Cloud Adoption & Risk Report 2018

Exec Summary

Cloud services bring a momentous opportunity to accelerate business through their ability to quickly scale, allow us to be agile with our resources, and provide new opportunities for collaboration. As we all take advantage of the cloud, there's one thing we can't forget – our data. With SaaS, our entire contribution to the cloud is through data and access to it. With IaaS, we have to manage the applications and operating systems that hold our data, creating another layer of risk in how those are configured and protected.

Through analysis of billions of anonymized cloud events, we can bring forth the current state of how the cloud is being used, and where our risk lies. Consider that nearly a quarter of our data in the cloud can be categorized as sensitive to the organization, putting us at risk if stolen or leaked. Couple that with the fact that sharing sensitive data in the cloud has increased 53% year-over-year, and we are setting ourselves up for failure if we're unable to see and stop that activity.

IaaS providers like AWS are disrupting our IT model, making us extraordinarily agile and taking scalability to its maximum state. As you build out your cloud infrastructure, keep your eyes on the details. Most organizations, as we've found here, have at least 14 misconfigured IaaS instances running at any given time, resulting in an average of 2,000+ misconfiguration incidents per month. Take even a small percentage of AWS S3 storage buckets – just 5.5% that are open and readable to the public, and you can see where this trend can introduce immediate and grand-scale risk of data loss. We need to get the basics right, or face losing the opportunity for business acceleration before the gas pedal can hit the floor.

In parallel to your control over data in the cloud is the control you have over who can access it. The majority of threats to data in the cloud result from compromised accounts, insider threats, and the like. 80% of organizations are going to experience at least 1 comprised account threat in the cloud this month. Not to mention, 92% of organizations currently have stolen cloud credentials for sale on the Dark Web. This isn't new, but we need to control our access, or this path gets even darker.

Fortunately, the cloud is still bringing more opportunities than threats. Most organizations use approximately 1,935 cloud services, up 15% year-over-year. Unfortunately, most think they only use 30.

We hope this data helps draw your attention to the highest areas of risk that you're facing today in the cloud. Read on to dive deeper into the data.

Key Findings

- 21% of all files in the cloud contain sensitive data – up 17% over the past two years.
- The amount of files shared in the cloud with sensitive data has increased 53% YoY.

- Sharing sensitive data with an open, public link has increased by 23% over the past two years.
- 48% of all files in the cloud are eventually shared.
- 22% of cloud users share files externally, up 21% YoY.
- 94% of IaaS use is AWS, but 78% of organizations using IaaS have both AWS and Azure running.
- Enterprise organizations have an average of 14 misconfigured IaaS instances running at one time, resulting in over an average of 2,200 individual misconfiguration incidents per month.
- 5.5% of AWS S3 buckets have world read permissions, making them open to the public.
- The average organization generates over 3.2 billion events per month in the cloud, of which 3,217 are anomalous, and 31.3 are actual threat events.
- Threat events in the cloud, i.e. compromised account, privileged user, or insider threat have increased 27.7% YoY.
- 80% of all organizations experience at least 1 compromised account threat per month.
- 92% of all organizations have stolen cloud credentials for sale on the Dark Web.
- Threats in Office 365 have grown by 63% in the last two years
- The average organization uses 1,935 unique cloud services, an increase of 15% from last year. Most organizations think they use about 30.

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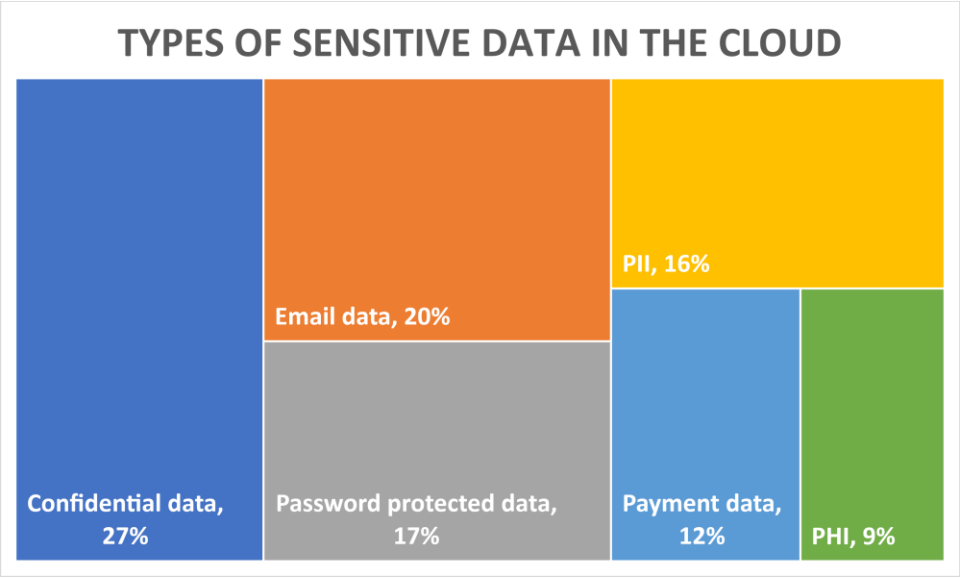
Breaking Down Sources of Cloud Data Risk

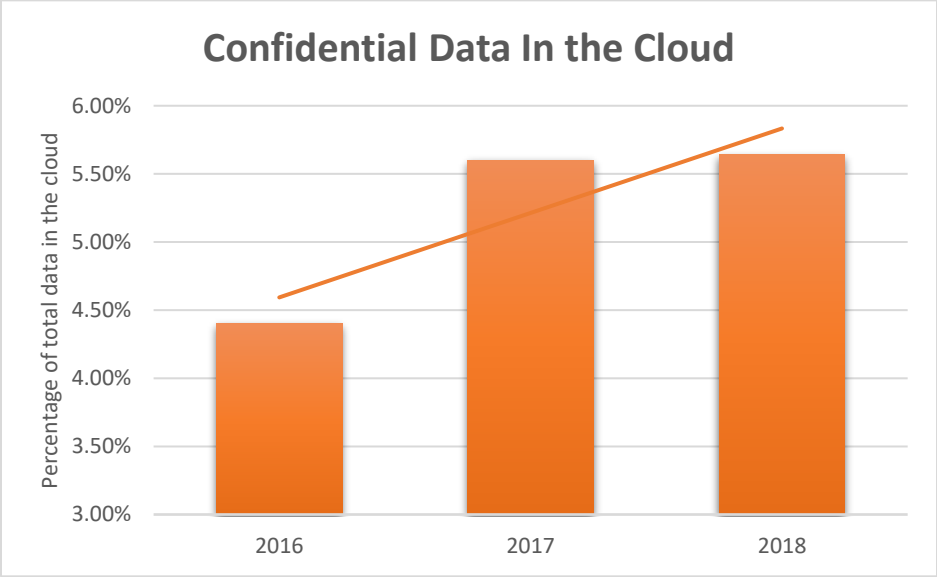
The use of cloud services is ubiquitous – we've seen this rise over the past decade to the point where many of our organizations couldn't function today *without* the cloud. Critical to this growth is the understanding that data, and most importantly sensitive data, now lives in the cloud and must be protected. In our last survey on cloud adoption in mid-2018, we found that 83% of organizations worldwide store sensitive data in the cloud[1]. In our research here, we uncovered that 21% of all files in the cloud contain sensitive data, a proportion which increased 17% over the past two years.

So not only do most organizations place trust in their public cloud service providers to store their sensitive data, but nearly a quarter of all data in the cloud meets the need for stringent protection.

