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Assessment- 1 Understanding of Cloud Computing Perceptions for UWTSD staffs.

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Executive Summary

In this consultation report our aim is to provide to the UWTSD from Birmingham a comprehensive analysis of the benefits and challenges for implementing cloud computing services into their campuses. Based on our very detailed research, analysis and consultation with various professionals, we strongly recommend that UWTSD from Birmingham should implemented Cloud service for their activities. By doing this the students, staff members and lecturer can have different benefits such as: increased efficiency a better security and accessibility. In order to successfully implement Cloud services, the UWTSD Birmingham must be aware of several important challenges which may have such as, lack of adequate knowledge of their staff member and lecturer, training, skills, and necessary infrastructure. Moreover, we strongly recommend that UWTSD Birmingham should think to provide an appropriate training and support to the staff and ensure they have the necessary knowelage to operate and manage cloud-based services such as: Office 365 account with all its features.

Overall, by migrate to Cloud services the UWTSD Birmingham have a big potential to bring few significant benefits to the campus, staff and students. Next in this report we will give recommendations and going into more details, UWTSD Birmingham can easily ensure a smooth transition to cloud computing and realise the full potential of this technology.

Introduction

The UWTSD is a prominent UK higher education body with many campuses across the UK. This including two new campuses in Birmingham. The UK government ordered closed the entire economy due to the COVID-19 pandemic, the physical activities have stopped since March 2020 and same the UWTSD Birmingham, all the in person classes and other activities, have been moved exclusively online. As a result of this hard decision, the UWTSD Birmingham has not ready for this hard decision and realised that moving most of their activities to the cloud could be very beneficial for the campus and its staff, this was maybe the only solution to continue the activity. However, the senior management has also recognised that many staff, including lecturers, may not have good knowledge, training, hardware, or any IT background so they can use cloud services, and they may have big difficulties in using and accessing those services. Therefore, UWTSD Birmingham take the decision to contact a specialized company in Cloud Computing and approached Hitech

Cloud Ltd, a specialist cloud computing implementation consultant with several years in this industry.

This report will provide an overview of the main benefits and challenges associated with the UWTSD request of implementing cloud computing along UWTSD campuses. The main purpose of this report will be to provide to UWTSD Birmingham a clear understanding of the potential advantages and limitations of cloud computing and recommend strategies so they successfully can implement this services. The report is structured under different headings and subheadings to ensure that all staff members of UWTSD Birmingham can easily understand the content and findings.

Methodology

For this consultation report on how UWTSD can implementing cloud services along the campuses from Birmingham, we take into consideration a range of research methods and data sources. First of all, Hitech Cloud Ltd conducted an academic literature review to develop a comprehensive and deeper understanding of the benefits and challenges associated with this request and migrate to cloud in the education sector[1],[2]. This review included academic articles, reports, and other relevant sources. Secondly, we tried to understand how the UWTSD staff members, including lecturers, IT staff, and senior management used the local servers and software's so we can gain insight into the specific needs and challenges of the campuses. Moreover, we also consulted with other higher education institutions that have already implemented cloud computing to understand best practices and how the other implemented cloud computing services.[3] Finally, we analysed and put together the data collected from the literature review and staff member along with our deep research to identify the key benefits and challenges of the migration to cloud computing at UWTSD Birmingham. We will also use this analysis to develop recommendations for how UWTSD successful implementation of cloud computing can. [4]

Cloud computing: Concepts and Models

The cloud computing is a new technology that allow to access via Internet connection various resources such as: networks, servers, storage, apps, these resources can quickly be access and released with very minimum effort and knoweladge. The concept of cloud computing is quite new and started to become popular in 2000s mainly because of the development of virtualisation technologies and the need for scalable, flexible, these are an

