Cloud Based Management System for RMG and Comparison of Efficiency

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A thesis submitted to the Department of Computer Science and Engineering
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Declaration

It is hereby declared that

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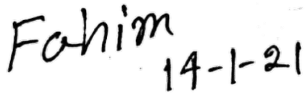

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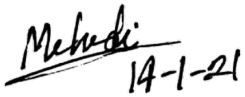

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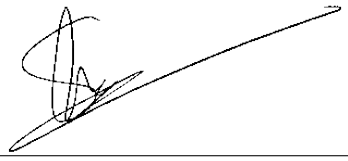

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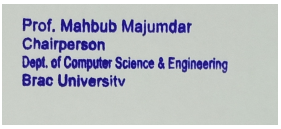

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Abstract

From technology startups to multinationals companies are starting to use Cloud Computing System, and the transformation is drastic. According to recent search just about 20 percent of companies have implemented cloud computing in order to gain more from production. Infrastructure as a Service (IaaS) has already made their move and its growth is increasing by 50percent annually. The success of IaaS means that companies are getting more help from cloud based software and resources that are being provided by cloud from large group of companies, crowds, engineers, and system personnel. IaaS users are probing for an improved cloud management system to help manage their increasing valise of cloud based approach. Using Cloud to cloud (C2C) or Wire-less mesh network (WMN) cloud management can step into a much developed stage. A cloud management system creates opportunity for organizations to use, maintain, oversee, observe, and administer utilizations over public and private clouds which ensures that agility and cost savings could be achieved by the company that uses the management system.

Keywords: Infrastructure as a Service, Cloud computing, Wireless Mesh Network, Cloud to Cloud, Cloud Management

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Chapter 1

Introduction

1.1 RMG Sector in our Country

Not too long ago, a drastic change in the organization and characteristics of computer networks and Tele-communication networks. Especially, in the daily life of a human being, the approach involving IP technology in the networks have become a necessity. However, this technology is still in expansion and a lot needs to be taken care of. Next generation network is already on its way and from serviceable point of view, this following network is a broadband multi-service network, which can supply merged and reformed services such as data service, voice service, video service and etc. to the wired or wireless user medium. So, it can be said that network technologies, infrastructures and services are facing drastic change in the near future. Because of that, present-day models are unable to fulfil specific requirements. Speaking of specific, traditional management systems are unambiguous system for controlling and as the complexity of Network Management System increased day by day, the grid ascends and the number of new provision in the system for controlling will increase at a rapid pace. From this statement we feel very confident to say that it is going to cost a lot of money for network management and network maintenance. Because of that, next generation network requires an effective and productive network management archetype. Telecommunication and network industries have already identified this problematic issue and investing their utmost attention to resolve it. One of the major origin of growth in our country's economy is Readymade Garments (RMG). Largest portion of foreign currency exchange comes from exporting these textile goods. In 2002 77 percent of our countries earnings were accounted by exporting textiles, clothing RMG. World Bank approximated in 1972 that the gross domestic product (GDP) of Bangladesh grew up to from USD 6.29 billion to USD 173.82 billion by 2014 and 82 percent of RMG was send overseas during that timeline helped to generate USD 31.2 billion foreign currency. In 2016, Bangladesh holds the second place in RMG trailing China. Many of the leading fashion brand such as HM, Tommy Hilfiger, Adidas etc. have set up their production process in our country which makes our country second-largest readymade clothing exporter. 5 percent of the textile factories are owned by the foreign investors but the rest 95 percent is owned, controlled and maintained by the local investors. In the year 2016-2017 USD28.14 billion was generated which was also 80.7 percent of the total export earnings in exports and 12.36 percent of the GDP by RMG industry. RMG industry is also practicing green manufacturing process. RMG industry is also decreasing our

