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**SE 4220**

**Individual Assignment 1**

**Cloud Landscape Review**

**Part 1 Cloud Providers**

**1. Amazon Web Services**

<https://www.techtarget.com/searchaws/definition/Amazon-Web-Services> Tech Target Article on What is AWS? Provides Info on the History, why its important, and how it works. Provides good detail on what the business proposition is of AWS. This appears to be a high level source to me because of the great high level over view it provides of AWS.

<https://www.geeksforgeeks.org/aws-tutorial/>GeeksforGeeks article on an AWS tutorial. Providing a brief overview of the different components within AWS and their benefits, has links to all of its more in-depth tutorials on each individual topic. This is a mid-level source as an overview, but I am sure the in-depth tutorials are better.

<https://intellipaat.com/blog/aws-benefits-and-drawbacks/>IntellilPaat article on the benefits and disadvantages of AWS. Provided examples of the advantages for individual services with AWS. This was a high-level source providing info with examples.

**2. Microsoft Azure**

<https://azure.microsoft.com/en-us/resources/cloud-computing-dictionary/what-is-azure/> microsofts documentation on what azure is and can do this is a high level resource straight from Microsoft.

<https://www.howtogeek.com/337961/what-is-microsoft-azure/> mid level resource article with some indepth analysis but all very general to cloud computing

<https://www.geeksforgeeks.org/what-is-microsoft-azure/> High level resource a geeks for geeks article that gives great background and information on features.

**3. Google Cloud Platform**

<https://cloud.google.com/docs/overview/> High level overview from Google Clouds Documentation with links to more in depth articles

<https://www.geeksforgeeks.org/google-cloud-platform-gcp/> High level overview from Geeks for Geeks with good information on features.

<https://www.businessinsider.com/google-cloud-platform> High level resource from business insider that gives information from the business application perspective.

**4. Alibaba Cloud**

<https://www.alibabacloud.com/en/about?_p_lc=1> mid level resource it is documentation directly from alibaba’s website

<https://www.itprotoday.com/alibaba-cloud/the-pros-and-cons-of-alibaba-cloud> mid level resource it discussed pros and cons of Alibaba in the landscape

<https://www.geeksforgeeks.org/alibaba-cloud-unique-features/> high level resource goes into the direct features of Alibaba compared to competitors.

**5. IBM Cloud**

<https://www.softacom.com/blog/business/pros-and-cons-of-ibm-cloud-platform/> low level resource that provides very general cloud computing advantages and does not get into specifics about IBM

<https://cloudwithease.com/what-is-ibm-cloud/> mid level resource that provides some industry cloud comparisons but does not go all that in depth.

<https://cloud.ibm.com/media/docs/pdf/overview/overview.pdf> High level resource an in depth document (180 pages) covering IBM’s cloud platform and its features.

**6.Oracle Cloud**

[**https://www.techtarget.com/whatis/definition/Oracle-Cloud**](https://www.techtarget.com/whatis/definition/Oracle-Cloud)tech target article highlighting oracle cloud features. This is a midlevel resource because it does not go very in depth.

<https://www.oracle.com/cloud/what-is-cloud-computing/cloud-computing-overview/> High level source directly from Oracle’s documentation discusses IaaS details in depth.

<https://video.search.yahoo.com/search/video?fr=mcafee&p=oracle+cloud+features&type=E210US1357G0#id=6&vid=3a6cdc116a8e58ac115df508c46ac675&action=click> Youtube video that gives great information on EPM and Oracles features for businesses. High Level source.

**7.Salesforce**

[**https://www.salesforce.com/sales/cloud/**](https://www.salesforce.com/sales/cloud/)High level source detailing SalesForce Cloud features from the websites documentation.

<https://www.youtube.com/watch?v=vEpcUe0pCP4> high level source it is a youtube video diving into the features of Salesforce cloud and giving demo’s on different features.

<https://reviewed.app/app/salesforce/> High level resource compares and contrast SalesForce Cloud to other Cloud platforms and details features that make it stand out.

**Part 2 Provider Descriptions**

**AWS:** Amazon Web Services is a powerful and widely used cloud computing platform offered by Amazon to businesses and individual users. It provides a wide array of services, including compute power, storage, and networking. With key services such as Elastic Compute Cloud. Simple Storage Service, and Lambda, AWS allows businesses to scale their operations on-demand, making it a powerful tool for both startups and large enterprises. These services are available on a pay-as-you-go pricing model, saving hosting costs for users by only having to pay for what they actually use. AWS has built data centers across the globe, ensuring high availability, reliability, and disaster recovery capabilities for users. However, AWS does have its disadvantages for new businesses and users. For new users, the platform's learning curve can be steep, and the wide variety of services can sometimes make it challenging to navigate. Also, the complexity of AWS pricing can lead to overpaying because of selecting the incorrect plan for your traffic. AWS has also done a good job of making it hard for Businesses to change away from them after using their services. Once they capture your initial business you are a customer for life. They do create benefits for new users through extensive documentation and Wikis on their various services.

