Migrating to the cloud posed change management challenges for a staff accustomed to managing software and hardware on premises. "We needed a whole new set of IT and application skills, so that's a pretty big organizational shift," says Urso, adding that his team also had to become comfortable with maintaining cybersecurity and resiliency in cloud environments.

Heavy machines get cloud treatment

United Technologies, whose businesses provide elevators, turbines and other industrial equipment, struck a strategic agree-

ment with Microsoft to leverage Azure and other cloud technologies to support its business.

UTC CIO Vince Campisi says Azure is accelerating computing capabilities used to support smart factory initiatives, including internet of things (IoT) capabilities, field services, maintenance and repair and other business processes. "Historically, it took two to three months to provision dedicated physical equipment for engineering, or six to eight weeks for virtual resources," Campisi explains. "We can now spin that up today."

UTC's Otis elevator unit uses Dynamics 365 CRM to help service technicians and sales teams better serve customers and anticipate when machines will require service.

Industrial giant bets big on AWS, Azure

General Electric's move to the public cloud ratcheted up in 2014 after the industrial giant lured Chris Drumgoole from Verizon Terremark. Drumgoole, the company's CTO, says that more than 90 percent of new apps GE builds run natively in a public cloud. "We don't deploy anything new internally anymore," notes Drumgoole, who reports to CIO Jim Fowler.

GE runs internal and customer-facing applications on AWS and Azure. But the company's commercial Predix platform—analytics software that helps companies service turbines and other industrial machines before they break down—runs in Azure. GE still runs apps sensitive to federal regulations in its own data centers, Drumgoole explains, though he expects those to migrate to a public cloud once regulations "catch up."

Drumgoole views hybrid cloud as a stopgap for a future where everything runs in the public cloud. "We still think the world ends in a public cloud," he jokes.

Drumgoole's biggest challenge today is deciding whether to refactor apps and move them to the cloud, put them into containers and migrate them, or let apps die and rewrite them. The stickiest questions surround niche apps that GE still needs but aren't ready for the cloud, such as Java apps that lean on an ERP to fulfill a business function.

Drumgoole's advice: Watch vendor lock-in. Every petabyte you migrate cedes more control to your cloud provider. Should you opt to bring that data back in, moving it will be challenging. Accordingly, GE hasn't moved to AWS and Azure lightly. "Getting out is not an easy proposition anymore," says Drumgoole. "We think about a world where we no longer physically, tactically control our own data. Because if I'm locked into my supply chain, I'm taking away the very choice I'm trying to create."

Public cloud helps ensure speed and agility

The public cloud is integral to MetLife, where Alex Seidita, the insurance company's chief technology architect, uses cloud software to differentiate MetLife for customers and improve operations. Speed and business agility are the biggest reasons MetLife has moved to the cloud, but the cloud also happens to "bring saving through automation," according to Seidita.

MetLife uses Microsoft Azure to power its microservices, including call center capabilities and Infinity, an application customers use to store photos, documents, and other content. As a result, MetLife has reduced the time to deploy new virtual machines by an average of 83 percent. The company also consumes IBM Softlayer to operate disaster recovery as a service.

The move to Azure and Softlayer has had an ancillary benefit, as Seidita's teams have brought best practices gleaned from the cloud to bear on MetLife's own data centers. "We've been able to leverage the same kinds of capabilities internally and externally for automation, which drives speed and agility," says Seidita.

Seidita's advice: CIOs, particularly those working in regulated industries, should seriously weigh what software services are appropriate to move to the cloud. MetLife created a "cloud-fit assessment," in which application inventory is scrutinized to determine which apps can be moved to the cloud, and which new apps should be developed in the cloud, based on security and governance requirements.

Banking on the cloud

Bank of America has long resisted moving to public cloud services, claiming that the economics aren't worth it and that its software-defined network (SDN) did the trick.

Yet BofA surprised industry watchers by striking major cloud deals with Microsoft Azure and Oracle. It's using Azure to support application modernization, a crucial component of its digital transformation, which includes moving 200,000 employees to Office 365. And it's consuming Oracle for ERP and financials.

"There's been a dramatic improvement in the ability to do virtualization securely," Cathy Bessant, BofA's chief operations and technology officer, told peers at the Forbes CIO Next conference in October 2017. However, Bessant added a caveat: "You're going to find us super-cautious in the world of public, pay-for-play cloud," noting that she was unsure whose apps are running next to BofA's and how it might impact the bank's application speed, security or service levels.