unemployment rate. In 2012 45 percent of all industrial employment was accounted by the textile industry. Over the years, buyers and sellers in the industry has been criticized because of the deadly accidents happened in the industrial building. A lot of people have demanded justice for worker safety violations and dedicatedly working with the government to increase safety protocols so that workers don't have to work in such a risky environment. Government and the industry authority has taken proper steps to ensure safe working environment for the workers but many argues that, the taken steps are simply not enough. The definition of Cloud management is software and technologies designed for operating and monitoring applications, information and services residing in the cloud. Cloud management components helps to make sure that cloud computing based assets are working optimally and properly interacting with users and other services. Cloud management strategies generally involve number of tasks such as security, compliance auditing and management, initiating and overseeing disaster recovery and contingency plans and performance monitoring which includes monitoring, up- time, latency etc. Day after day cloud computing is getting more critical and different kinds of private, hybrid and public cloud-based systems and groundwork already in use that components collection must be flexible and scalable of a company's cloud management because it is a very important cloud computing strategy. The process of sending-receiving all or part of company's information, applications and services from on-site establishment behind firewall to the cloud, where the data can be come up over the internet on-demand basis. It can cause a many challenges and security issues but cloud computing can also help a company to a great deal such as reducing capital expenditures thoroughly and operating, maintaining costs while also earning interest from dynamic scaling, high obtainable, multi-tenancy and constructive resource allocation advantages that cloud based management offers.

1.2 Aims and Objectives

Cloud computing is globally used network system which will help next generation management system much more efficient and productive. Focus of this study is to build a cloud management system for our RMG management network system which is much more efficient than on premise infrastructure which is clearly not the efficient way to use network management in RMG sector at all. We have to find a way to make our cloud management system that is much more user friendly, less costly, much easier to deploy, keeps organizational data safe and secure, less time consuming and does not need a maintenance group. Firstly, we had to analyze possible cloud management networking model that will follow all the above qualities. Then we had to check if our identified networking model is suitable for RMG sector. Then we had to see if our deployment model is faster than before or not. After that, we have to find out if the cost of the services are higher or lesser than before or not. Also, we have to make sure our analyzed model is secure than before. Our goal is to create a better networking management system than current system that is running in our RMG management system. For creating such a cloud networking model for our RMG sector, we have to study a lot of papers related to this concept so that we can safely say our cloud management system will definitely improve RMG sector and increase efficiency.

1.3 Limitations of RMG sector in our Country

RMG is a very fast growing organization in our country and our GDP is very much depended on RMG sector. RMG sector is a large network in our country but this organization is still using on premise infrastructure system to maintain their productivity and communication. On premise infrastructure system is very expensive to set up in the organization, need a large number of specialist for managing and maintaining. It has less scalability because entire structure has been already procured. Moreover, it needs large space area for server and also if any data gets lost in the system it is very hard to recover the lost data. It also consumes a lot of time to deploy and has very poor data security. Scalability is also a big issue here because it is very costly and cannot be extended without a lot of maintenance. Data in On premise infrastructure can be accessed remotely which also raises high security risk for intruders to manipulate data and harm the networking system. As RMG is a leading and fast growing industry in our country, this issues are limiting the efficiency and productivity of this sector. It is also unnecessarily expensive and consumes a lot of time which is a challenge that needs to be looked at for an important sector as RMG in this country.

Chapter 2

Literature Review and Related Work

Ready Made Garments is a vast sector in our country. As the efficiency and productivity is poor in our RMG sector our countries economy has also got depended on this sector. Because of that, development of our country faces challenges every year and GDP drops drastically. In order to avoid these obstacles and challenges, many researchers have tried to come up with effective solution regarding this issue. To be more accurate, many authors have tried to use cloud management system to improve various managerial and networking issues in organizations.So, we have tried to review some of the researches done in this following sector.

Before working with cloud management we have thoroughly studied on premise management also known as human driven management which is largely used in our country at the moment. Wu et al. [1] in this paper have pointed out some of the limitations and drawback of on premise network management. They also mentioned the differences between cloud and on premise networking. Firstly, almost all of the typical network management models are not only consolidated and closed, but also are generally Managed-Agent prototype. Such prototype can only execute restricted management functions. Therefore, it cannot perform constructive management of new services in future open service environments [1]. Because of that, an up to date network model has become the necessity to fulfill all the essentials of the next generation network. Secondly, the writers stated that such model has to be developed network-driven style other than human-driven or element-driven style. Beforehand, almost all management related activities were done by humans [1]. The management system model we are trying to develop is network-driven. So, this is a key point in the paper. Thirdly, the authors stated that after the evolution of NMS (Network management system), the element-driven model became largely popular and got used all over the world. When an error occurs Network management system can collect the occurrence sent by network equipment. Then, without dealing with any of the errors NMS will directly delineate them to the operators [1]. Cloud management system will solve these errors as cloud provider is continuously maintaining the services provided. Fourthly, during the period of NMS the provided services could be shut out to undertake the service quality to end users. NMS has to maintain the network vigorously. If error occurs, NMS is capable enough to modify the network and perform wide range of specific management works to assure nor-