cost-effective solutions because the companies or individuals doesn't need to upgrade all the time their hardware or software. Speaking about Cloud computing this technology offer several unique characteristics and features that distinguish it from traditional computers, some of those unique characteristics may include on-demand self-service, access the network, resource pooling, scalability. These characteristics will allow any user to access cloud computing resources when they needed and usually they only pay for what they use, and scale their cloud resources as they required. Moreover, cloud computing providers, usually offers three service models which are: Infrastructure-as-a-Service using acronym IaaS, Platform-as-a-Service using acronym PaaS, and Software-as-a-Service acronym SaaS. Given the acronym is very important because usually most of the people will refer to these services using only the acronym. Going deeper in understanding these services the IaaS model provide virtualised computing resources, including servers, storage, and networking, that can be used to build and deploy applications into the network. Secondly, the PaaS service offer a platform for developing, testing, and deploying applications without the need for managing directly the cloud service infrastructure. Finally, for the SaaS users have the most access and provides ready and use software apps that can be accessed through the cloud without the need for installation or maintenance [5].

In our context of UWTSD requirements, each service model offers several advantages and disadvantages. And is very important to go deeper and explain what actually each services have to offer.

- **IaaS** infrastructure is designed to provide the most flexibility and control from these three services and require a more management & maintenance effort, so the IT department of UWTSD need to be proper trained, the IT department will manage applications, data, runtime, middleware and Operating system. However, the provider will manage the hardware such as server, storage and network. Advantages of this infrastructure is due to simply scalability, that means the UWTSD will pay for the resources only what they will use and if they will need more resources easily the IT department can scale up or scale down. Disadvantages are due to security and control complex and the IT department will have to implement security measures and policies. [6]
- **PaaS** provides a balance between control and ease of use but may limit the capacity of IT Department to customisation of some options. By default PaaS the developers can use very quickly this infrastructure to develop and deployment

different apps. For this infrastructure the IT Department will manage, application and data.

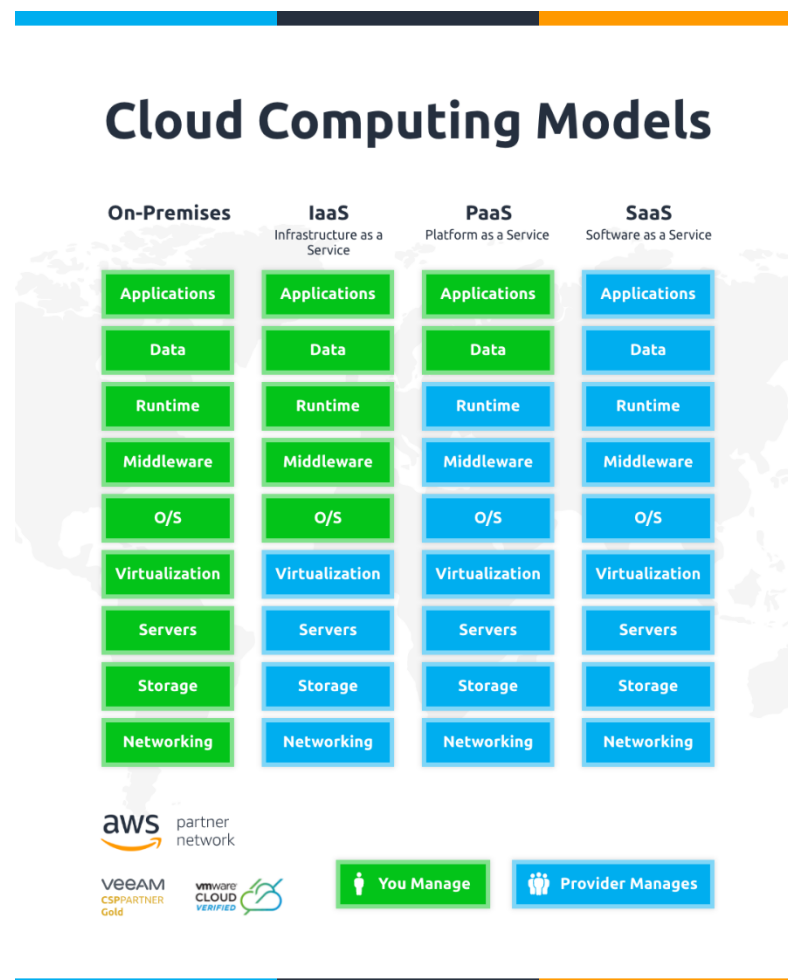
Advantages, simple management and development speed, this infrastructure is more easier for non-experimented IT departments such UWTSD, by simple management the IT department can access this services using any computer with access to internet.