Even so, Bessant said that 80 percent of the technology workloads "that we do will be in some sort of virtualized stack" by the end of 2019.

Public cloud turns service company into tech leader

Merrill Corp. is transforming its business, and the company, which provides virtual hosting spaces for sensitive corporate information such as merger and acquisition documents, is tapping Microsoft's Azure public cloud to do this. CTO Brad Smuland, who is leading the transition, says the cloud will make it possible for the service company to become a tech company.

Smuland is running about 1,700 servers in Azure and 4,500 servers in an on-premises data center, though he's porting more servers to Azure daily. Unlike peers who rushed to the cloud only to be burned by spiraling costs, Smuland says he's closely monitoring the cost of his Azure consumption. He uses a cloud cost management tool from Turbonomic that automatically shifts workloads from on-premises servers to Azure and vice versa, based on algorithms that determine which platform will cost less or perform better to complete a computing task.

Smuland says the shift has required Merrill, which employs 3,000 people across 36 locations worldwide, to re-engineer and re-architect IT systems, and re-skill for talent. He has had to hire and train up employees, including software engineers, cybersecurity engineers, product managers and user experience designers. These techies juggle on-premises and cloud infrastructure, oversee new cybersecurity models, and build native cloud applications with microservices in a DevOps environment. Some existing IT staff went "willingly," though Smuland says he had to nudge other employees to make the journey, underscoring how the migration is more cultural than functional.

"We went in with our eyes wide open, but it has taken more effort than I expected," Smuland explains. "It was really around the skills change, the culture change and the approach. That goes to the fabric of the people and how we operate and we've had quite a lot of work there."

Smuland's advice: While changing the IT culture and upskilling is critical, CIOs must work with strategic partners to succeed. "But those key strategic partnerships [Microsoft and Turbonomic] are critical to the success and the speed," he adds. "Without them, I wouldn't make it. All too often my fellow CIOs feel like they have to roll their own, develop it and have that authorship."

Public cloud keeps airline flying high

Looking to facilitate collaboration with business executives and automate software delivery, American Airlines found its answer in the cloud. The company is moving its website, mobile app and other digital services to IBM Cloud services as part of an architecture refresh and organizational shift to faster software development, according to Daniel Henry, vice president of customer technology. Henry says a key driver for choosing IBM was the technology giant's alignment with Cloud Foundry, an open source platform-as-a-service environment American is using to develop "cloud-native" applications.

"We want to build an application in a way that allows us to increase our velocity on adding features to the website and meeting the demand of our business," Henry remarks. "Creating our cloud-native apps within IBM is going to give us that opportunity."

Henry says the company is also leveraging IBM's "garage" methodology, which includes architectures, best practices for developing software using microservices, agile and DevOps. The idea is to enable American engineers to better collaborate with business executives and automate software delivery processes, ostensibly to boost the velocity of application development for employees and customers.

For American, the cloud is a trigger for reinventing how its IT team delivers software to the business. Notes Henry, "It doesn't require you to move to the cloud, but that's a big enough trigger for you to say, 'Maybe we need to re-evaluate how we go about our business to make us more efficient and collaborative.'"

Although American has partnered with IBM for years, particularly using the vendor's professional services, it didn't get them a foot in the door on cloud, Henry says. "We did an extensive PoC [proof-of-concept] and were very excited with the results. They had to earn it and they did."

Henry's advice: Just do it. While there is plenty of information on cloud computing to agonize over, CIOs should just take the plunge. And enterprises should also commit to reinventing themselves. "It can't be the status quo or you won't see the efficiencies," Henry says. "You must be committed to knowing the outcomes will be better."

Your family tree in a public cloud

The market for genomics data delivered as a service has become increasingly competitive of late. To achieve an edge, Ancestry.com has announced it's going "all-in" on AWS, where the company will host billions of historical records, including family trees, and customer DNA profiles, says Nat Natarajan, executive vice president of product and technology at Ancestry.

"We're all-in because we believe that to continue to grow our business we need to improve our speed of innovation," Natarajan asserts. In six months, Ancestry has moved over half of its data—8 petabytes—to AWS, a move he says will position Ancestry for greater international growth as more consumers seek information about their ancestors.