mal network functioning by itself. This methodology is known as "Network-driven style", which signify that the network is driven by NMS to fulfill its tasks, not just identifying it [1]. This proves that network driven model is faster and less time consuming. Fifthly, indistinguishable ideas have been acknowledged but restriction of requisition in IP grid still exists in information transmission. The writers also added that the model should be dispensed, rather than consolidated [1]. Dispensed management is far more efficient than consolidated management, especially when failure of a single manager could cause the network to get out of control or crash unexpectedly. Because of that, we have to create a realistic administer controlling model which is controlling middleware. We will install plenty of management middleware such as database middleware, application server middleware inside the network so that the network management system runs smoothly. Moreover, the elevated level controlling requisitions achieve their undertakings within the association of middleware. By middleware, the unpredictability of basic grid is straight-forward to the requisitions. Suggested by the authors of the paper, open loop framework does not require assessment or error handling and also easier to maintain. However, we are trying to build an efficient management system which requires error handling and assessment. Although it is harder to maintain but the management system will greatly benefit from that so we are eager to implement closed loop framework in our system. With the assessment data, NMS involuntarily take out specific controlling works simply to keep the grid functioning spontaneously. However, scalability, heterogeneity, data consistency, service integration, interoperability and etc. are the characteristics that has to be satisfied by the management model explained above [1]. We have to fulfill all these requirements in our system so this point is very important in the paper. Hopefully, each and every single one of these factors will enormously build the multi-faceted nature of modern controlling requisitions. Lastly, to face these unique obstacles, the authors also proposed network control model should be diverted to C2C (Cloud to Cloud) network management model. The authors also added that the reason behind difficulties to create a wireless network management is access network management which is highly depended on variety of components. To overcome this challenge, they suggested that lot of servers should be deployed in the network management and by adding these servers in the middleware network management system can perform service management tasks whenever requested by users in the cloud [1]. After analyzing both network driven and human driven system we can safely say that network driven management would be much more useful than human driven management and it should be cloud network driven management focuses on Wireless Mesh Network mechanism (WMNs). WMN is an unconventional wireless access networks, which are not similar to any other typical wireless networks as they are considered as the mixture of WLAN (single-hop) and mobile AdHoc networks (multi-hop) [7]. As our cloud management services will be provided in different sectors of an organization which will create a cloud mesh network. So, this point should be noted. The authors have described some beneficiary of WMNs such as self-organizing, self-repairing, multi-hop cascade and many more. Because of that a lot of scholars and experts have studied and evaluated WMN. WMNs are analyzed mainly by simulation. However, recent study shows that the appraisal of the working protocols and algorithms managed by simulation to understand the constructiveness of the suggested solutions could bring about just somewhat illustrative of mesh scenarios. Hence, a huge space is created