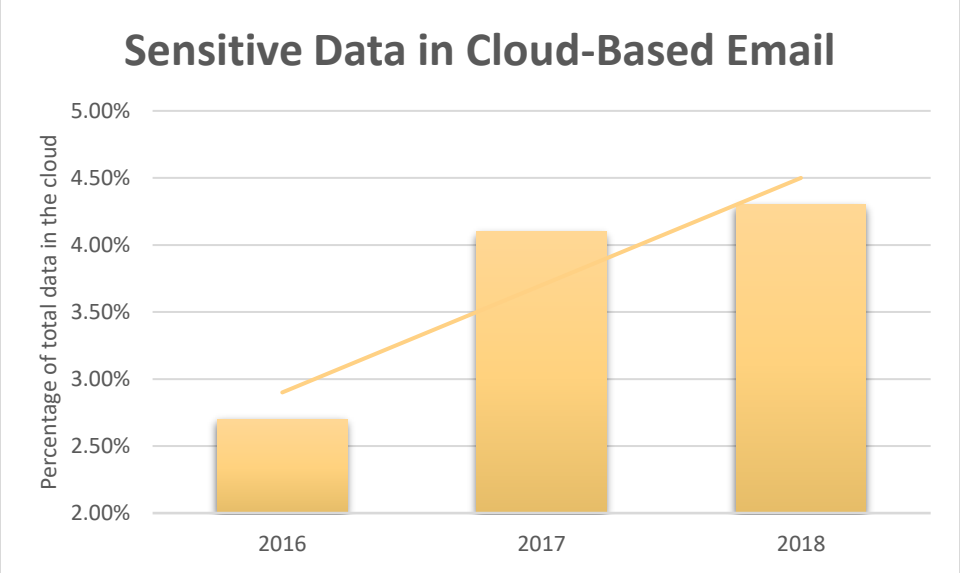
Let's get specific and look at the categories we're calling sensitive data here:



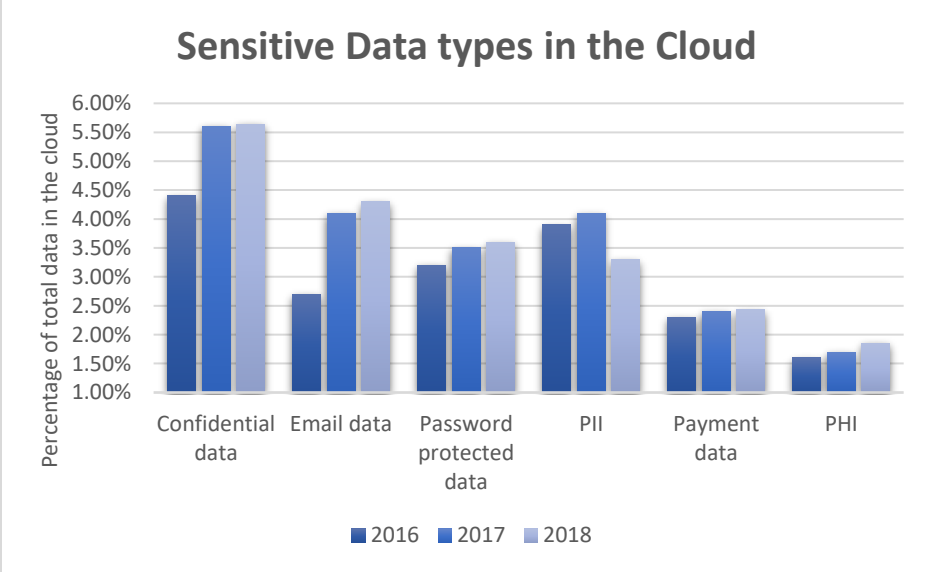
Not surprisingly, the classification of "confidential data" takes the largest share of all sensitive data in the cloud at 27%. More interesting is the increase in trust – the total amount of confidential data stored in the cloud rose 28% over the past two years. During that time, we've seen services like Box and Microsoft Office 365 rise in popularity concurrently, carrying with them the shift of corporate data to the cloud.



Specifically, with the rise in popularity of Office 365, we see an even larger increase in sensitive data flowing through cloud-based email, primarily Exchange Online. Today, 20% of all sensitive data in the cloud runs through email services like Exchange Online in Office 365, a volume which has increased 59% in the past two years. Email remains one of the easiest methods to exfiltrate data, and moving it to the cloud removes visibility for IT teams that could once monitor SMTP traffic on their own servers. We'll see a few more trends related to data flowing through email in the next section – but for now the growth and inherent loss of visibility remain significant on their own.



Let's look at the rest of the sensitive data types we evaluated for additional insight:



The first insight we can take from the remaining data types is a sharp decline of -20% YoY in Personally Identifiable Information (PII) in the cloud, which could be a result of several trends. For one, cloud use in corporate environments is increasingly for business, as opposed to personal use. Many cloud services, such as Dropbox, came into the enterprise as consumer services and quickly transitioned to business use cases as their utility became apparent. Another cause could be end-user diligence, keeping PII out of the cloud as a result of security awareness. We may need to give our end-users the benefit of the doubt on this one.

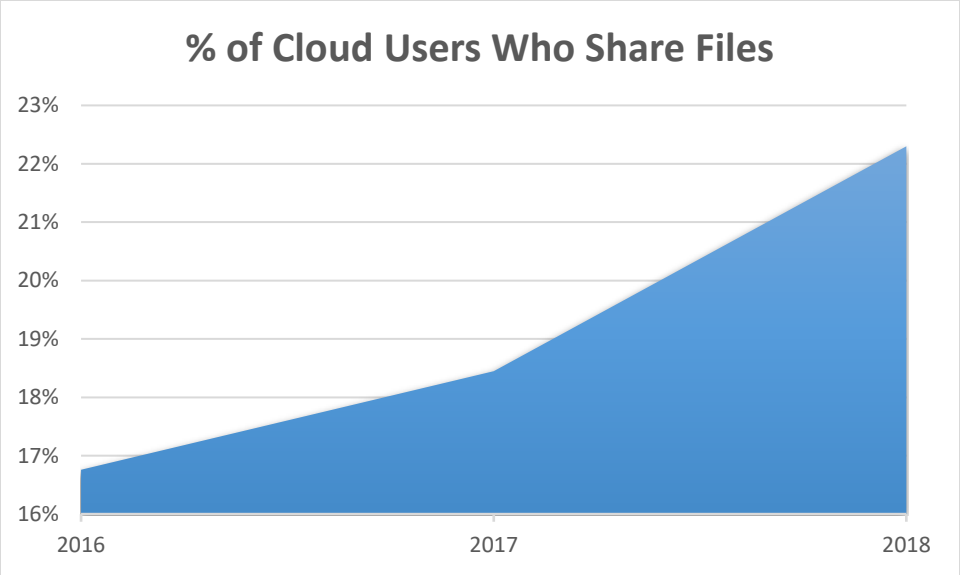
Next, we see gradual increases in personal healthcare information (PHI) and password protected data, at 16% and 13% respectively over the past two years. While healthcare information accounts for only 9% of all sensitive data in the cloud, it is encouraging to see trust increase for this highly regulated industry. Lastly, payment data remains stable at approximately 12% of all sensitive data in the cloud on an annual basis.

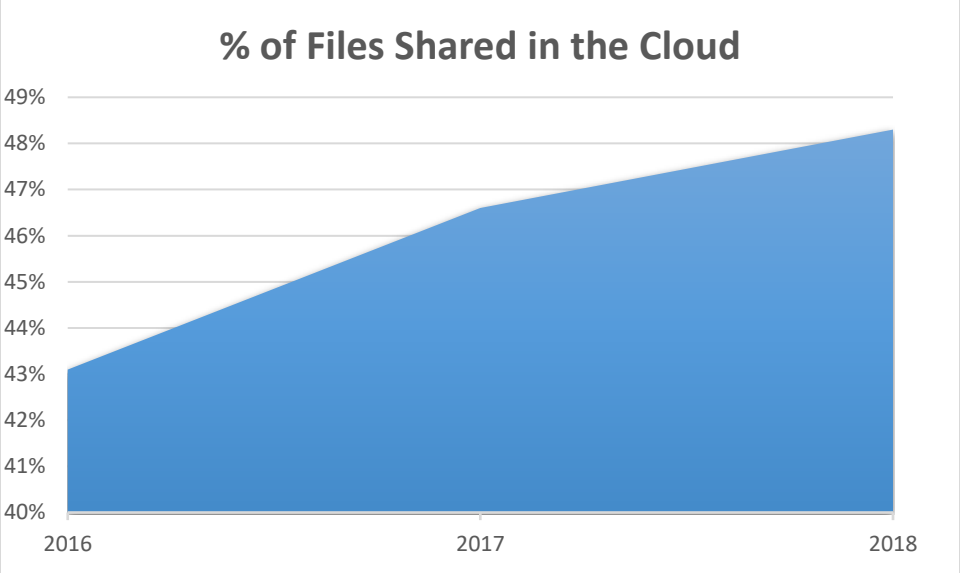
What we take away from this breakdown is the increase in trusting broad categories of sensitive information to the cloud year after year. As the proportions of our data shift from servers we own to services we use, so does the risk. It's critical that we understand what goes into the cloud, so we can protect it with that growing proportion of risk in mind.