Consuming several AWS services, including platform-as-a-service, serverless computing and other tools, Ancestry has moved 6,000 of its 12,000 server instances to the cloud and 550 databases to AWS, with a goal to move a significant portion of its consumer products to AWS by the end of 2017.

"The driver for us was really speed," Natarajan tells CIO.com. "How quickly can we do certain things? We believe this was the fastest way for us to get there."

Natarajan's advice: Garner executive support, recognize that moving to the cloud is less about technology and more about operations, process and people, and appoint a dedicated leader to run point for the transition. "Thinking about the ops pieces, culture change and skillset change is crucial," Natarajan says.

"This was about creating global productivity teams that could collaborate and leverage our scale around the globe, do it effectively in a digital manner, and have the technology be the enabler rather than get in the way."

Mojgan Lefebvre
CIO, Liberty Mutual

Rethinking cloud ROI: Come for cost savings but stay for agility

An agility–based ROI approach is a much more effective way to look at the value of cloud computing, and thus to gain that value.

BY DAVID LINTHICUM | Companies are moving away from the traditional operations-oriented ROI model, and now look toward agility as the core metric to determine value. That's clear in a new report called "How Enterprises Are Calculating Cloud ROI—And Why Some Enterprises Are Moving Ahead Without It," from ISACA (Information Systems Audit and Control Association).

Although this is new to many enterprises and analysis firms, it's not new to me. I've written many blog posts since 2011 about the reasons to use business agility as a primary metric for calculating the real cloud ROI. It wasn't just me, of course: Clearly the cloud experts were talking about agility and ROI. But enterprises were still focused on ops costs and capital cost avoidance as the primary metric.

As I've said many times, enterprises come to the cloud for cost savings but stay for the agility. Finally, that slogan seems to be gaining wider acceptance in the Global 2000 enterprises.

We're going through the turning point right now. That's very exciting, considering the fact that the cloud is not that disruptive when it's just for ops saving.

There are good tools and models for figuring out the ROI of agility that cloud computing can bring. I've done a ton of these models, and I can tell you that this is a very different measurement of ROI. Patterns such as the vertical market, the size of the business, and the degree of innovation need to be understood before you can understand the ROI of agility.

But you can build reusable algorithms that you can take from domain to domain, and dial in historical metrics. For example, you could do so for companies similar to yours that have used cloud computing and have reached this level of ROI due to the agility that cloud has brought.

Still, it's difficult to find public case studies to prove ROI assumptions. So your ROI calculations are difficult to verify upfront. But you should proceed nonetheless. It's important to understand that this agility-based ROI approach is a much more effective way to look at the value of cloud computing technology.

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Role-based access control is fine—who needs attribute-based access control?

The benefits in business agility and security confidence that come from role-based access control are more than worth the effort of deployment.

BY JOE CAMPBELL | Reading through my past articles for CSOonline.com is like going down memory lane for me. They've been a series of myths based on the various challenges I hear when suggesting a particular approach to security. In some cases, these challenges are real and concrete and require a good working relationship where we find the right approach. But all too often the concerns shared with me are founded on rumors, misunderstandings or simply because we live in a culture resistant to change. Hopefully we can learn about these myths together and clear the air on the topics discussed.

RBAC and ABAC

Ahh... the myths of authentication and authorization. For instance, it's my opinion that implementing attribute-based access control (ABAC) is overkill and that role-based access control (RBAC) is fine. To be honest, for many, this is a subtle argument that is based on the traditional approach an organization has given their out-of-date toolsets. Basically, it's what they are used to. The good news is this is likely the easiest myth to bust.

The key words at play here are "access control." Now, I know this is a common concept for many of us, but let's quickly review the basics. There are two fundamental aspects of security, the yin and yang, as it were: authentication (AuthN) and authorization (AuthZ). Authentication is the process you go through whenever you sign into an application or log in to your computer. The entire purpose of authentication—including step-up authentication with multi-factor authentication (MFA)—is so that the security layer can then complete authorization. It's the authorization step that determines which buttons you can click, which accounts you can edit, or even if you have the ability to issue a statewide emergency alert.

Most applications today are secured with nothing more than RBAC. Active Directory is based on RBAC (SharePoint, SalesForce, etc... all RBAC). So, what exactly am I complaining about? Well it's not the applications' use of RBAC that is the issue, but rather the method we use to assign these roles to people in the first place. Are your administrators simply making arbitrary decisions to add someone to a role, or are those decisions made automatically based on that user's attributes? It's the attribute-driven approach to role management that we need to embrace.