in the middle of solutions proposed in literature and their experimental evaluation. Therefore, many papers are being placed experimental test beds but after that, the following obstacle is how to maintain and look after these large and mobile networks [7]. As we want to develop our model to the highest level we are interested to try and learn the implementation process of WMNS. Moreover, the author proposed to make wireless network study more easier and maintain networks more efficiently, this paper puts its center of attention on how to execute constructive management in the long-distance, large-scale WMNs [7]. We believe this proposition will help us to improve our system. Furthermore, Hu et al. [7] shows how to design and execute a cloud computing based management system also known as CCMS for WMNs [7]. Cloud computing management for WMNs will take us one step closer to our goal. Moreover, authors have also explained the architecture and installed a test bed to get expected result through experiments. They also gathered performance and the viable errors they have faced and solution of those errors [7]. We can gradually move forward while developing our system based on their experiments and analyze the efficiency of the following management system. In the following paper, authors have also suggested that WMN can be developed using web service which helps largely to collects information and groups it then reintegrated the data it accumulated for management. They also advised to use Python a high level programming language that is used to data exchanging among background management system and network devices [7]. From this we can say that we have to explore the idea to use python language for data exchange between background management and network devices. Lastly, the authors of paper [7] have taken assistance of Cloud computing which provides infrastructure, manifesto, and software application as services are made accessible as community-oriented services as a measured usage model to end users. These different services in the industry could be classified as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) [7]. As we are trying to build cloud management we have to identify from which service we could greatly benefit from. The paper has brought to life an approach that could make a network management system very effective in RMG field.

Wilianto et al. [9] began with saying that Information technology service management (ITSM) or relationship management is an analysis about client services in relation to an information technology substructure [9]. Our job is to design, scheme, implement, manage and supervise network management system which also depends greatly on information technology. The authors added, Information Technology Library (ITIL) lays out the foundation for better implementation in Information Technology Service Management (ITSM) [9]. ITIL means the list of components that needs to maintain the ITIL such as computers, servers, data storage devices, networks and various communication devices etc. Wilianto et al. [9] also mentioned the framework to betterment of the process are,

- Service strategy
- Service operation
- Service design
- Service transition

Wilianto et al. [9] indicate towards the common representation of Infrastructure as

a service(IaaS), platform as a service (PaaS), and Application as a service (SaaS) in the cloud. Moreover, they also showed the service design of cloud computing [9]. Analyzing this service model could help our work tremendously. Wilianto et al. [9] also gives a non-comprehensive scenario of the key aspects creating cloud computing such as models, locality, shareholders, differentiate, benefits and many more features [9]. As we are working on cloud management we maintain these qualities to make it effective and useful. Cloud computing substructure has five benchmark and these are on demand self-service, broadband access network, resource pooling, rapid elasticity and steady service. These are the benchmarks to make any structured management system. Wilianto et al. [9] says, the classification of services was calculated with the following stipulators. The medium of highest speed data transfer is Bandwidth and it is estimated in bits/s. However, the original data transfer rate is known as Throughput. Latency is the continuation between the sender and the receiver. Jitter calculates the arrival time disparity [9]. For maintaining management system this section could play a vital role. Lastly, bit failure rate calculates the numerical values of corrupted bits in percentage of total circulated data and information[9]. This will help us to troubleshoot errors. In this paper authors have pointed out the importance of information technology and many services in order to create a network driven management system and how to maintain it.

Hughes et al. [4] emphasizes on security issues, risks and betterment of those issues in cloud environment. Hughes et al. [4] proposed a security strategy familiar as Predicate Based Encryption (PBE) which represents a group of unbalanced encryption and Identity is derived from base encryption. This process consolidates attribute-based access control (ABAC) with unbalanced encryption, allowing for single-encrypted / multi-decryptor environments to be put together by utilizing only a script [4]. As our system will contain sensitive information about the organization and users, protecting these data and information would be helpful to create a safe management environment. Authors have also pointed out some limitations regarding this precursor-based encryption as it focuses on its application both as a service and as a software platform. Moreover, this proposed strategy also includes undesired vulnerabilities, unwanted leaks, and other unwanted violations of the privacy of cloud resident information [4]. As we keep working on a cloud management system, we have keep an eye on these problems which could jeopardize the productivity of the system. Hughes et al [4], designated some of the security issues of the cloud is

- Unguarded distributed technology
- Data loss or leakage
- Uncertain application interfaces
- Atrocious use of cloud computing.
- Hostile user

Authors have highlighted these problems so we have make sure that our system does not have these qualities in order to protect the system and user data information. The authors also pointed to the fact that user and organization is trusting service provider to not breaching terms and conditions and safely keep their information [4].

Breaching this terms and condition would be a downfall for the system organization. They also added that sometimes terms and conditions are changed without user knowledge. This creates confusion and certain terms that user did not agreed upon [4]. This is a key point to maintain user satisfaction. Privacy has been a big issue for a long time as the authors mentioned. Password protection and data encryption will ensure users their needed privacy. To ensure data security, the authors proposed some following targets that could make the system much more protected.

