CLOUD TECHNOLOGY – INDUSTRY INSIGHTS

Historical market analysis/trends/growth

Point #1: When Computacenter thinks about Cloud Technology, we are looking at three areas where business is addressing Cloud Technologies which increases their capabilities

1. **Easy on ramp** – In order for organizations to adapt to ever-changing market conditions, accelerate new initiatives and scale without borders, Public Cloud providers have provided a platform and resources to create what had never been possible before. These capabilities have provided an avenue for organizations to leverage these services and capabilities to tackle new and emerging areas of their business to get to market faster, expand where they were not able to previously and continuously learn how to take advantage of technology where they were not able to previously.

2. **Software as a Service** – Imagine you never have to worry about your IT department having to build and manage IT infrastructure or upgrade a core business platform over the weekend only to realize there was an issue which affected the entire company. With Software as a Service (SaaS), this is the reality for organizations. As more SaaS platforms are available for businesses to leverage which can handle 90+% of the business functions, the overhead of managing software and IT infrastructure has become a thing of the past.

3. **Innovation** – Organizations have been leveraging Cloud Technology for more than a decade now and some are realizing the benefits it brings to their organization. The rampant access to new technology when applied correctly is accelerating innovation and adopting new ways of solving real-world problems. This has led to some of the greatest innovation in recent years and without Cloud Technologies this would not be possible.

Trends that Computacenter has been seeing with customers over the past 15 months have been the following areas.

1. **FinOps** – As organizations have been adopting Cloud Technology to innovate, build and react to changing operating landscapes, their Public Cloud spend has been increasing. Organizations are now looking at how they can control spending without stifling innovation and transformation. By developing and putting in place a well-defined and structured FinOps practice, organizations are able to get the maximum business value from Cloud Technology.

2. **Multi-Cloud** – Not all Cloud Technology is created equal. Face it, SaaS, Private Cloud, Public Cloud and Edge are unique, have unique requirements, and provide different business needs to the organization and the users. Each operating environment, application or location will require connectivity and will need to be accessible. The adoption of a Multi-Cloud strategy for connectivity, security and availability is a regular conversation across all organizations regardless of their size.

3. **Cybersecurity** – No organization wants to be in the news where their company data is being held ransom. An effective cybersecurity practice will have a framework which works to Identify, Protect, Detect, Respond and Recover from cybersecurity risks. Cybersecurity is not unique to Cloud Technology however as Cloud Technology is being adopted, having the right framework, identifiers, and guardrails in place with help to move the security conversation to the start of innovation and not when something goes terribly wrong.

Point #2: Cloud Computing has become an essential tool for business, a helpful way to store and share data. Organizations were compelled to embrace cloud platforms since remote working options were made possible by the pandemic. Cloud computing trends are popular in areas like application and infrastructure software, business processes, and system infrastructure.

Cloud Computing is an on-demand availability of computer system resources and delivery of computer services including servers, storage, databases, networking, software, analytics, and intelligence over the internet to offer faster innovation, flexible resources, and economies of scale. It is used by every corporation that wants business continuity, cost reduction, and enhanced future scalability. The top cloud computing trends to look out for in 2023 are AI and ML, Kubernetes, Multi and Hybrid cloud solutions, IoT, and more. As Cloud computing trends are growing, here are the top 10 cloud computing trends to look out for in 2023.

Edge Computing

Edge Computing is one of the biggest trends in cloud computing. Here, data is stored, processed at the edge of the network, and analyzed geographically closer to its source. Faster processing and reduced latency can be achieved due to the increasing use of 5G. Edge computing has major benefits which include more privacy, faster data transmission, security, and increased efficiency. Edge computing will be at the center of every cloud strategy, making it the top cloud computing trend for 2023.

IoT

IoT is a well-known trend in cloud computing. It is a technology that maintains connections between computers, servers, and networks. It functions as a mediator and ensures successful communication and assists in data collection from remote devices. It also resolves warnings and supports the security protocols by businesses to create a safer cloud environment.