When Sharing isn't Caring – Cloud Collaboration as a Blessing and a Curse

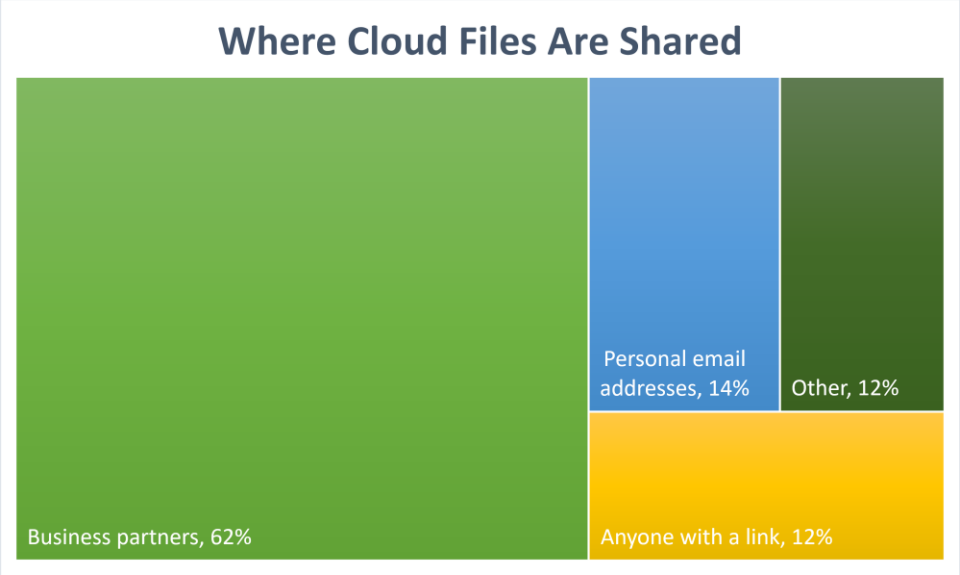
Your data lives in the cloud, and as we learned, at least a quarter of it requires protection to limit your risk. However, the risk of exposure is counter to one of the key tenets of many cloud services – collaboration. Cloud storage services like Box, or productivity suites like Office 365 are used to increase the fluidity of collaboration. But of course, collaboration means sharing, and that sharing can expose your sensitive data.

Looking at global cloud use today, we see that 22% of cloud users actively share files in the cloud. They are power users however, because 48% of all files in the cloud are eventually shared. Both are on the rise. The quantity of active sharing cloud users is up 33% over the past two years, and total files shared up 12% over the same period.





If the 48% of files being shared were limited to party invites and pet photos we'd have a much easier time managing our cloud risk. Nonetheless there are two areas that we need to draw our attention to here: what kind of data is being shared, and where it's going. Let's start with where:

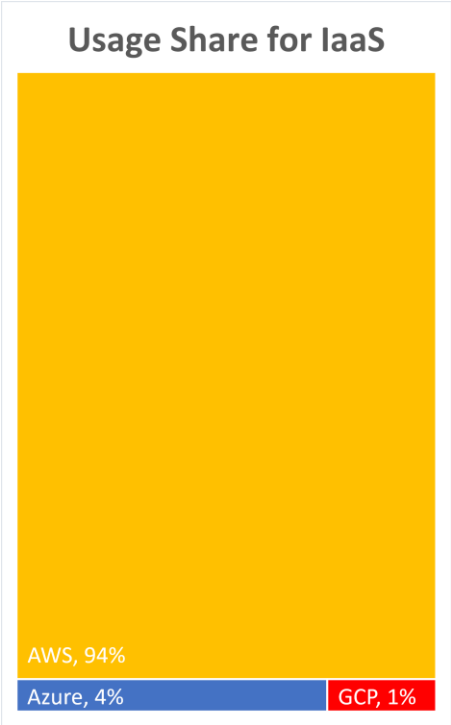


Two categories immediately raise red flags: personal email addresses, and anyone with a link. Anyone using a corporate cloud account and sending data to a personal email address is invariably exposing that data in the open, forever out of complete purview of corporate IT. Even worse however is data shared to anyone with an open link, potentially leading to uncontrollable sprawl of your data. Once you have a file in a service like Box or OneDrive set to open access by "anyone with a link", that is essentially like running a web hosting service for the world, letting anyone hit that link and see your data.

Now of course the heart of the risk lies in the content of what's being shared. Currently 8% of all files shared in the cloud contain sensitive data. Over the past two years, files shared with sensitive data to "anyone with a link" have risen 23%, files sent to a personal email address are up by 12%, and those shared with business partners up 10%. It's imperative to understand how sensitive data is being shared to gain control over risk-inducing activities.

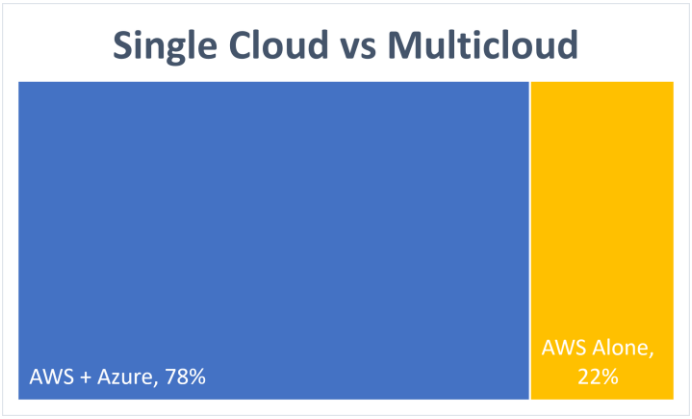
You Can Bet Your IaaS is Misconfigured – So Don't Forget the Basics

Data doesn't just live in SaaS applications like Salesforce or Office 365. Amazon Web Services (AWS) has been not-so-quietly driving the transformation of server and data center infrastructure into to cloud-based services, classified as Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS – think serverless computing like AWS Lambda). Today, 65% of organizations around the world use some form of IaaS, 52% for PaaS[1].



The draw is undeniable. Servers are expensive to buy and maintain, not to mention slow to roll out. IaaS and PaaS erase those problems, giving IT teams the option to spin up VMs, containers, or functions-as-a-service at will. The ability to scale and boost in agility are far too compelling to ignore.

Naturally, this isn't just the AWS show. Microsoft has Azure, and Google their Cloud Platform (GCP), among others. The market dynamic is interesting here on two fronts, one of which especially has implications for IT strategy. First, when we look at IaaS usage worldwide, AWS absolutely leads the pack with 94% of all access events, leaving 3.7% for Azure and 1.3% for GCP. However, 78% of organizations are currently using both AWS and Azure together, either as an official multi-cloud strategy or by shadow IT. So, AWS is used the most, but in the vast majority of organizations, employees have Azure accounts too. The implication here comes down to visibility and management. When your infrastructure runs with two or more providers, much like using multiple SaaS apps, do you have consistency in your security across them?



Once you've solved management, auditing the actual IaaS or PaaS instances you have running is critical. In our research we found that on average, enterprise-sized organizations using IaaS have 14 misconfigured services running at any given time, resulting in an average of over 2,200 misconfiguration incidents per month. Take a second to think about your environment. To help jog your memory, here are the top 10 ways we see IaaS misconfigured, using AWS specifically in this data set:

1. EBS data encryption is not turned on.
2. There's unrestricted outbound access.
3. Access to resources is not provisioned using IAM roles.
4. EC2 security group port is misconfigured.
5. EC2 security group inbound access is misconfigured.
6. Unencrypted AMI discovered.
7. Unused security groups discovered.
8. VPC Flow logs are disabled.

9. Multi-factor authentication is not enabled for IAM users.
10. S3 bucket encryption is not turned on.

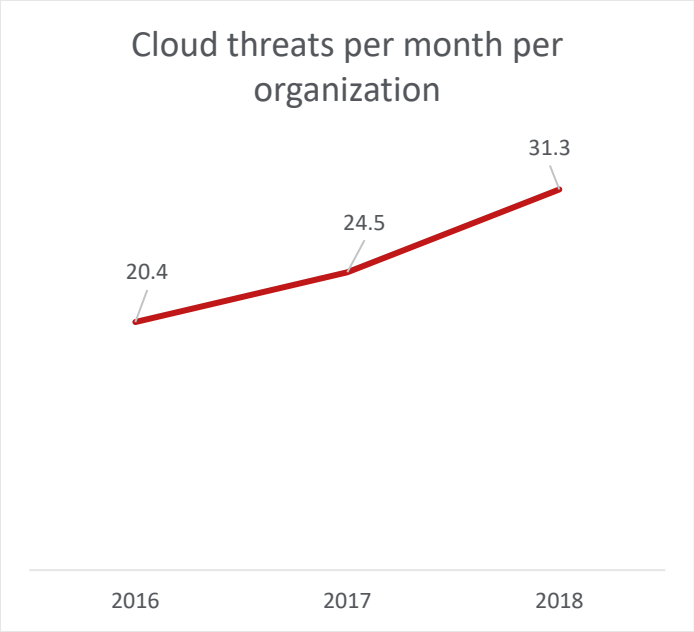
Misconfiguration "sounds" bad on its own, but why should we really care? Again, it comes down to the data. When organizations we work with turn on Data Loss Prevention (DLP), they see an average of 1,527 DLP incidents in their IaaS storage per month. That means they detected sensitive data that either shouldn't be there, or requires additional monitoring and security controls. All told, 27% of organizations using IaaS have experienced data theft from their cloud infrastructure[1].