- Data stability
- Data integrity
- Data encryption
- Data accessibility
- Virtual image stability
- Virtual image integrity
- Virtual image secrecy
- Storage devices
- Service availability
- Communication medium

These requirements have to be fulfilled so that data and information of user stay protected as it is said on paper [4]. These requirements will help us improve our cloud management system so this should be noted. Author also gave some solutions towards some specific problems such as User confidentiality could be increased by user and resource seclusion and derivable data. They also added that in order to improve remote access authentication, authorization, location and retraction procedures could help a great deal. Stability and error tolerance also plays an important role in protecting user information in the cloud [4]. So, we can strongly agree if we maintain these requirements then our system can protect user data at all situation.

Maddineni et al. [6] discussed some security strategy for data protection in the cloud. The theme of this paper was to identify appropriate security strategies to understand security threats and diminish them from cloud computing. This study spotted a total of 43 safety barriers and 43 protection strategies. Maddineni et al. [6] stated that most commonly evaluated feature is privacy (5 percent). After that comes, sincerity (2 percent) and availability (3 percent). In his research the author pointed out some of the challenges in cloud computing where majority of the challenges are in ensuring data privacy (74.6 percent), performance (63.1 percent), availability (63.1 percent) and integration with in house IT (61.1 percent). Rest of them are inability of modification (55.8 percent), controlled requirements dis allowance (49.2 percent), insufficient providers (44.3 percent) and so on. His research also stated a survey in 2010 has proved that 58percent general population and majority of senior business leaders are eager to see the potential of cloud computing. Almost all of the people involved in the survey have expressed their concerns about the privacy, security and accessibility about their data in the cloud [6]. From this survey, we can understand that security issues could largely effect a cloud system and if security measures are taken lightly then the cloud system will be inefficient. It is largely

based on survey about cloud computing [6]. From this survey the author came up with some strategies that will eradicate cloud computing challenges. Such as,

- SSL Encryption
- Virtual Private Network (VPN)
- Internet Protocol Security (IPSec)
- Third Party Auditor
- Service Management API
- Execution of strong API access control

Maddineni et al. [6] believes some of these strategies will increase the data protection in the cloud. So, we cannot treat this statement lightly. The author also mentioned some of the challenges that he faced during these surveys. Following challenges were,

- Security agreement rules
- Secure identification of users
- Secure communication
- Secure audit such as security logs

We have to analyze these challenges and make sure that our system does not get damaged by these issues. The author also indicated some of the future problems that a cloud computing can face such as,

- VM (Virtual Machine) security
- Trusted transactions
- Hypervisor viruses
- Misuse of cloud computing
- Sensitive shared technology

These future problems could be harmful to our cloud management system so we have to take necessary steps against these problem so that our management system performs tremendously.

Karahroudy et al. [3] started with some general information and classifications of cloud computing. Karahroudy et al. [3] mainly focusses on Security Analysis and Cloud Computing Framework with Partially Distributed File Systems. In this paper, a technology called Partially Distributed File System (PDFF) was developed with the party that developed as a protocol for modifications to existing GFS / HDFS [3]. There are four main components to this PDFSP

- Client accessed machine
- Public UI machine
- Cloud management server
- File recovery server