**Azure:** Azure is Microsoft’s cloud computing platform, and they have done a great job creating an environment that integrates well with all their other widely used technologies. They have developed hyper vision on a massive scale so that cloud users can create both windows and Linux virtual machines. Microsoft has its own DevOps tool Azure DevOps integrated right into the cloud for best development practices when developers create their own applications on the cloud. Azure also has extensive Disaster recovery and backup plans in place to protect client’s data. There are already AI services that can be integrated into applications as well as features including Microsoft CoPilot that help enhance Software Development. Azure Cloud shell is another feature that is a copy of Microsoft PowerShell but helps developers manage the cloud resources and automate process through scripts. The biggest benefit by far is business staying with the Microsoft environment that many have already adopted there is seamless integration with Office 365 product into cloud applications. There are also many different data storage types including Azure Blob Storage and Azure Data Lake storage to help support even the largest industries. Azure VPN Gateway is another security aspect to help enhance security between legacy on premise hardware and MS Azure Cloud Infrastructure.

**Google Cloud Platform:** Google Cloud infrastructure has data centers around the globe to provide enough resources to anyone that needs them, a unique feature is the project aspect. All google cloud resources belong to a project this is an organizing method to ensure that all resources being used are structured into a singular project. There is also the Google Cloud Client Libraries that allow you to easily create and manage resources using the App APIs these allow you to easily interact with Google Services. BigQuery is another feature of Google Cloud aimed to support Businesses’ Big Data needs and helping uncover Data Analytics to help inform business decisions. An interesting aspect of GCP is that they bill by the second and round up, this means it can become very costly for businesses using their Cloud platform and is not as cost effective as AWS. App Engine is a feature that has been around since 2008 but it allows developers to easily deploy applications on a platform as a service. GCP offers IaaS, PaaS, and SaaS to businesses offering a solution for every business no matter the size or needs, Google is banking on its inhouse AI capabilities and integration into GCP being a big factor in capturing more market share.

**Alibaba Cloud:** Alibaba Cloud is the cloud computing provider that is dominating the Asian Market and Ecommerce Industry. It is a cloud computing platform that offers a range of services, including IaaS, PaaS, and SaaS. It provides businesses with tools to scale their operations efficiently through offerings like elastic computing, data storage, big data analytics, and AI solutions. Alibaba Cloud’s infrastructure supports high-performance applications, making it particularly suited for industries such as e-commerce, logistics, and finance. One of Alibaba Cloud's key strengths is its integration with the larger Alibaba ecosystem, which enhances the platform’s capabilities in areas like retail and supply chain management. Its AI-driven tools and machine learning services enable businesses to build intelligent applications that improve decision-making, customer experience, and operational efficiency. The platform also stands out for its strong security features, including DDoS protection, encryption, and global compliance, ensuring businesses can trust it with sensitive data. With a global network of data centers, Alibaba Cloud enables companies to expand their reach and serve customers worldwide while maintaining low-latency performance. Overall, Alibaba Cloud is a powerful, cost-effective, and scalable solution for businesses looking to embrace digital transformation, enhance productivity, and leverage the cloud to gain a competitive edge.

**IBM Cloud:** IBM Cloud offers a solution of both a Platform as a service and Infrastructure as a service, they have also developed their own Data Analysis AI IBM Watson that integrates easily into services. They provide service to large scale enterprises across the major industries with both public and hybrid cloud capabilities. It also has a built-in identity and access management component to better authenticate users and easily manage user privileges. This security factor is a big benefit to major enterprises like healthcare and financial services where data privacy is extremely important. IBM cloud has a wide range of Database sources offering relational and NoSQL options. They have also been able to implement blockchain technology that is especially important in the supply chain market. IBM Cloud code engine is another important feature that work hand in hand with its Cloud Kubernetes Service to support Software Developers in easily creating microservices without any worry about the hardware infrastructure. IBM also has emerged as one of the industry leaders in quantum computing they allow access to these resources through the cloud for enterprises that are starting Research and Development in the quantum computing domain.