AI and ML

Artificial Intelligence and Machine Learning are two technologies that are closely related to cloud computing. AI and ML services are more cost-effective since large amounts of computational power and storage space are needed for data collection and algorithm training. They are a solution for managing massive volumes of data to improve tech company productivity. The key trends that are likely to emerge in this area include increased automation and self-learning capabilities, greater data security and privacy, and more personalized cloud experiences.

Disaster Recovery

Cloud computing is effective in disaster recovery and offers businesses the ability to quickly restore critical systems in the event of a natural or man-made catastrophe. it refers to the process of recovering from a disaster such as power outages, data loss, or hardware failures using cloud-based resources.

Multi and Hybrid Cloud Solution

A lot of enterprises have adopted multi-cloud and Hybrid IT strategy which combines on-premise, dedicated private clouds, several public clouds, and legacy platforms. They offer a combination of public and private clouds dedicated to a specific company whose data is key business driver, hence, multi and hybrid cloud solutions will be among the top cloud computing trends in 2023 and the coming years.

Kubernetes

The key trend is the increased adoption of container orchestration platforms like Kubernetes and Docker. This technology enables large-scale deployments that are highly scalable and efficient. It is an extensible, open-source platform that runs applications from a single source while centrally managing the services and workloads. Kubernetes are rapidly evolving and will continue to be major players in cloud computing trends over the next few years.

Serverless Computing

Serverless Computing came into the computing industry as a result of the emergence of the sharing economy. Here, compute resources are provided as a service rather than installed on physical servers. This means that the organization only pays for the resources they use rather than having to maintain its servers. In addition, serverless cloud solutions are becoming popular due to ease of use and ability to quickly build, deploy and scale cloud solutions. Overall, technology is an emerging trend that is growing in popularity over the years.

Why Cloud technology is preferred over physical devices/storage

Cloud Technology can be described in many ways, Public Cloud, Private Cloud, Sovereign Cloud and more. Each has its own uniqueness and is chosen for a specific reason.

Public Cloud is great for building and scaling without limits, adopting new technology as soon as it's available and innovation at a rapid pace. Public Cloud is not always the right place to run an application or store its data. Depending on the workload and which resources it needs access to, the application may need to run as close to where the transactions are taking place.

Private Cloud Technologies are still very relevant across many industries where these challenges and fit

are required. Now with new ways of procuring and maintaining Private Cloud, many of the benefits to organizations which Public Cloud brings are available without compromise.

As the saying goes, “it depends.” We welcome all conversations in order to help you make the right decision for your applications and data to ensure the right resources are being used at the right time.

How businesses/organizations can use these services to reduce costs, increase scalability and improve their IT performance

Cost Savings: If you are worried about the price tag that would come with making the switch to cloud computing, you aren't alone 20% of organizations are concerned about the initial cost of implementing a

cloud-based server. But those who are attempting to weigh the advantages and disadvantages of using the cloud need to consider more factors than just initial price - they also need to consider ROI.
Once you're on the cloud, easy access to your company's data will save time and money in project startups. And, for those who are worried that they'll end up paying for features that they neither need nor want, most cloud-computing services are pay-as-you-go. This means that if you don't take advantage of what the cloud has to offer, then at least you won't have to be dropping money on it.

The pay-as-you-go system also applies to the data storage space needed to service your stakeholders and clients, which means that you'll get exactly as much space as you need, and not be charged for any space that you don't. Taken together, these factors result in lower costs and higher returns.

Security: Many organizations have security concerns when it comes to adopting a cloud-computing solution. After all, when files, programs, and other data aren't kept securely onsite, how can you know that they are being protected? If you can remotely access your data, then what's stopping a cybercriminal from doing the same thing? Well, quite a bit, actually.

For one thing, a cloud host's full-time job is to carefully monitor security, which is significantly more efficient than a conventional in-house system, where an organization must divide its efforts between a myriad of IT concerns, with security being only one of them. And while most businesses don't like to openly consider the possibility of internal data theft, the truth is that a staggeringly high percentage of data thefts occur internally and are perpetrated by employees. When this is the case, it can actually be much safer to keep sensitive information offsite.