All of these components work perfectly to get the confirmation of the data is being sent so it doesn't go wrong. Partially distributed file system process is mastering raw data which will improve the data reading performance. This process could be beneficial to our management system so this is a key point in the lecture. Karahroudy et al. [3] also addresses three issues of security: privacy, authenticity and availability [3]. We have discussed certain problems and their solutions in previous reviews. Some of the strategies outlined by Karahroudy et al. [3] for data safety and integrity in cloud computing were Ingenious tree-based key management, privacy-augmented data externalization to the cloud, privacy access control protection for the cloud, privacy-inflated keyword searching in the cloud and universal remote integrity testing for personal data. Karahroudy et al. [3] described a procedure empowers efficient multi-client keyword searches and conceals private data in search queries. This statement and procedure could play a vital role developing our system. An encryption process for a system which followed two-stages was introduced to fulfil flexibility and access control in the cloud. The experimental results pointed to the direction that proposed scheme is well-organized, to be specific when the length of the data file is too big or frequently checking stability. In this study, an algorithm known as RSA has been implemented for forensic communication and to encrypt and decrypt the file while another algorithm MD5 algorithm is introduced and used to cover tables for unauthorized users as well as for digital signatures. The two algorithms provide three (3) aspects of security that are confidentiality, acceptance, and availability. Karahroudy et al. [3] replication of shared key process has been used to protect and secure user data and also a voting method to check the stability of shares. However, some other techniques were mentioned but we think those techniques are unrelated to our research.

Khan [8] proposed a technique known as Access Control and Data Confidentiality to protect user data. How to implement access control policies inside the cloud structure was the primary goal of this paper [8]. Access control is a primary element of program security that confirms secure technology and access control policies mainly used to protect confidential data. We have to make sure that we implement proper authorization process, encrypt the data in order to make our system access controlled. The author also described a scenario in Medical/Health care where he came out with the following structure as Data Owner (Medical center), Data Consumers (patients, nurses, doctors etc.), Service Provider and accountable administration. A deployment model was to be proven successful where data confidentiality and authentication method was very effective in Infrastructure as a service and because of that it has been highlighted at large [8]

Ga et al. [10] the authors tried to point out a technique known as Enhanced Mutual Trusted Access Control-Algorithm (EMTACA). Trust management is plays a vital role in cloud computing as they lay out virtualized and scalable web services to the users. It is not about the value which is right or wrong. Trust is about the reliability in something that is expected as promised. Trust is needed to solve problems caused by uncertainty and vulnerabilities due to the openness of cloud computing. Ga et al. [10] discusses about the trusted and reputation system. This model first determines the amount of users Behavior information and secondly the correction factor and ultimately the response system give the identity of trust. The process, which

takes the degree of trust of the user. Among other things, values including resource usage rate, service availability, applications weaknesses, user access frequency, time, environmental conditions, unauthorized access, etc. can pinpoint user behavioral belief. Nevertheless, things like operation success rate, error rate, repair rate etc. are reasons to failure. Ordinary cloud users tend to choose service providers that provide reliable services. Trust values help the user to choose the most reliable service provider. Trust value can be measured by 0 to 1. 0 referring to not trusted and 1 being the most trusted service provider. One of the benefits of using cloud service is it gives both the users and service provider equal administrative power within the cloud environment. During uncertainty or malicious attacks interactive trust can also be defined as a bridge between cloud users and service providers. Interactive trust is gained by a common threshold trust standard held for both clients and service providers. If and only these two entities achieve the threshold value of trust, there may be service requests and provision of services. It indicates to a faith-based decision. In our Cloud Based RMG Management System we can use EMTACA. Because the users must have faith on the system. And by using EMTACA we can gain trust from the users.

Georgiou et al. [11] the authors discussed about ongoing security policies for cloud computing. The justification behind elevated security policies are to safeguard user information, enact certain rules for the misuse of cloud computing, eradicate risks and assist to follow compliance with regulations [11]. Georgiou et al. [11] largely focused on Software as a Service (SaaS) and manifested a detailed review and research about the general concern of security in cloud computing. Author gave importance to the existing threats that are not applicable to conventional system [11]. In order to identify integrated rules in the cloud policy, he proposed a methodology to asses all kinds of threats in the cloud. Many organizations inspect the advantages and potential danger of cloud services in order to business assessment. As the name "Cloud computing" suggests, execution and operational nuances, for example, area, are unessential, which is a great effectiveness. Lamentably, because of not being a conveyance model that is effectively hazard surveyed, and there are circumstances in which cloud computing can't be viewed as adequate without a more elevated level of affirmation than is at present given. Associations need to assess cloud computing hazards, recognizing fitting controls and use cases. One of the biggest obstacle is elevated security and also a great challenge for turning the next generation networking as a practicality. In cloud data center, sensitive data and applications are continuously moved and runs as virtual computing resources in virtual machine. Nevertheless, in order to keep information and data secure that are being processed in data centers, end users should be confirmed about