There are a few more common misconfigurations we see that didn't make the list but have serious implications for data loss and risk to your IaaS environment. First, looking at our view of the AWS universe, we can see that 5.5% of S3 storage buckets have "world read" permissions, meaning they are open to the public. Likely because of the news over the past few years with so many public incidents of data exposure in open S3 buckets, this percentage remains somewhat low as AWS customers have been cleaning up their settings.

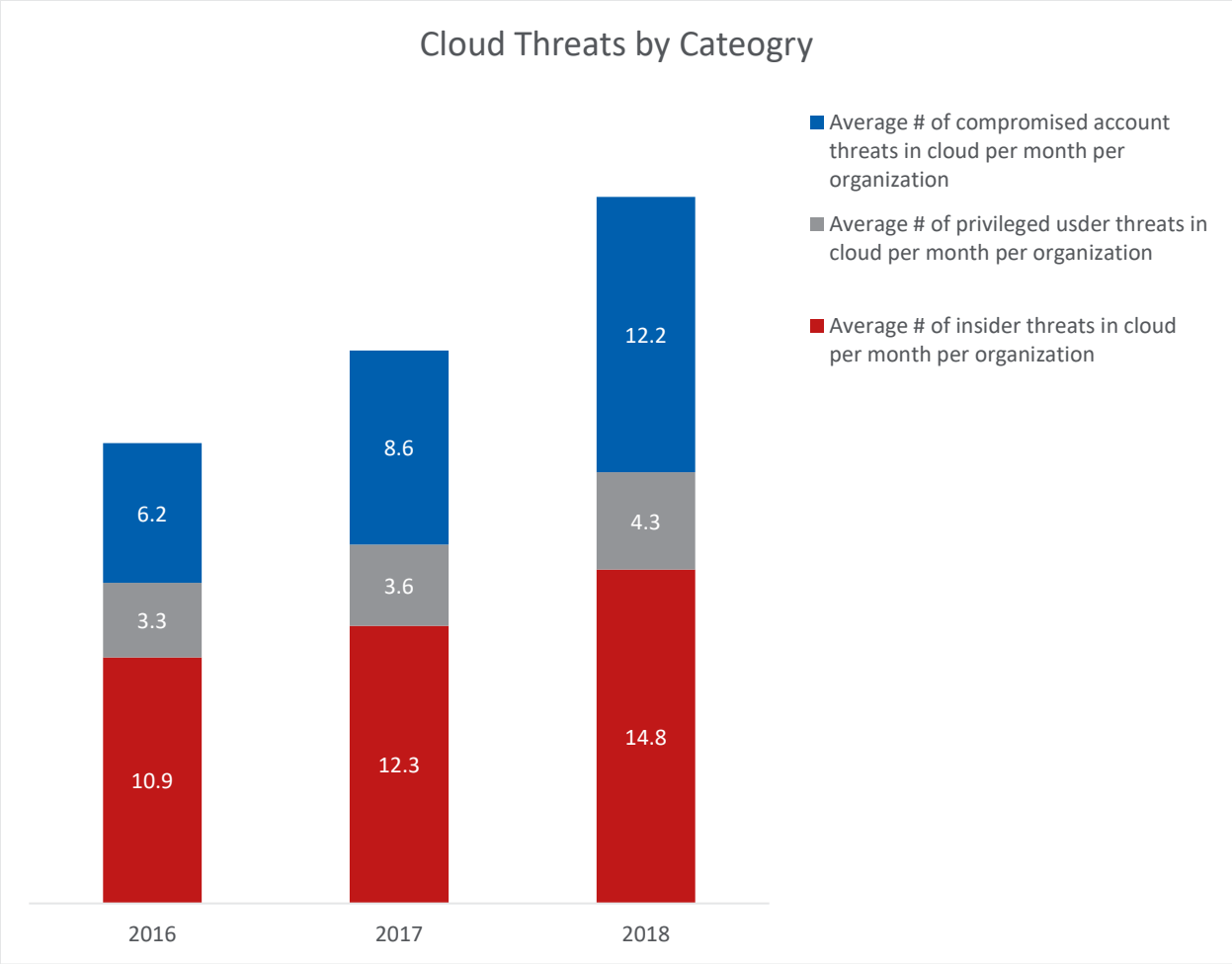
Lastly, we have a peculiar incident trend that is relatively rare, but its implications make it worth covering. On average, we see that enterprise organizations have at least 1 AWS S3 bucket set with "open write" permissions, giving anyone in the world access to inject their own data into your environment. Not only that, but most organizations access 25 of these "open write" buckets from their corporate network, most often through a third party. Open write is like a free-for-all to anyone trying compromise your organization. Want to erase your records? Great. Want to inject malicious code? Even better. This one is an open book (literally), so make it a priority to check your settings and shut it down.

Internal and External Threats

Security incidents are no longer isolated to PCs and applications on the network, owed primarily to the scale of corporate data stored in the cloud today as well as the sheer number of events taking place in the cloud. The average organization experiences 31.3 cloud-related security incidents each month, a 27.7% increase over same period last year. Broken down by category, these include insider threats (both accidental and malicious), privileged user threats, and threats arising from potentially compromised accounts.



We continue to see steady growth in cloud services both in terms of how many new services are being sanctioned by IT departments as well as the number of users being provisioned to use these services. Given the overall trend towards migrating on-premises IT resources to the cloud, a rise in security threats shouldn’t be surprising.



Compromised Accounts

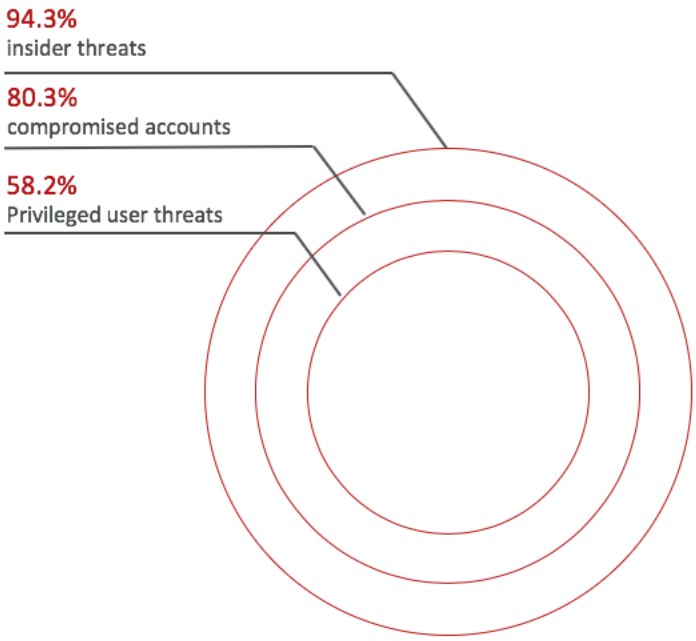
On average, organizations experience 12.2 incidents each month in which an unauthorized third-party exploits stolen account credentials to gain access to corporate data stored in a cloud service. These incidents affect 80.3% of organizations at least once a month. Additionally, 92% of companies have cloud credentials for sale on the Dark Web. This sounds like a losing battle, but many business-critical cloud services support multifactor authentication which can help reduce your risk of compromised accounts being used for nefarious purposes.

Insider Threats

The average organization experiences 14.8 insider threat incidents each month, and 94.3% of organizations experience at least one per month on average. Insider threats include behaviors that unintentionally expose an organization to risk, such as mistakenly sharing a spreadsheet with employee Social Security numbers externally. They also include malicious activity, such as a salesperson downloading their full contact list before leaving to join a competitor.