Flexibility: Your business has only a finite amount of focus to divide between all of its responsibilities. If your current IT solutions are forcing you to commit too much of your attention to computer and data-storage issues, then you aren't going to be able to concentrate on reaching business goals and satisfying customers. On the other hand, by relying on an outside organization to take care of all IT hosting and infrastructure, you'll have more time to devote to the aspects of your business that directly affect your bottom line.

The cloud offers businesses more flexibility overall versus hosting on a local server. And, if you need extra bandwidth, a cloud-based service can meet that demand instantly, rather than undergoing a complex (and expensive) update to your IT infrastructure. This improved freedom and flexibility can make a significant difference to the overall efficiency of your organization.

Mobility: Cloud computing allows mobile access to corporate data via smartphones and devices, which, considering over 2.6 billion smartphones are being used globally today, is a great way to ensure that no one is ever left out of the loop. Staff with busy schedules, or who live a long way away from the corporate office, can use this feature to keep instantly up to date with clients and co-workers.

Through the cloud, you can offer conveniently accessible information to sales staff who travel, freelance employees, or remote employees, for better work-life balance. Therefore, it's not surprising to see that organizations with employee satisfaction listed as a priority are up to 24% more likely to expand cloud usage.

Insight: As we move ever further into the digital age, it's becoming clearer and clearer that the old adage “knowledge is power” has taken on a more modern and accurate form: “Data is money.” Hidden within the millions of bits of data that surround your customer transactions and business process are nuggets of invaluable, actionable information just waiting to be identified and acted upon. Of course, sifting through that data to find these kernels can be very difficult, unless you have access to the right cloud-computing solution.

Many cloud-based storage solutions offer integrated cloud analytics for a bird's-eye view of your data. With your information stored in the cloud, you can easily implement tracking mechanisms and build customized reports to analyze information organization wide. From those insights, you can increase efficiencies and build action plans to meet organizational goals.

Increased Collaboration: If your business has two employees or more, then you should be making collaboration a top priority. After all, there isn't much point to having a team if it is unable to work like a team. Cloud computing makes collaboration a simple process. Team members can view and share information easily and securely across a cloud-based platform. Some cloud-based services even provide collaborative social spaces to connect employees across your organization, therefore increasing interest and engagement. Collaboration may be possible without a cloud-computing solution, but it will never be as easy, nor as effective.

Quality Control: There are few things as detrimental to the success of a business as poor quality and inconsistent reporting. In a cloud-based system, all documents are stored in one place and in a single format. With everyone accessing the same information, you can maintain consistency in data, avoid human error, and have a clear record of any revisions or updates. Conversely, managing information in silos can lead to employees accidentally saving different versions of documents, which leads to confusion and diluted data.

Disaster Recovery: One of the factors that contribute to the success of a business is control. Unfortunately, no matter how in control your organization may be when it comes to its own processes,

there will always be things that are completely out of your control, and in today's market, even a small amount of unproductive downtime can have a resoundingly negative effect. Downtime in your services leads to lost productivity, revenue, and brand reputation.

But while there may be no way for you to prevent or even anticipate the disasters that could potentially harm your organization, there is something you can do to help speed your recovery. Cloud-based services provide quick data recovery for all kinds of emergency scenarios, from natural disasters to power outages.

Loss Prevention: If your organization isn't investing in a cloud-computing solution, then all of your valuable data is inseparably tied to the office computers it resides in. This may not seem like a problem, but the reality is that if your local hardware experiences a problem, you might end up permanently losing your data. This is a more common problem than you might realize computers can malfunction for many reasons, from viral infections to age-related hardware deterioration, to simple user error. Or, despite the best of intentions, they can be misplaced or stolen (over 10,000 laptops are reported lost every week at major airports).

If you aren't on the cloud, you're at risk of losing all the information you had saved locally. With a cloud-based server, however, all the information you've uploaded to the cloud remains safe and easily accessible from any computer with an internet connection, even if the computer you regularly use isn't working.