(a) the real presence of the cloud computing environment in the world
(b) the reliability of frameworks in cloud computing environment
(c) the security of information in the cloud

Georgiou et al. [11] had set their goal to find out the exact issues that is ongoing in the cloud computing environments and help end users perceiving the unmistakable and elusive dangers related with their utilization and some future tentative arrangements. Georgiou et al. [11] researched the relationship of trust to the cloud computing environment very thoroughly. Information assurance, security - Ethics was the main variable in the overview led. The relationship of confidence will be the

vital Components before distributed computing acknowledgment by MNEs when all is said in done and specifically. The outcomes show solid association between the information where perception and information examination were talked about Security, security and morals in a distributed computing climate. Because of observational investigation, it is Paper Cloud Services offers an IT reasonable rule for the specialized climate. This is the rule proposed one stage towards overseeing IT experts (People-product Problems) just as overseeing IT work force in a specialized climate, for example, distributed computing to keep away from any conceivable security and/or information penetrates Damage which is generally determined by shameless conduct. The proposed rule is transforming into a need as a result of the new distributed computing climate and I.T. globalization. The rule presented the sort of three essential principles which has been portrayed in ten unmistakable sub-rules (ventures) to achieve security and information assurance.

Heiser et al. [2] author sates some key findings from his research these are

(a) The most effective to assess the barriers associated with using an application in the cloud to do this is to get a third party
(b) Data detachment, data seclusion, authorized user access, service provider viability, availability these are the cloud computing IT risks areas.
(c) Freedom of location and as a result of "subcontracting" the service provider IT risks, legal issues and compliance issues that are unique to cloud computing
(d) If your business managers have unauthorized use of external computing services, then they are blocking and making unfamiliar and creating corporate security policies uncontrolled data-related risks.

Heiser et al. [2] also sates some recommendations these are

(a) Companies that have IT risk assessment potentiality and control from the outside source services should be applied to appropriate aspects of cloud computing
(b) Regulatory, legal and oversight issues related to location freedom and services subcontracting should be evaluated before using cloud-based services.
(c) Demand for transparency. Do not contract for IT services with any vendor who refuses provide detailed information about its safety and sustainability management programs
(d) Create a strategy for controlled and secure use of alternative delivery processes, so that business managers know when they are suitable for use and one of them follow the approved recognition process.

Heiser et al. [2] defines cloud computing as "a style of computing where IT is actively widely scalable. Skills are provided 'as a service' to external customers using Internet technology from a safety and risk perspective" It provides the least transparent external encouraged service methods, often storing and processing your data externally in multiple unspecified locations containing encouragement from other, anonymous suppliers, and multiple customer data. Following model saves a lot of money but it does not simply identify the same risk, like any service provided externally, rather adds some more challenging risks. If an organization considers the use of any external services, it needs to:

(a) Assess security privacy and regulatory compliance risks
(b) Recognized cases of misuse of this service delivery method based on risk level and current control
(c) Pinpoint acceptable levels of risky use for service delivery methods
(d) Choose and apply compensation controls before they become fully operational.

If we follow these things in our RMG management system, we will be greatly benefited. Heiser et al. [2] suggested these following things to evaluate, these are

- Privileged User Access
- Compliance
- Data Segregation
- Availability
- Recovery
- Investigative Support
- Viability
- Support in Reducing Risk.

In our RMG Management Systems these qualities are highly essential.

Sun et al.[5] point out about security issues, privacy issues in cloud computing. Security is the biggest obstacle has long dreamed of computing as a utility for a new era. Security matter in the cloud computing environment is tiered into 4 sub-division these are:

(a) Process of providing safety mechanisms
(b) Process of keeping data confidentiality
(c) Process to increase transparency
(d) Process to prevent service overtaking

Privacy is the proficiency of one or multiple to disclose information about themselves or themselves and through this they express themselves by choice. Privacy issues vary with different cloud views and can be divided into three subcategories which are:

(a) How users maintain control over their data cloud storage and processing
(b) How does it guarantee data replication in an authoritative and consistent manner
(c) Which gathering is answerable for guaranteeing lawful necessities for individual data