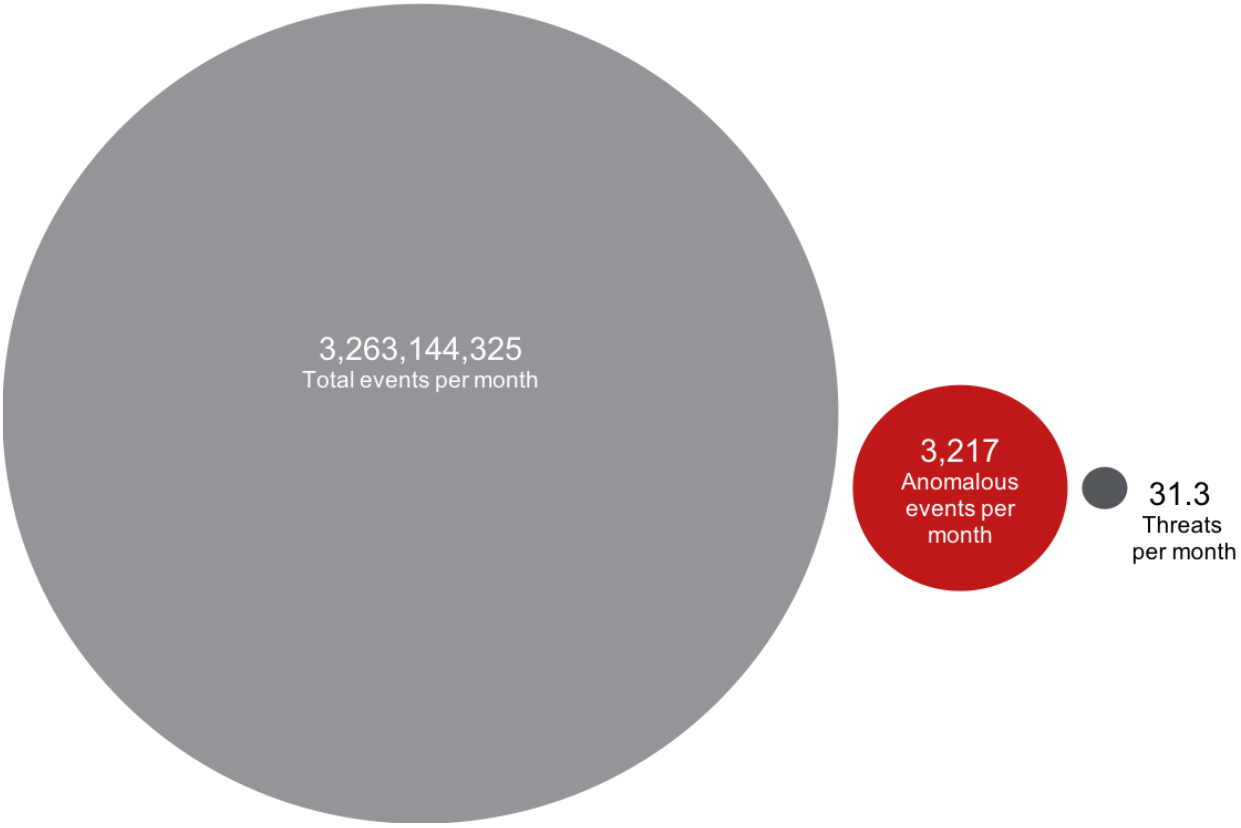
Privileged User Threats

Privileged user threats occur monthly at 58.2% of organizations, with the average company experiencing 4.3 each month. These threats can take different forms, ranging from an administrator accessing data in an executive's account to modifying security settings in a way that unintentionally weakens security. While not as common as insider threats associated with regular users, the high level of application permissions for privileged users can make these threats especially damaging.



Cloud Threat Funnel

As the number of cloud services and cloud users grown, so has the amount of cloud activity. The average organization today generates more than 3.2 billion unique transactions in cloud services each month (such as user login, upload file, edit document, and so forth). With this volume of data, it would be impossible to manually search through an audit trail of user activity to identify potential threats. In response, organizations are investing in user and entity behavior analytics (UEBA) tools, which use machine learning to identify anomalous events against the background noise of everyday activity.



Cloud Usage Trends

We see more cloud services launch every week. Not surprisingly, the number of different cloud services in use at enterprises has grown in lockstep with increasing number of cloud services in the market.

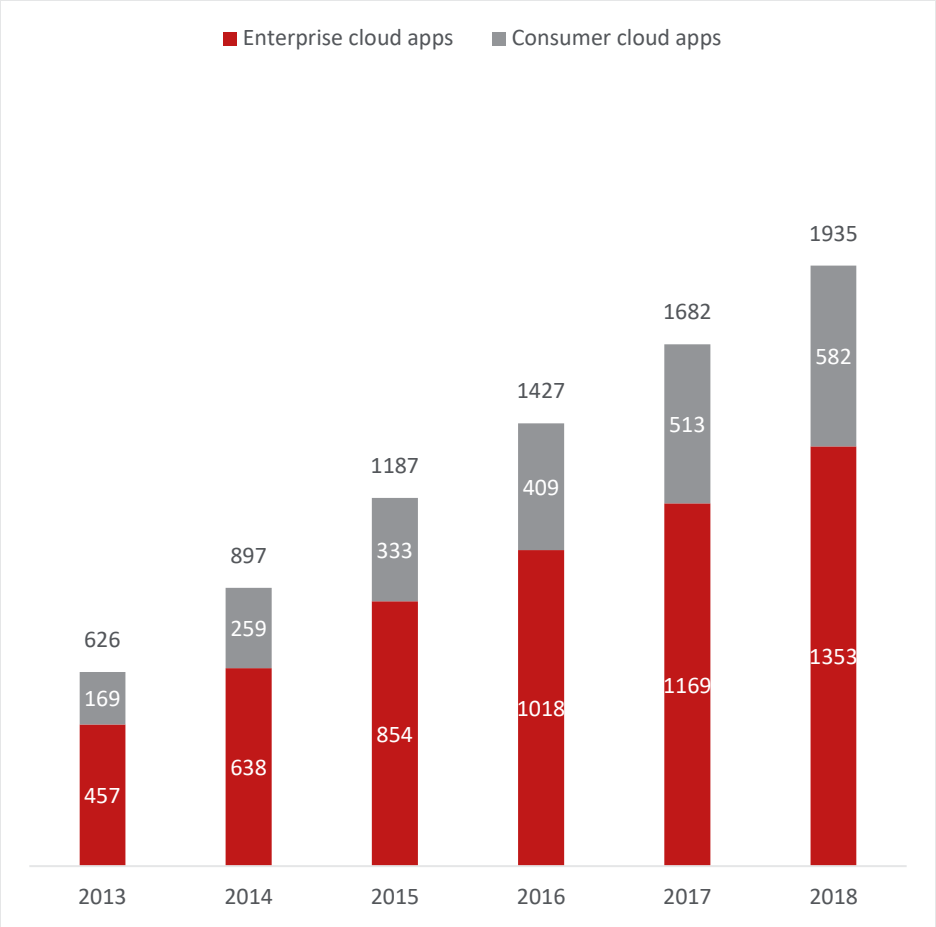


Figure x. Cloud usage over time—average number of cloud service in use per organization by type.

Average Number of Services

The average organization now uses 1,935 cloud apps, an increase of 15% over last year. Broken down by service type, enterprise applications (e.g. Office 365, Salesforce, etc.) account for 70% of cloud services in use by the average company, while cloud apps intended for consumers (such as Facebook or Pinterest) represent the other 30%.

Although new cloud applications are being introduced by employees every year, the growth rate in the number of cloud services has slowed down significantly, from a peak of 43% in 2014, to 15% in 2018 (see below figure).

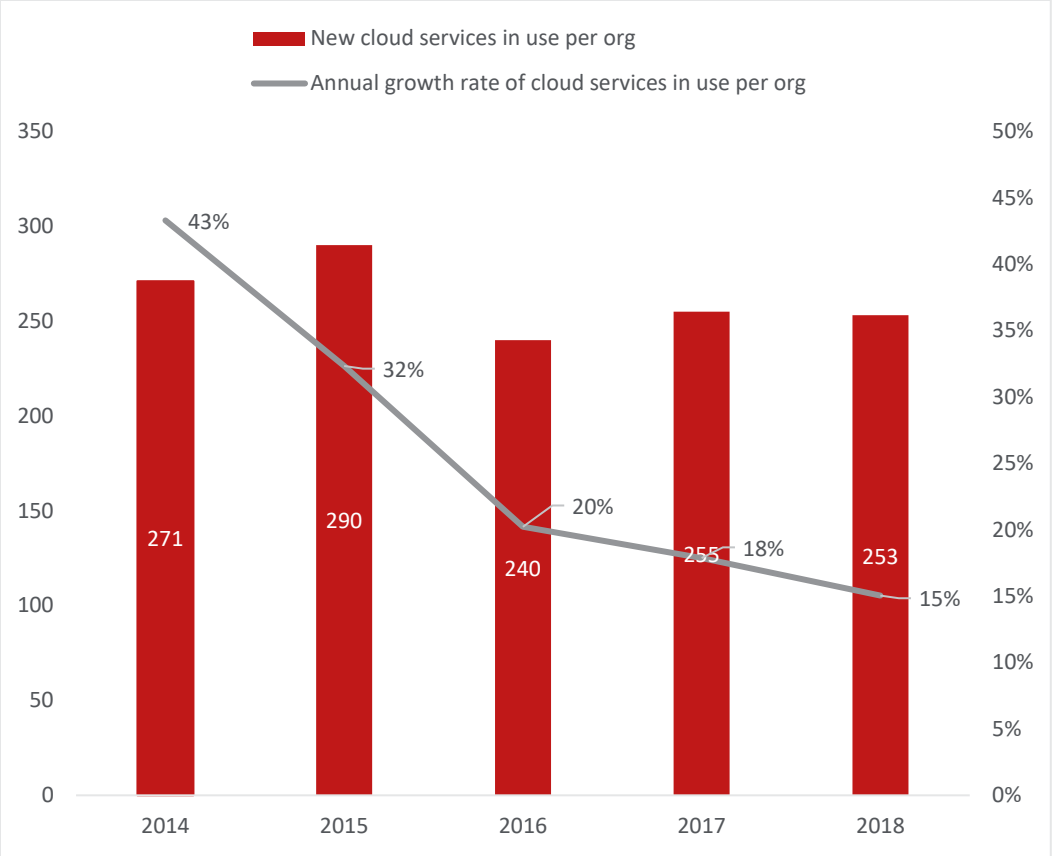


Figure x. Cloud usage over time—net new cloud applications introduced annually vs year-over-year percent growth of total applications in use per organization