Are your administrators simply making arbitrary decisions to add someone to a role, or are those decisions made automatically based on that user's attributes? It's the attribute-driven approach to role management that we need to embrace.

Imagine a new employee, Jane, has just joined the finance team. As an HR administrator, you make a call to the security team and ask that Jane be granted access to the payroll system. The security team places Jane in the finance-payroll AD group, and voila, Jane has access to the payroll system. Six months later, Jane is transferred to the facilities team and, as an HR administrator, you call the security team and ask them to add Jane to the facilities-admin role in AD. Now Jane has access to the facilities application… and the payroll system. After the auditors catch this and likely other avoidable mistakes, you and your colleagues begin looking for another job and wonder what you could have done better. Roles are like taxes: easy to dole out, and rarely taken back.

Of course, you know what the problem is—this isn't terribly complicated. The problem here is that people are being assigned roles based on manual processes and requests, not by automatic decisions driven by the user's attributes. I've seen it over and over again: with time, users accumulate roles, but never have outdated roles taken away. Or a user moves into a new job and waits forever to get the access they require. Both of these problems (and more) are solved when we automate this process through identity governance.

Imagine the same scenario above. Jane joins the company and in the HR system is placed into the Finance department. An attribute-driven provisioning process automatically executes and moves Jane into the proper AD role. Jane gets the access she needs instantly. When HR transfers Jane to the facilities team, the automation sees her department attribute change and instantly removes her from the finance group and adds her to the facilities AD group. There is no impact on the business as Jane waits for her access to change, and there is no security exposure to the company with users who are over-provisioned.

This is just the tip of the security iceberg! Here is another great example of attribute-driven access control. Imagine functions within an application that a user can only execute if they have passed the requirements of the training system. Fetching someone's training status via a web API or quick connection to a database is a rudimentary process that can factor into the security decisions that your governance platform makes. This is attribute-driven security at its finest.

I can imagine many folks won't believe that I run into resistance when I talk about the benefits of attribute-based access control. But remember, the resistance in this case doesn't necessarily come from a misunderstanding of the technology, but rather resistance to change and the concern that doing something like this would require many years and even more dollars. The truth is, modern identity platforms are ready to do this type of stuff out-of-the-box.

Even if you were to encounter friction in the deployment, the benefits in business agility and security confidence are more than worth the effort.

What the storage industry's inevitable transition to the cloud means for your business

Incorporating the cloud model into a storage strategy helps IT meet its overarching goals. This column spells out how and why, as well as what to expect from the industry for the rest of this year.

BY PAUL TIEN | In late 2017, Microsoft made a relatively unheralded acquisition of a company named Avere Systems. Avere's raison d'etre is enterprise storage. In their own words, "Avere Systems was created by file systems experts determined to reinvent storage by changing the way enterprises thought about and bought storage resources." Ostensibly, Microsoft purchased this firm to add cloud-based storage capabilities to its ever-expanding portfolio.

From my perspective, I cannot think of a more appropriate and indicative event to kick off what will surely be a transformative time for the storage industry. All across this market segment, new startups are gaining market share, while more-traditional storage OEMs are looking for new ways (M&A or otherwise) to augment their product functionality. Like every other aspect of IT, the cloud era is disrupting the storage market and changing the way IT must address its needs. Together, you and I are going to follow this transition and discuss how it will impact you—the IT talent responsible for storage resources within your organization.

Why should we concern ourselves with this shift? Despite not having disclosed terms of the deal, the fact that a behemoth like Microsoft is investing in this transition should raise a significant red flag for everyone in this industry. Not to mention, it is hardly the only example of this movement. In the interests of full disclosure, it should be noted that I founded and run a storage vendor headed down this path (Morro Data), but then again, we're hardly the only ones on the block. Companies like Nasuni, Pazura and Avere are all examples of this trend.

Let's start at the beginning—what are the market realities that are driving this shift, and what benefits can businesses expect to reap as a result?

Data, data and more data

In lockstep with the rise of the cloud era, Big Data and the analytics that mine it for value headline a massive increase in the volume of data which businesses must store, manage and protect. The only thing Clive Humby—the man widely attributed with saying "data is the new oil"—got wrong with his 2006 analogy is that we are making more and more data with no end in sight.