**Oracle Cloud:** It is designed to help businesses build, deploy, and scale applications efficiently, with a focus on performance and security. The platform provides services like compute, storage, and networking, as well as advanced tools for data analytics, machine learning, and artificial intelligence. A major feature of Oracle Cloud is its Autonomous Database service, which uses artificial intelligence to automate tasks such as database maintenance, backups, and performance optimization. This reduces the need for manual intervention and ensures reliable, efficient operation. The platform also offers strong security features, including the IAM authentication feature, encryption, and compliance with industry regulations like medical standards and data privacy, making it a great option for businesses that handle sensitive data. Oracle Cloud is especially beneficial for companies that already use Oracle software, such as Oracle Database and ERP systems, as it offers easy integration with these tools. Additionally, Oracle Cloud supports hybrid cloud setups, allowing businesses to combine their on-premises infrastructure with cloud resources. With its focus on data management and analytics, Oracle Cloud helps businesses make better data-driven decisions. Its scalable infrastructure ensures that organizations can run mission-critical applications without interruptions or performance issues.

**SalesForce:** Salesforce is a cloud-based platform that focuses on customer relationship management, helping businesses manage customer data and interactions. It allows companies to track sales leads, opportunities, and customer accounts in one place, making it easier to improve customer relationships and boost sales. Salesforce centralizes all customer data, which helps sales teams personalize their outreach and automate tasks like follow-ups.One of its biggest strengths is its CRM integration with various business functions such as marketing, customer service, and sales, making it a comprehensive solution for managing the entire customer journey. With cloud access, users can view and update customer information from anywhere, supporting remote and mobile workforces.Salesforce also allows for customization through its AppExchange, where businesses can find additional apps to enhance the platform that has been prebuilt to help common business problems. This flexibility makes Salesforce a powerful tool for companies of all sizes looking to improve their customer management and overall business efficiency. Salesforce also acquired Slack a super common business communication tool like teams, businesses that use slack can integrate it into Salesforce cloud applications.

**Part 3 Provider Comparisons**

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| --- | --- | --- | --- |
| **Provider** | **Advantages** | **Disadvantages** | **Features** |
| **Amazon Web Services**  **Industry Leader** | **Scaling services with traffic always meet demand.**  **Secure, Cost effective** | **Steep new user curve.**  **Locked in as your provider once you start using. (High switching costs)** | **Pay-as-you-go pricing model**  **Extensive documentation**  **EC2 scalability** |
| **Azure**  **Second Place** | **Integration with Microsoft Products, Security standards for compliance industries, Hybrid cloud model** | **Pricing structure is complicated, learning curve for administrators, and** | **Hybrid Cloud, Azure DevOps, Microsoft CoPilot and future AI features.** |
| **Alibaba**  **Asian Market Leader** | **Many Asia Data Centers, Advanced Security, Hybrid cloud model, less pricey compared to competitors.** | **Not as much of a global reach in providing service, Poor documentation, smaller developer community** | **Advanced Security Features, Is missing the presence of DevOps tools integration.** |
| **IBM Cloud**  **Best Data Analytics** | **Has prepackaged cloud solutions through Cloud Pak, Leader in Data Analytic features,** | **Less DevOps features can be integrated into cloud, much slower in adding new innovative features, less intuitive UI compared to competitors.** | **IBM Watson integration, Cloud Pak, Block Chain Technology, various different pricing models** |
| **Oracle Cloud**  **Large Scale Enterprise Applications** | **Integration with Oracles vastly used ERP systems, Built in DevOps tools, Competitive pricing** | **Less innovative on cloud-native deployment, Focused on Enterprise scale** | **Autonomous Database that limits user management, Integration with Oracles ERPs** |
| **Sales Force**  **Best CRM cloud** | **Heavily focused on supporting sales, Slack and tableau are integrated, AppExchange has predeveloped apps** | **Highly specialized in one business operation, Very high costs, limited focus outside CRM,** | **Integration with vastly used SalesForce CRM, Einstein AI, Tableau cloud analytics, Slack integration** |
| **Google Cloud Platform**  **Betting on the future of AI** | **Google at forefront of innovation has strong AI and ML potential, Contract pricing, Google’s amazing ecosystem,** | **Lower availability than AWS Azure, less support for ERP and CRM, Very high learning curve for new developers** | **Big Query, TensorFlow. Google Kubernetes, App enginer, is missing easy ERP or CRM integration** |

**Part 4 Concept Discussion**

1. **DevOps**

Dev Ops is a Technical Ideology that integrates the Software Development team with the Information Technology team that manages their software into one singular team. The main goal of Dev Ops is to increase the efficiency that new software is released and available to users, this efficiency is increased by using automation tools to test, integrate, and deploy software. The DevOps lifecycle is an eight-phase continuous cycle that consists of planning, building, testing, deploying, and observing data. DevOps collects user feedback on software and are able to add features and redeploy software much faster than the old software development lifecycle. There are tons of DevOps Software tools that support the lifecycle, and many of these tools are able to integrate together. For example, users can create stories on Jira, push code for that story to a repository, and have the code automatically enter the CI/CD pipeline. There are many benefits of DevOps such as more releases, increased collaboration, rapid deployment, and security. The biggest drawback of DevOps is adoption, it takes focus from the whole team to adapt this framework. It is important to focus first on processes and teams before selecting the tools you will use. Overreliance on using the correct tools can make adoption more challenging. The DevOps system needs to be consistently analyzed for improvements and what is working vs not.