The main disadvantage for this service is due to the inability to predict scalability which the UWTSD may need. [7]

- **SaaS** provides the full control to the Cloud providers, this infrastructure is most easier to be implemented due to is available strait away and can easily be accessed using any internet browser. For this infrastructure UWTSD will not have to worry about any maintenance or software update and this responsibility will be to cloud provider.

Advantage, immediate access to use and simple scalability.

The main disadvantage is due to the fact that you won't have access and control to this infrastructure and all access is to provider. [8]



In order to decide which services are best for this project, the service model choice should be based on the unique UWTSD requirements, such as customization, scalability, and security.

Cloud Services and Mitigation of security issues

For migrating to an Cloud enviroment, the UWTSD and HITACH need to take very serious into consideration the Cloud security, this is an crucially aspect of cloud computing as the data and applications hosted in the cloud need to be protected from a vast of security threats which today we faced. The importance of cloud security is very important for any organization to be able to ensure that the confidentiality, integrity, and availability of cloud resources and data stored is secure. Without adequate security measures, Cloud enviroment may be vulnerable to different type of cyber-attacks and ultimately could result in data security breach, loss of important data, and financial loss. Moreover, cloud security is also necessary for compliance with UK Government requirements, such as PCI DSS UK and UK GDPR [9]. However, cloud computing offer unique security challenges that need to be taking into consideration very serious. These may include data breach, data loss, identity and access management, compliance, and multi-tenancy issues. Data breach is when a third party obtain an unauthorized access to sensitive data stored in the cloud system. Data loss can occur due to natural disasters or hardware failure or sometimes due to malicious attacks. Identity and access management issues is when users have access to more data than necessary. Compliance concerns in our case is when cloud providers fail to meet the UK regulatory requirements designed especially for Tech companies. Multi tenancy occur when multiple users share the same computer or device, and an experimented hacker could use this vulnerability in one user application to access another user data. To mitigate those security concern, providers of cloud services are using various advanced security measures, such as: encryption the data, access control, data backup and recovery, and monitoring the system for security purpose. Encryption the data is used to protect data across all cloud infrastructure, and access control will make sure that only authorized users can access sensitive data. Moreover, data backup is used to ensure that data stored and managed by users can easily be recovery in case of any data loss. Security monitoring is use to detect any anomaly of security threats in real-time. By offering these security measures, cloud services providers can mitigate the potential security risks of cloud computing and ensure the confidentiality, integrity, and availability of cloud resources.

Virtualization & Hypervisor and Modern Cloud services

- **Virtualization**

Is the process for creating many virtual machines instead of using different PCs, this allows the user for creating, O/S, server or a network resources. In the context of cloud computing, virtualization allow multiple users to access shared resources on a cloud infrastructure, such as computers, storage, and networking, through the creation of these virtual machines (VMs). This technology allow users to use more efficient hardware resources to reduce costs and provide a better flexibility and scalability because VMs provide different ways to run multiple OS on a single PC [10].

- **Hypervisor**

If the VMs replace the traditional physical PCs, the Hypervisor is the software programs that allow to create and manage those VMs. Hypervisors have two types: Type 1 and Type 2

- Type 1 hypervisors, also known as bare-metal hypervisors usually type 1 is more efficient and have a better security than type 2, and will run directly on the host machine hardware, managing resources and providing a platform for virtual machines to run.
- Type 2 hypervisors are more easier to be installed and use than type 1, but this type have some security vulnerabilities and lower performance than previous type. Also is known as hosted hypervisors, and is running as a software layer over an existing O/S.

Overall, both virtualization and hypervisors play a crucial role in enabling cloud computing by providing a platform for running multiple virtual machines on a single physical machine [11].