Like every other aspect of IT, the cloud era is disrupting the storage market and changing the way IT must address its needs.

IT storage folks realize that with this scale and value, the cloud model must be leveraged to cope with this trend.

Accessibility demands agility

To reap value from this data, there are increasing demands for more agile IT infrastructure capable of delivering to the organization the insights and information from IT's storage assets. That means cloud access and cloud storage.

Protect your most valuable assets

If we're going to build digital businesses leveraging data as our primary asset, we're going to need to do a better job in protecting our most valuable asset. This means comprehensive defenses against hackers and natural disasters alike. This cannot be achieved without leveraging the cloud in some manner.

Cloud-based storage enables IT to address these issues in ways on-premise storage simply cannot. Some of these benefits include:

- **Capacity/scalability.** The cloud essentially gives IT access to infinite storage
- **Simplified infrastructure.** Access from anywhere with Internet access? That sure makes it a lot easier to connect users with the information they need.
- **Security/disaster recovery.** Whether it's thwarting ransomware, another layer in an existing protection scheme, or rebuilding after natural disasters like fire, etc., cloud-based recovery is superior to on-premise storage in almost every way.

Now if all of this is true, you may ask "What's standing in the way of IT ditching on-premise storage altogether?" There is a simple, one-word answer: performance. Since time immemorial, this has been the one attribute to trump all others when it comes to IT. As it stands, applications run faster and better when they have immediate real-time access to data—that cannot be denied and is the reason that, in the near-to-mid-term, on-premise storage isn't going anywhere.

So how to reconcile these conflicts? As always, the real answer will be specific to your own organization's unique needs. However, there is a high likelihood that some combination of compute resources and storage resources will be deployed in a hybrid scheme depending on where potential performance bottlenecks may exist. I look forward to a great deal of conversation on these approaches.

Serverless: The future of cloud computing?

While the cloud lends companies more agility, *New York Times* CTO Nick Rockwell says event-triggered computing cuts cost and enables more efficient application development. Welcome to the serverless era.

BY CLINT BOULTON | The cloud has been a boon for many companies, enabling CIOs to turn off servers or even shutter data centers. CIOs rent processing power, storage and other tools from a mix of vendors in a quickly growing market. But a small contingent of IT leaders is looking to a more efficient way to rent computing horsepower. Rather than take on the often onerous obligations of designing and managing cloud architecture, they are going "serverless."

With serverless computing, cloud instances are no longer allocated, only to sit idle until called upon to fuel applications and other functions. Rather, resources are provisioned only when a specific event occurs. A textbook example of event-based computing is the internet of things (IoT), with sensor-based devices reacting to triggers on the fly. And when a user accesses a mobile app from his or her smartphone—an event—virtual machines in the cloud retrieve and serve up the information.

New York Times CTO Nick Rockwell is convinced that serverless, also known as "function as a service" (FaaS), represents the next leg in the cloud journey, enabling developers to focus on writing code rather than worrying about the servers it will run on. "Serverless makes products both reliable and scalable," Rockwell tells CIO.com. "In the long term, economically, it's going to be a far better, far cheaper, far more efficient way to go."

Juggling a cloud, or two, or three

It's a forward-looking position, considering Rockwell is still migrating the *Times* to traditional cloud services. When Rockwell joined from Condé Nast in 2015, the *Times* was connecting its computing infrastructure to Amazon Web Services' Virtual Private Cloud, which allows enterprises to connect their data center to a virtual private cloud within AWS. And it lacked a complete content delivery network (CDN) to store content at the "edge," closer to consumers' computing devices.

Today, the *Times* is largely split between two clouds: AWS runs most of the *Times*' corporate applications and ecommerce platform, while Google Cloud Platform (GCP) powers consumer-facing applications, including NYTimes.com, the *Times* mobile app and the *Times* crossword puzzle. The *Times* also has a cloud CDN courtesy of Fastly, which ensures that consumers can access *Times* websites and apps by keeping an updated copy of those services—a hedge against system outages.

The cloud migrations have helped, but managing them remains a chore. Rockwell's infrastructure teams must still figure out how

Due to the waste in idle cloud instances, New York Times CTO Rockwell says serverless can potentially yield 5x to 10x in efficiency gains.

many AWS and GCP instances they need, how large those instances should be, and whether instances will require additional inputs, outputs, or memory. They then need to configure each instance, and patch and install software on the operating systems. Plus, they must carefully manage dependencies associated with each application, and figure out how each part of an app scales.