For the 6th year in a row, file sharing & collaboration continues to be the category with the greatest variety of cloud services in use (e.g. Slack, Cisco WebEx, etc.), accounting for 20.9% of cloud services in use. Rounding out the top 5 categories are finance (7.5%), IT services (7.1%), cloud infrastructure (7.1%), and development (6.5%). Cloud-native security are becoming a staple as well, at 3.8% of all cloud services in use per organization.

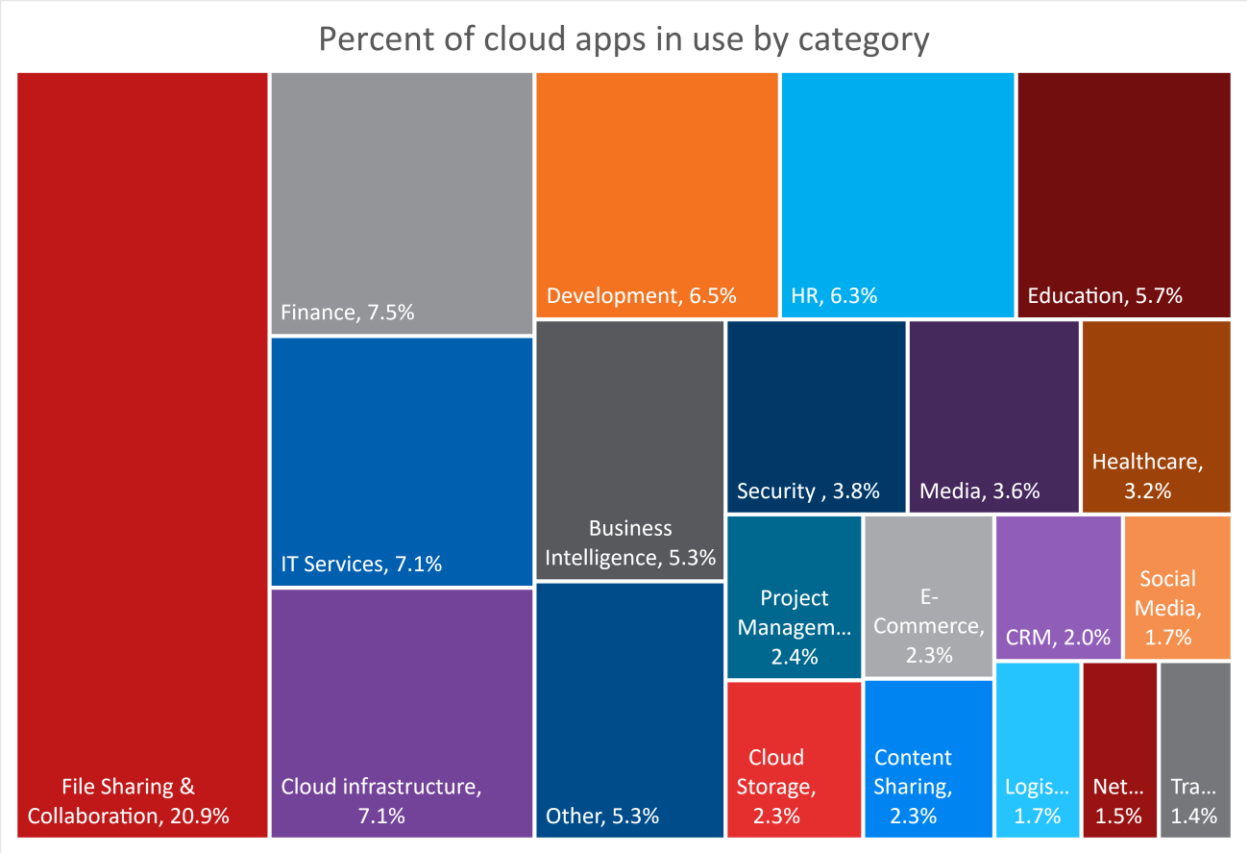
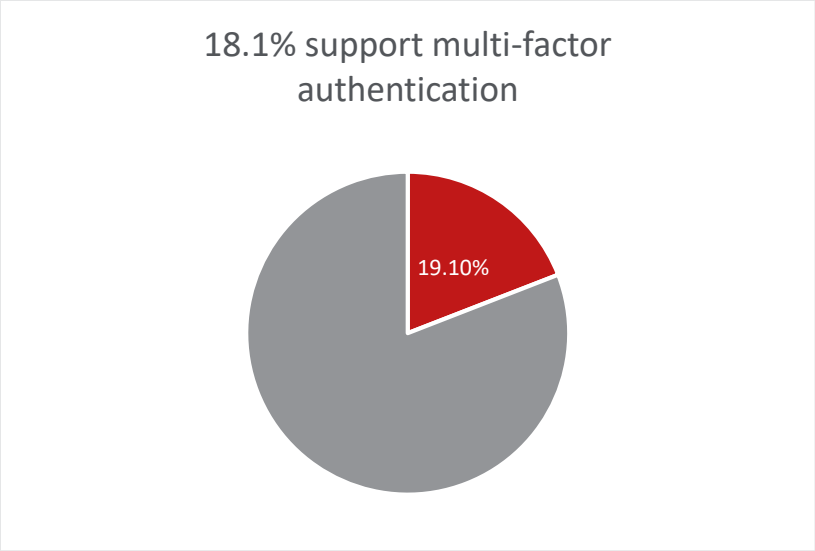


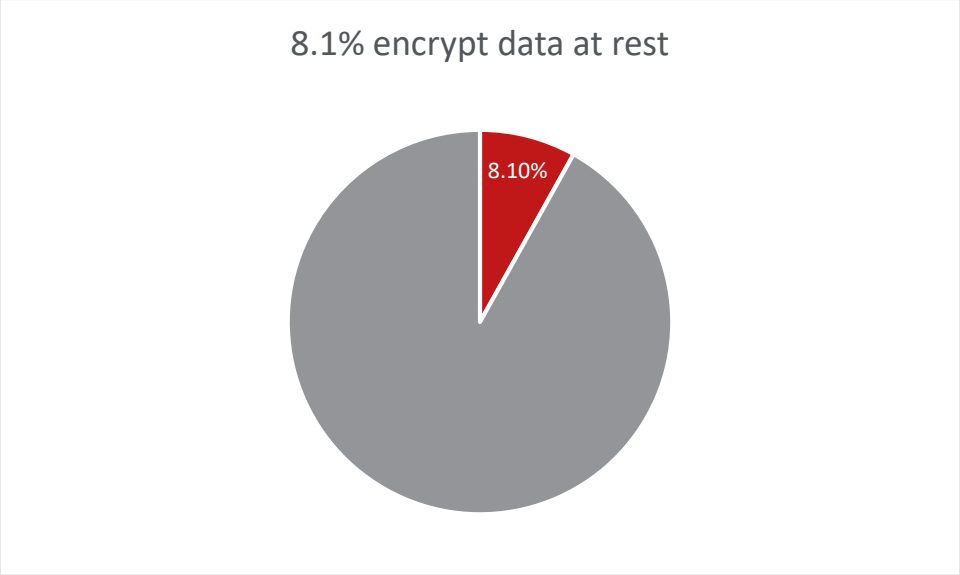
Figure x. Cloud usage by category—percent of cloud services in use in 2018 by category per organization

Native Security Controls Vary by Provider

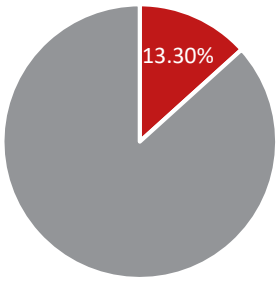
No two cloud service providers offer the same set of security controls. Across over 25,000 cloud services in use today, only 8% meet the strict data security and privacy requirements of enterprises as defined by our CloudTrust Program. Digging deeper, we find that fewer than 1 in 10 providers store data at rest encrypted, and even fewer support the ability for a customer to encrypt data using their own encryption keys. Due in part to the implementation of the EU General Data Protection Regulation (GDPR), encryption using customer-managed keys is rapidly becoming a requirement for organizations who store EU resident data in the cloud that crosses national borders.