- **Modern Cloud Services**

In today world where we are facing an amazing digital transformation the Modern cloud services revolutionized the way businesses operate by offering more efficient and cost-effective solutions for any IT infrastructure.

Modern cloud services have different type such as: containers, Dockers, serverless, Kubernetes, and Function-as-a-Service (FaaS).

Containers is used to offer an efficient deployment of applications and their dependencies. The Dockers provide a platform for creating and deploying and managing those containers.

Serverless computing is designed to allow users to execute code without worrying about the underlying infrastructure. While Kubernetes known as K8s is a open source system that provide a scalable and flexible platform for managing the apps. Ultimately, the FaaS allow users to create and deploy any applications without managing the servers.

Each of these services offer unique features and for example, if the UWTSD will require an efficient way to deployment any applications, containers and Dockers may be the best solution. Moreover, if the UWTSD require a scalable and flexible platform for managing containerized applications, Kubernetes may be the best option [12].

Findings and recommendations

After conducting research and analysis by HITACH team, we strongly believe that UWTSD can benefit from implementing cloud computing services for its Birmingham campuses. The main benefits of UWTSD in adoption the cloud computing will be, reducing costs, increase efficiency and scalability, and provide more flexibility. In terms of cloud service models, all three infrastructure can offer unique features and benefits to UWTSD depending on their specific needs.

Regarding security measures the UWTSD needs to take proactive measures to ensure that their data in the cloud is secure. The IT Department should prioritize implementing security measures such as data encryption, access control, and regular data backups to protect any sensitive information. Furthermore, UWTSD should also consider offering to IT Department a comprehensive advanced training to ensure that the cloud infrastructure choosed will be proper managed.

In terms of virtualization, UWTSD can benefit from implementing a hypervisor-based virtualization solution to improve resource utilization and also reduce costs. Different types of hypervisors can be considered based on the UWTSD specific requirements and resources.

Based on our findings, we strongly recommend that the UWTSD should migrate to cloud computing services. Also, the UWTSD should prioritize implementing security measures to protect their data and develop a comprehensive implementing cloud infrastructure plan.

Implementation Plan

We can suggest an implementation plan to the UWTSD in three phases. This implementation plan will ensure a smooth and efficient transition to cloud computing for UWTSD, while also mitigating potential risks and maximizing the benefits of cloud services.

Phase 1: Assessment and Planning

- First, we will need to conduct an analysis of UWTSD current IT infrastructure and to identify areas that can be migrated to the cloud.
- Together with UWTSD Finance and IT department develop a detailed plan for the migration process, including timelines, budget, and resource requirements.
- Contact different cloud service providers to determine the most suitable cloud service models for UWTSD.
- And conduct a risk assessment to identify potential security risks and develop mitigation strategies.

Phase 2: Migration and Deployment

- Start the migration process by moving non-critical applications and data to the cloud.
- Set up the necessary infrastructure for the cloud service model choosed.
- Deploy security measures to ensure the protection of UWTSD data and resources.
- Conduct thorough testing to ensure the functionality and compatibility of migrated applications and data.

Phase 3: Optimization and Maintenance

- Monitor and optimize the cloud environment to ensure optimal performance.
- Provide advanced training and support for IT department and other staff members to ensure effective utilization of the new cloud infrastructure.
- Establish a maintenance plan to ensure the ongoing security and functionality of the cloud environment.
- Continue to review and assess the cloud environment to identify areas for improvement and make necessary adjustments.

Conclusion

In conclusion, we have provided a comprehensive and independent report of the potential benefits and challenges for implementing cloud computing services. We have outlined the key concepts and models of cloud computing, we discussed the importance of security in cloud infrastructure and, identified potential security risks and mitigation strategies. We have also explained the benefits of virtualization and discussed the different types of hypervisors. Based on our findings, we have provided specific and actionable recommendations for implementing of the three cloud services, IaaS, PaaS, and SaaS solutions in the UWTSD IT infrastructure, along with an implementation plan in three phases. If the IT department require any further support in migrating to the cloud and implementing the recommended solutions, we would be more than happy to assist.

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