"The resource utilization and optimization falls to the customer," says Rockwell, echoing a lament voiced by many CIOs over the years. "If we rent 50 instances and if one is fully loaded and the other 49 are idle, that's our problem."

The potential of serverless

Hence Rockwell's brewing interest in serverless, which renders moot the problem of idle instances. Instead, when a pre-defined event occurs, code written specifically to execute a function is triggered, and the serverless platform performs the task. Customers don't need to tell the cloud vendor how many times these functions will be triggered, and they pay a fraction of a penny every time a function is executed.

Due to the waste in idle cloud instances, Rockwell says serverless can potentially yield 5x to 10x in efficiency gains. "Given a healthy competitive dynamic, a lot of those savings will come back to users," he notes.

Whether serverless becomes the Next Big Thing in computing remains to be seen. Gartner says that more than 90 percent of serverless deployments will occur outside IT departments' infrastructure and operations groups. And vendors are seeking to capitalize on the interest of brands such as the *Times* and General Electric, whose CTO Chris Drumgoole has also expressed his enthusiasm for the serverless model.

AWS launched AWS Lamba as its first commercial serverless platform in 2014. Comparable offerings from Microsoft and Google should bolster competition, creating more choice for customers. Rockwell is currently running the *Times* crossword puzzle and other apps using serverless in Google's App Engine, though he plans to run more apps in this fashion over time.

Rockwell isn't committing to any one serverless platform, but he favors Google's engineering prowess, combined with its container management capabilities and platform-as-a-service (PaaS) products.

Most cloud platforms make software agnostic, enabling developers to make decisions on how to design and solve problems correctly. But Google's approach is "opinionated," essentially picking architecture design options, such as programming languages, and sticking with them. Moreover, it's trying to build an ecosystem of opinionated products designed to work together, Rockwell points out. While more choice has, as a rule, been a developer's preference, fewer choices actually helps minimize the cost associated with planning, designing and building an architecture from scratch.

"Google has the best serverless story right now," says Rockwell. "We've been a little bit on the bleeding edge with Google, but so far it's worked out well."

How to shift cloud metrics to measuring agility

Cloud metrics have long centered around operational cost savings, but that's not where the actual value of the cloud is.

BY DAVID LINTHICUM | It's a constantly evolving science, the ability to understand the exact business benefit of cloud computing. A few years ago, the benefit was largely conceived as "capex vs. opex," the ability to shift to an on-demand consumption model and thus avoid the capital expenses of hardware and software.

Sometimes that works, sometimes not. When considering tax advantages, the existing hardware and software sunk costs, and the prices of cloud services, the cost advantages of shifting from capital expenses to operational ones are hit or miss. It really depends on what type of business you're running, and your past IT strategies and spending patterns.

The real benefit of cloud computing is agility. No longer do you have to wait months to get hardware and software placed in some remote datacenter. Today, you can go to the Amazon Web Services or Microsoft Azure IaaS console and build or remove virtual machine instances as you need—or do not need—them. This is the real game-changer.

On average, it took enterprises with cloud deployments about five years to understand this benefit. As I've said before, they come to cloud for the operational cost savings but stay for the agility.

The problem is that agility is almost impossible to measure—or even explain. I've tried to define cloud-based business agility and measurement methods in books, speaking events, and articles at *InfoWorld*, and I still get blank looks.

It comes down to the metrics you use to measure the value of agility, and those depend on the enterprise's type of business and industry. Still, here's some guidance on creating metrics for your own enterprise:

Focus on what improves with cloud computing. In other words, define the as-is state and the planned to-be state with cloud, as far as agility is concerned. For example, it once took three months to get an application into production. Using an IaaS provider, the goal is between three hours and three days. What does that mean to your enterprise, in terms of value?

Note the complex relationships between cloud and noncloud systems. It's not that easy to do agility metrics, considering that traditional and cloud-based systems are typically coupled. Although it takes only days versus months to place an inventory system in the cloud, the system still depends on the on-premises sales order system that takes months to expand or change platforms. These limitations need to be noted, and taken into account.

Complex and scary stuff? Not really. There is good stuff coming as you move into cloud, and it will only accelerate the value it creates. The metrics will become less important as the results become more and more obvious.

It once took three months to get an application into production. Using an IaaS provider, the goal is between three hours and three days. What does that mean to your enterprise, in terms of value?