1. **Microservices**

Microservices is the new software architecture approach to creating large software applications. This framework aims to separate services and make services not dependent on each other at all. By developing services to be loosely coupled they can be developed independently in different languages. Each service has its own database, but services can communicate with one another through APIs. It’s a huge benefit that one service can fail or be updated without affecting any of the other services, this increases the reliability of these large software services that businesses are very dependent on. Microservices use an API Gateway to handle all requests and route them to the correct Service. There is also the Service Registry pattern that allows Services to look up and find other active services to communicate with one another. One of the key aspect of Microservices is Containerization. Applications like Docker and Kubernates have made is much easier for Software to package an application and its library dependencies into one container that is portability between a developers local system and the production environment. The docker images ensure that a microservice has the correct versions as well as there is no overlap interference between dependencies which is very important considering the number of microservices that will be deployed on the same production environment.

1. **Software Automation**

Is the use of technologies to automatically perform repetitive tasks that happen during the software development lifecycle. Automation goes hand in hand with analytics, these automated tasks can be set up to collect analytics that teams can analyze and consider when designing software. The major benefits of software automation are increased efficiency, cost savings, and more accurate insights into the production ready nature of software. Once tasks like testing, integration, and deployment have been automated they can be reused over and over again and increase the efficiency in which teams release production ready software. Another aspect that can be automated with cloud computing is service scaling, based on the amount of traffic you can decide how much resources you want to pay for and this can be scaled down when there is less traffic. This saves costs even more on top of not having to manually test software. The CI/CD pipeline is founded on the principles of software automation. When a developer has a pull request approved, the code will be automatically integrated into the system, tests will run to make sure the new code has not broken any existing functions, upon all of the tests passing the software will be automatically rebuilt and deployed in the production environment requiring no human interaction. This process minimizes the downtown of services by catching bugs early and instantly redeploying services with the new features included.

1. **Site Reliability Engineering**

Site reliability engineering is the combination of software engineering and systems administration to support scalability, reliability, and the performance of software applications. They act as the guardian of a company’s live applications and actively monitor the effectiveness of software applications for its users. They use coding and automation to increase the efficiency in which the DevOps team is able to respond to unwanted software performance whether an application cannot handle the current demand or is unavailable all together. A key aspect of Site Reliability Engineering is considering the potential risks of Services outages, they then create strategies to mitigate the risk with uninterrupted business operations as the centerpiece of their goals. A vital element of Site Reliability engineering is logging, creating these automatic logging mechanism allows for Alerts of poor performance and tickets to be created for potential problems. In the past the idea of monitoring services and incident response was done manually by on call engineers, Site Reliability aims to automate these tasks using scripts to remove the human element from upkeep of services. Service level objective is a performance metric for software systems to measure how reliable and efficient they are based on the scale of use. Site Reliability Engineers closely monitor these SLOs and make changes to system design and computing resources to ensure that systems are able to provide services that meet the SLO metric.

**Part 5 Similarities, Differences, and Relationships**

**Similarities** The biggest similarity between DevOps and Site Reliability Engineering is the utilization of Software Automation to increase the efficiency of Software Operations. Knowing how to utilize technology tools to automate tedious processes like Integration testing, deployment, and log management is very apparent in both DevOps and Site Reliability Engineering. Another similarity is a common goal between Site Reliabilty and MicroServices, both share a common goal of increasing the availability of software and limiting the downtime.

**Differences** There are inherent differences between DevOps and Site Reliability Engineering, DevOps is focused on the efficiency of the software development lifecycle whereas Site Reliability Engineering is focused more on already production live software management. Site Reliability Engineering is focused on keeping released software reliable and available to users where DevOps is much more focused on the speed at which new software releases are made.

**Relationships** Micro Services and DevOps work hand in hand, because MicroServices increase the complexity in managing different software’s. DevOps increased efficiency to releasing new code is essential to make the benefit of Microservices a valuable tradeoff. Another relationship is between DevOps and Software Automation, Automation is the tool that makes the ideology of DevOps work. Using Software Engineering to develop scripts for different phases of the SWDLC that can be automatically ran every time new code is pushed. Integrating software automation everywhere possible will increase the speed at which new code is released and catch errors before they reach production.