Automatic Software Updates: For those who have a lot to get done, there isn't anything more irritating than having to wait for system updates to be installed. Cloud-based applications automatically refresh and update themselves, instead of forcing an IT department to perform a manual organization-wide update. This saves valuable IT staff time and money spent on outside IT consultation. PCWorld lists that 50% of cloud adopters cited requiring fewer internal IT resources as a cloud benefit.

Sustainability: Given the current state of the environment, it's no longer enough for organizations to place a recycling bin in the breakroom and claim that they're doing their part to help the planet. Real sustainability requires solutions that address wastefulness at every level of a business. Hosting on the cloud is more environmentally friendly and results in less of a carbon footprint.

Cloud infrastructures support environmental proactivity, powering virtual services rather than physical products and hardware, and cutting down on paper waste, improving energy efficiency, and (given that it allows employees access from anywhere with an internet connection) reducing commuter-related emissions.

How to select the right Cloud services for different needs while ensuring they comply with government regulations and security requirements

1) Please refer to the attached: **Why Cloud Provider Resiliency (CPR) is Essential to Your Business's Success**

2) Article from Gartner https://www.gartner.com/en/articles/migrating-to-the-cloud-why-how-and-what-makes-sense#:~:text=Gartner%20enterprise%20clients%20have%20indicated,robust%20user%20interface%20(UI).

3) **Common cloud computing questions**

Which cloud should I use?

That depends on what you're doing.

- Workloads with high volume or fluctuating demands might be better suited for a public cloud.
- Workloads with predictable use patterns might be better off in a private cloud.
- Hybrid clouds are the catch-all because any workload can be hosted anywhere.

Which cloud is safest?

That's a loaded question.

- Public clouds tend to have a wider variety of security threats due to multi-tenancy and numerous access points. Public clouds often split security responsibilities. For instance, infrastructural security can be the provider's responsibility while workload security can be the tenant's responsibility.
- Private clouds are thought to be more secure because workloads usually run behind the user's firewall, but that all depends on how strong your own security is.
- Hybrid cloud security is made up of the best features of every environment, where users and admins can minimize data exposure by moving workloads and data across environments based on compliance, audit, policy, or security requirements.

Which cloud costs more?

Another loaded question.

- You usually pay for what you use in a public cloud, though some public clouds don't charge tenants.
- Whoever set up a private cloud is usually responsible for purchasing or renting new hardware and resources to scale up.
- Hybrid clouds can include any on-prem, off-prem, or provider's cloud to create a custom environment that suits your cost requirements.

Which cloud has the best resources?

That depends on how you want to spend money. Do you want to incur capital expenses (CapEx) or operating expenses (OpEx)? This is the classic *scale-up* vs. *scale-out* question.

- Public cloud users seem to have unlimited access to resources, but accessing those resources is usually an operational expense.
- Deploying more private cloud resources requires buying or renting more hardware—all capital expenses.
- Hybrid clouds give you the option of using operating expenses to scale out or capital expenses to scale up.

4) There are four main types of cloud computing: private clouds, public clouds, hybrid clouds, and multi-clouds. Choosing a cloud type or cloud service is a unique decision. No two clouds are the same (even if they're the same type), and no two cloud services are used to solve the same problem. But by understanding the similarities, you can be more informed about how the caveats of each cloud computing type and cloud service might impact your business.

What's the same?

Every cloud abstracts, pools, and shares scalable computing resources across a network. Every cloud type also enables cloud computing, which is the act of running workloads within that system. And every cloud is created using a unique mix of technologies, which almost always includes an operating system, some kind of management platform, and application programming interfaces (APIs). Virtualization and automation software can also be added to every kind of cloud for additional capabilities or increased efficiencies.

What's different?

The differences between public clouds, private clouds, hybrid clouds, and multi-clouds were once easily defined by location and ownership. But it's just not that simple anymore. So while we compare the differences below, there are plenty of caveats.

Public clouds

Public clouds are cloud environments typically created from IT infrastructure not owned by the end user. Some of the largest public cloud providers include Amazon Web Services (AWS), Google Cloud, and Microsoft Azure.

Traditional public clouds always ran off-premises, but today's public cloud providers have started offering cloud services on clients' on-premise data centers. This has made location and ownership distinctions obsolete.