Next, given the prevalence of data breaches caused by stolen credentials, it is alarming to find that only 19.2% of cloud services support multi-factor authentication.

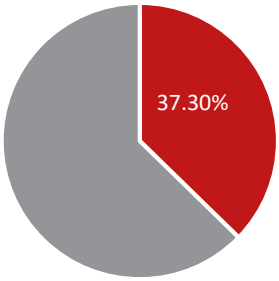

18.1% support multi-factor authentication
19.10%


8.1% encrypt data at rest
8.10%

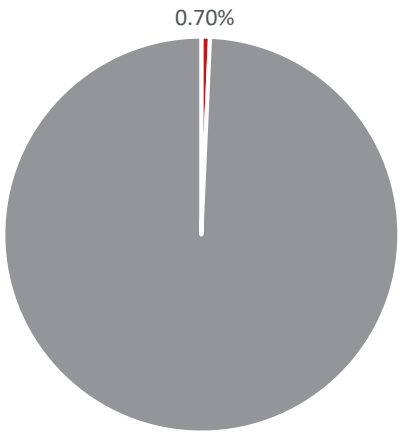
13.3% delete data immediately on account termination



37.3% specify that customer owns all data upload

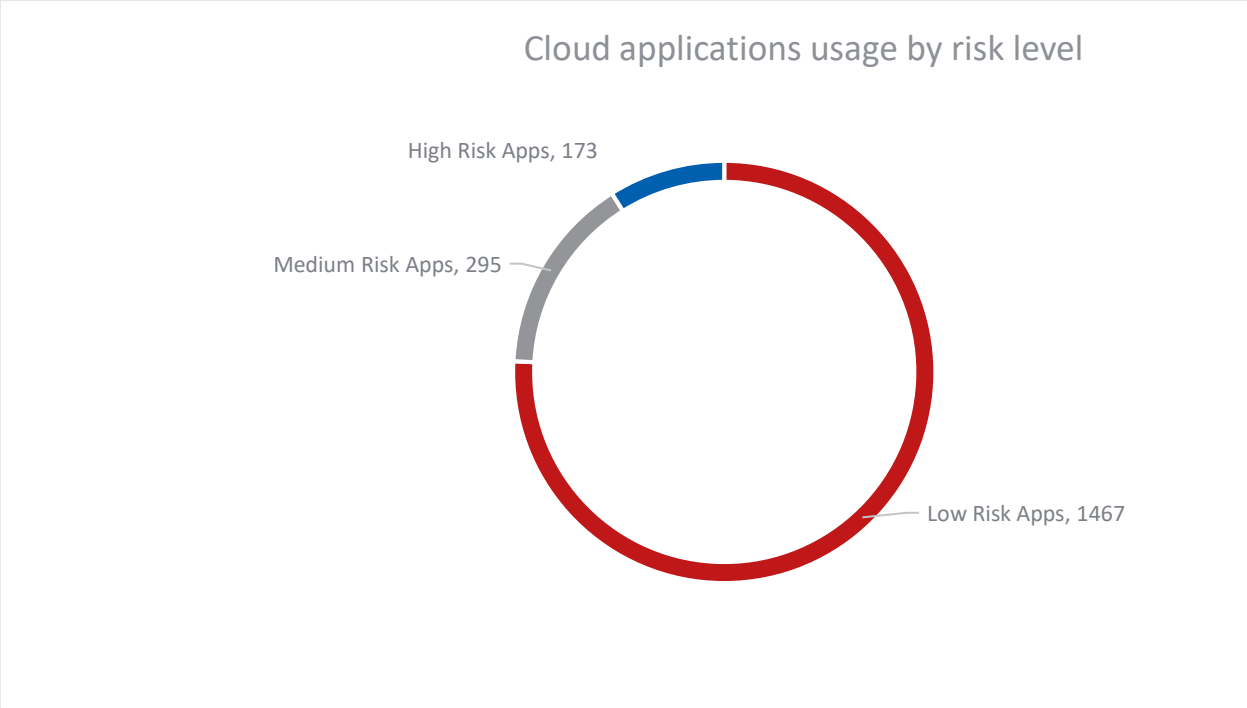


0.7% encrypt data with customer-managed keys



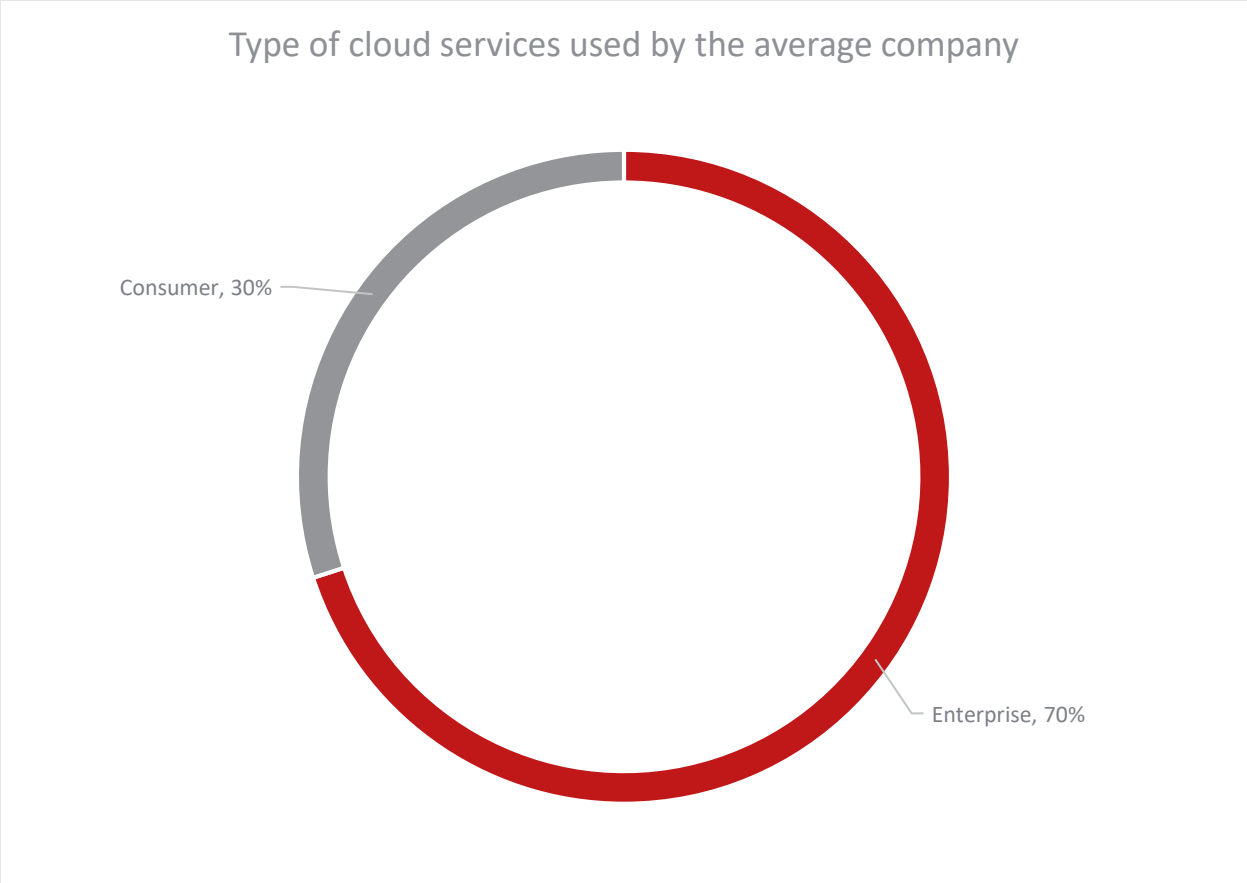
What happens to data once uploaded to a cloud provider? This continues to be one of the biggest concerns we hear from our customers. Fewer than half of providers specify that customer data is owned by the customer (the rest either claim ownership over all data uploaded, or don't legally specify who owns the data). An even smaller number of cloud providers delete data immediately on account termination, with the remainder keeping data up to one year or even claiming the right to maintain copies of data indefinitely.