Cloud lockin is here to stay, so learn to love it

To get the benefits of the cloud means tapping into proprietary ecosystems. But there is one way to lessen the impact: change agility.

BY MATT ASAY | With all the gleeful finger-pointing over which cloud provider is the least (or most) generous with open source code, it's worth remembering that all cloud providers essentially fail when it comes to open source. Why? Because the very nature of their platforms means that their best code remains closed even when openly licensed.

All of which makes your favorite cloud "probably the most proprietary software in the history of software," as Dremio CMO (and former MongoDB exec) Kelly Stirman says. What to do?

You can't check out of the cloud any time you like

No one likes lockin, but if you take a quick glance around the industry you'll find that most every category is dominated by a vendor or two that exercises outsized lockin. What started out at Microsoft with its Windows and Office hegemonies moved to Apple's iPhone, and at the enterprise infrastructure level we're currently cozying up to Amazon Web Services, Microsoft Azure, and Google Cloud.

"Not to worry!" you say. "After all, these companies L-O-V-E open source!" Well, they do, but what does that actually mean in the cloud context?

For example, in response to Google's Miles Ward extolling the openness of Google Cloud Platform, Cloud Guru co-founder Ant Stanley asked an uncomfortable question: "Can we talk about Big Query and Spanner customers then? Great tech platforms but huge lockin." Ward, nonplussed, responded, "Apache Drill and ANSI SQL. Next?"

In so doing, Ward sidestepped the gaping void between platforms like GCP and the raw technologies that comprise them. Apache Drill isn't a real substitute for Google's Spanner. Sure, at some level, it might replicate some of the features or functions, but to derive value from Spanner you need, well, Spanner—and all the infrastructure behind it.

Again, Ward tried to give the open source response: ":| split writes to newdb. SELECT * at olddb. INSERT * at newdb. Repeat, move reads to new database. I get there are quirks, but there's no lock." Yet, again, it doesn't work, because, as he ultimately admits, the only real way to get the equivalent to Spanner is to "just lay a few thousand miles of fiber, snag a few atomic clocks, get GPS sorted, and, yeah, you're cool."

In other words, on-premises, server-based lockin forced you to buy new cloud software to get out of lockin. In the cloud world, you have to buy a new datacenter and all the network infrastructure to go with it. The cloud, in short, has perfected lockin, and open source doesn't really help.

Worse, even if you have the code and the datacenter, it's still

If a developer can significantly increase her productivity by running AWS Lambda or other proprietary services on a particular cloud, she's going to do it, even if it means tying herself long–term to that cloud platform.

not enough, because you'd need the experience running that code as Google, AWS, or Microsoft would. As Expedia's vice president of technology, Subbu Allamaraju, highlights, open source absent a cloud-scale feedback loop tends to fail over time. But to get Spanner to run like Spanner, you need to not just have the resources of Google, you actually need to be Google.

Talk about lockin.

How I learned to stop worrying and love the cloud lockin bomb

One obvious response is "Who cares?" Given how fast enterprises are shoveling cash into the cloud, this also seems to be the popular response. The reason, as with the old world of proprietary software lockin, is that the benefits largely outweigh the risks. If a developer can significantly increase her productivity by running AWS Lambda or other proprietary services on a particular cloud, she's going to do it, even if it means tying herself long-term to that cloud platform.

As for whether this is a wise course of action, Allamaraju offers an emphatic yes: "You can't take advantage of all the new capabilities to innovate for your business while staying agnostic to the platform." Enterprise IT innovation is being driven by the clouds, and the more of that innovation you imbibe, the more you dig deeper into lockin to this or that cloud. There's simply no way around it (absent buying your own datacenter, but even that won't give you Google Spanner, AWS Lambda, etc.).

You can mitigate lockin by exercising what Allamaraju dubs "change agility." This isn't a way to avoid software licensed in any particular way, but rather to ensure developers can bounce among cloud services. He says, "Embrace techniques like service orientation, asynchronous and decoupled communication patterns, micro-architectures, experimentation, failing fast, tolerance for mistakes, chaos engineering, constant feedback, and continuous learning." In other words, you embrace lockin but evade it (somewhat) by flitting among services.

A perfect solution to lockin? Nope. But it may be the best we've got. It's not that open source is irrelevant in the cloud context, but rather that it's not a panacea.