All clouds become public clouds when the environments are partitioned and redistributed to multiple tenants. Fee structures aren't necessary characteristics of public clouds anymore, since some cloud providers allow tenants to use their clouds for free. The bare-metal IT infrastructure used by public cloud providers can also be abstracted and sold as IaaS, or it can be developed into a cloud platform sold as PaaS.

Private clouds

Private clouds are loosely defined as cloud environments solely dedicated to a single end user or group, where the environment usually runs behind that user or group's firewall. All clouds become private clouds when the underlying IT infrastructure is dedicated to a single customer with completely isolated access.

But private clouds no longer have to be sourced from on-premise IT infrastructure. Organizations are now building private clouds on rented, vendor-owned data centers located off-premises, which makes any location and ownership rules obsolete. This has also led to a number of private cloud subtypes, including:

Managed private clouds

Customers create and use a private cloud that's deployed, configured, and managed by a third-party vendor. Managed private clouds are a cloud delivery option that helps enterprises with understaffed or under skilled IT teams provide better private cloud services and infrastructure.

Dedicated clouds

A cloud within another cloud. You can have a dedicated cloud on a public cloud or on a private cloud. For example, an accounting department could have its own dedicated cloud within the organization's private cloud.

Hybrid clouds

A hybrid cloud is a seemingly single IT environment created from multiple environments connected through local area networks (LANs), wide area networks (WANs), virtual private networks (VPNs), and/or APIs.

The characteristics of hybrid clouds are complex and the requirements can differ, depending on whom you ask. For example, a hybrid cloud may need to include:

- At least one private cloud and at least one public cloud
- Two or more private clouds
- Two or more public clouds
- A bare-metal or virtual environment connected to at least one public cloud or private cloud

But every IT system becomes a hybrid cloud when apps can move in and out of multiple separate—yet connected—environments. At least a few of those environments need to be

sourced from consolidated IT resources that can scale on demand. And all those environments need to be managed as a single environment using an integrated management and orchestration platform.

Multi-clouds

Multi-clouds are a cloud approach made up of more than 1 cloud service, from more than 1 cloud vendor—public or private. All hybrid clouds are multi-clouds, but not all multi-clouds are hybrid clouds. Multi-clouds become hybrid clouds when multiple clouds are connected by some form of integration or orchestration.

A multi-cloud environment might exist on purpose (to better control sensitive data or as redundant storage space for improved disaster recovery) or by accident (usually the result of shadow IT). Either way, having multiple clouds is becoming more common across enterprises that seek to improve security and performance through an expanded portfolio of environments.

Different types of Cloud services, including SaaS, PaaS, and IaaS

Cloud services are infrastructure, platforms, or software that are hosted by third-party providers and made available to users through the Internet. There are three main types of as-a-Service solutions: IaaS, PaaS, and SaaS. Each facilitates the flow of user data from front-end clients through the internet, to the cloud service provider's systems, and back—but varies by what's provided.

IaaS

IaaS means a cloud service provider manages the infrastructure for you—the actual servers, network, virtualization, and data storage—through an internet connection. The user has access through an API or dashboard, and essentially rents the infrastructure. The user manages things like the operating system, apps, and middleware while the provider takes care of any hardware, networking, hard drives, data storage, and servers; and has the responsibility of taking care of outages, repairs, and hardware issues. This is the typical deployment model of cloud storage providers.

PaaS

PaaS means the hardware and an application-software platform are provided and managed by an outside cloud service provider, but the user handles the apps running on top of the platform and the data the app relies on. Primarily for developers and programmers, PaaS gives users a shared cloud platform for application development and management (an important DevOps component) without having to build and maintain the infrastructure usually associated with the process.

SaaS

SaaS is a service that delivers a software application—which the cloud service provider manages—to its users. Typically, SaaS apps are web applications or mobile apps that users can access via a web browser. Software updates, bug fixes, and other general software maintenance are taken care of for the user, and they connect to the cloud applications via a dashboard or API. SaaS also eliminates the need to have an app installed locally on each individual user's computer, allowing greater methods of group or team access to the software.