Due to the general lack of critical security controls across cloud services, employees will inevitably select risky cloud services to use. While the vast majority of cloud service users are simply looking to become more efficient and productive, they can nonetheless put enterprise data at risk. Of the 1,935 cloud services in use at the average organization, 173 of them rank as high risk services (8.9%).



The Top Cloud Services

Our methodology looks only at cloud services in use at enterprise organizations – yet still we see a significant proportion of consumer services. While some consumer cloud services pivot over time to be classified as enterprise services, the vast majority are social media, and generally less-secure for your data. Below, we break down the top services in both categories.



Top 10 Enterprise Cloud Services

Today, 70% of all cloud services in use by the average company are enterprise services, accounting for 71.8% of uploaded data. Office 365 is the top enterprise cloud service by user count, followed by Salesforce and Cisco WebEx. From a security standpoint, the top 10 enterprise cloud services are significantly more likely to have enterprise-class security controls than the average enterprise cloud service.

1. OneDrive		
2. Exchange Online	3. Salesforce	4. SharePoint Online
5. ServiceNow	6. Box	7. Cisco Webex
8. Yammer	9. Workday	10. Slack

Top 10 Consumer Cloud Services

Consumer cloud applications account for 30% of the cloud services in use at the average workplace. Social media, content sharing, and collaboration services dominate the top 10 list. Several of the services on this list have enterprise versions available for businesses (such as Google Drive, Skype for Business, and Dropbox Business)

1. Facebook

2. Youtube	3. Gmail	4. Twitter
5. Linkedin	6. Apple iCloud	7. Google Drive
8. Dropbox	9. Skype	10. Whatsapp

Top 10 Collaboration and File Sharing Services

For the fifth year in a row, an Office 365 application has taken the first spot on the top 10 list of collaboration services this year, followed by Gmail and Google Drive as part of G Suite. Dropbox Business and Box take spots six and seven. Yahoo! Mail and Evernote—two of the cloud services that we usually see on this list—have dropped out of the top 10 while Slack and Intralinks are making their debut.

1. OneDrive		
2. Exchange Online	3. Gmail	4. Google Drive
5. SharePoint Online	6. Dropbox Business	7. Box
8. Cisco Webex	9. Slack	10. Intralinks

Top 10 Social Media Services

Despite the recent headwinds blowing against Facebook around data privacy and fake news proliferation, it remains as the most common social media app in use at the average organization. In the meantime, Twitter and LinkedIn have further solidified their place as the second and third most commonly used social media application respectively. And while Google+ has been slated for end-of-life, we still see prominent use at the time of this analysis.

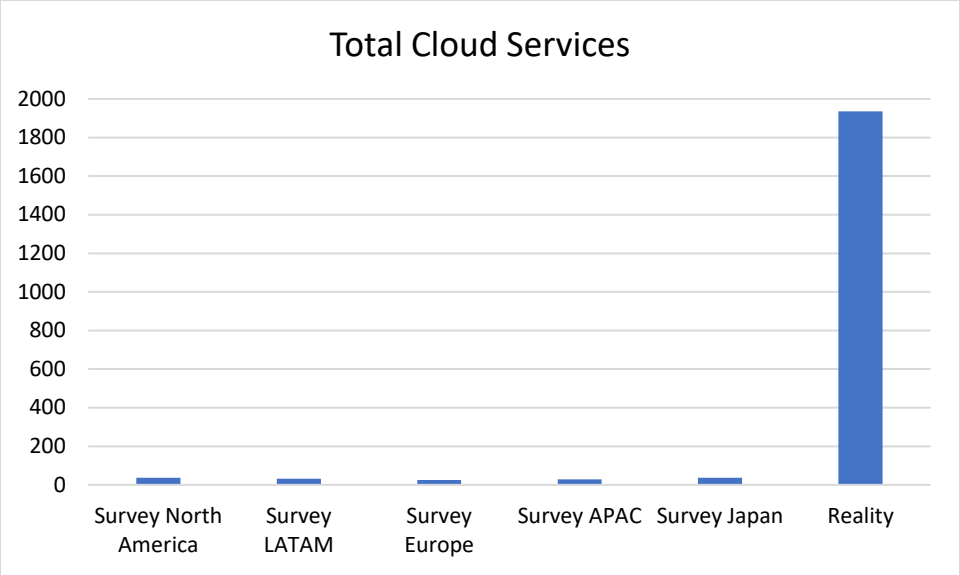
1. Facebook		
2. Twitter	3. LinkedIn	4. Youtube
5. ShareThis	6. VK	7. Twitter for Business
8. Sina Weibo	9. Google+	10. Tumblr

Perception vs Reality – Total Cloud Services

In April 2018, we published the report "Navigating a Cloudy Sky: Practical Guidance and the State of Cloud Security"[1] based on a survey of over 1,400 IT professionals across 11 countries, each respondent was asked over 100 questions about their organization's cloud use. If we compare the survey answers with the reality of our analysis here we see a number of glaring differences.

First, the respondents were asked to estimate the total number of cloud services they believe are in use in their organization. The average response was 31, with only 2% of respondents believing that they had more than 80 – yet the real average is 1,935. The perception gap is shocking, meaning that 98% of cloud services are not known to IT – leading to obvious cloud risk.

[1] https://www.mcafee.com/enterprise/en-gb/solutions/lp/cloud-security-report-stats.html



Perception vs Reality – "Over Trusting" Cloud Services to Keep Data Secure

In the survey, we asked respondents how much they trusted their cloud providers to keep their organization's data secure. 69% of respondents said that they trusted the cloud providers to keep their data secure (and 12% of respondents claimed that the service provider is solely responsible for securing their data), and yet cloud security is a shared responsibility and no cloud provider delivers 100% security (including data loss prevention (DLP), access control, collaboration control, user behavior analytics (UBA) etc.). Its likely therefore that organizations are underestimating the risk they are entering by trusting cloud providers without applying their own set of controls.

Shared Responsibility Model for Security in the Cloud

On-Premises (for reference)	**IaaS** (infrastructure-as-a-service)	**PaaS** (platform-as-a-service)	**SaaS** (software-as-a-service)
User Access	**User Access**	**User Access**	**User Access**
Data	**Data**	**Data**	**Data**
Applications	**Applications**	**Applications**	Applications
Operating System	**Operating System**	Operating System	Operating System
Network Traffic	**Network Traffic**	Network Traffic	Network Traffic
Hypervisor	Hypervisor	Hypervisor	Hypervisor
Infrastructure	Infrastructure	Infrastructure	Infrastructure
Physical	Physical	Physical	Physical

Customer Responsibility — Cloud Provider Responsibility

Takeaways and Your Best Route Forward

In practice, we produce this kind of analysis to help pinpoint areas of risk so they can be mitigated, allowing you to take advantage of the cloud and accelerate your business. This time around, we have three core recommendations to share that will assist with your cloud security strategy:

1. **Audit your AWS, Azure, Google Cloud Platform or other IaaS configurations.** IaaS use is growing rapidly as an alternative to on-premises data centers, and you need to get ahead of misconfiguration before it opens a major hole in the integrity of your security posture.
2. **Understand which cloud services hold most of your sensitive data, and apply Data Loss Prevention (DLP) to them.** Implement with Office 365 if you're using it, or Box. These are both megastores for sensitive data, and you can reduce your risk exposure by immediately controlling what data can enter or exit them.
3. **Lock down sharing, again where your sensitive data lives.** Right along with controlling the data itself, goes controlling who it can go to. Collaboration controls allow you to eliminate irreversible exposures like documents set to "anyone with a link", and generally limit your sharing to other risky destinations like personal email addresses.

Start there. As cloud services continue to evolve, so will your strategy for risk mitigation. Cloud Access Security Broker (CASB) technology can execute each of the use cases above, tapping into cloud service APIs for deep levels of control. With cloud now an official extension of nearly every IT environment, it's time to ensure security keeps up with its accelerating pace.

1https://www.mcafee.com/enterprise/en-us/solutions/lp/cloud-security-report.html

Our Methodology

To bring you these findings, we analyzed aggregated, anonymized cloud usage data for over 30 million McAfee MVISION Cloud users worldwide at companies across all major industries including financial services, healthcare, public sector, education, retail, high tech, manufacturing, energy, utilities, legal, real estate, transportation, and business services. Collectively, these users generate billions of unique transactions in the cloud each day. We compiled their usage in an extensive cloud activity graph, revealing trends in usage against behavioral baselines across time. Our cloud service registry tracks over 50 attributes of enterprise readiness and allows us to analyze behavior using detailed data signatures for over 25,000 cloud services. Additional contextual data was sourced from our 2018 survey of 1400 security professionals in 11 countries, all using public or private cloud services.