Providers have to maintain these things. Trust is viewed as quantifiable convictions that can settle on solid choices utilizing experience. The issues of trust in the distributed computing condition can be separated into four sub-classifications

(a) How to define and assess reliance as indicated by the extraordinary trait of distributed computing situations

(b) How to deal with noxious suggest data, which is significant in distributed computing situations, as reliance connection in mists is transitory and dynamic
(c) How to give contrast to security level of administration as per the reliance degree
(d) How to oversee trust degree change with connection time and setting, and to screen, alter, and truly reflect reliance association vital shift with existence.

In distributed computing security issues, protection issues, trust issues these are the most significant issues, suppliers must keep up these issues truly. So in our RMG management system we have to maintain these issues very sincerely.
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Chapter 3

Methodology

3.1 Workflow

The research mainly focuses on developing a cloud based management model for RMG in our country to increase production and efficiency.

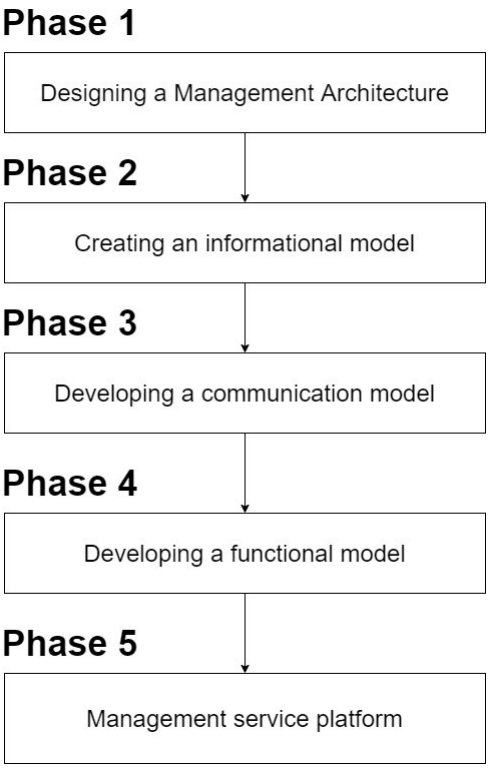

Figure 3.1: Workflow Diagram

We have divided our research in 5 primary phases in order to make our work easier. We have also used the most upgraded components to develop our management system.

Chapter 4

Analysis Design

4.1 Management Architecture

At first, we have to design management architecture for our cloud management system. The spirit of the architecture is application-based. A cloud application will run between Client-side and Server-side systems. It explains how controller communicates with representatives in the gadgets straight forward, at the moment when the network does not produce anything important. With the expanded bulk and difficulty of business requirements and networks, such pattern proves to be no longer satisfactory. So, to reach a satisfactory level of efficiency in network and service management, distributed management services should be installed in the networks. Controlling requisitions uses the services hosted by the cloud via facility access. The controlling requisitions cause these facilities to complete controlling operations without communicating with representatives first hand. Such as, internet is our cloud and end user will access cloud from any device with internet via web browser. In the cloud, user can utilize our cloud based application for his purposes for storage, other application and services he needs. Management application will have 2 parts which is front-end and back-end. Front-end will consist user friendly interface and the application. Moreover, back-end will consist all the functions such as storage, virtual machines, deployment models, servers etc. which will help our application to run without any interruption.

4.2 Informational Model

Our Information model will be Usual Transmission Control Protocol-based controlling systems takes upon an object-oriented information model. This object oriented based model is also an instance of managed object classes. Our model will consist 4 layers which is Application layer, Transport layer, Internet layer and Network access layer. Transport layer maintains the communication of various devices in the cloud. As we all know that, in application layer http (Hyper Text Transfer Protocol) has become one of the most used web based communication protocols. It was mainly developed as a request-response model for client-server communication. Clients uses browser to request server for services and server acknowledge the request before providing services. TCP is connection oriented protocol which needs acknowledgement for every data packet sent and received in the system.

4.3 Communication Model

Cloud communication is mixtures of communication between the cloud and the devices that can access the cloud. We are eager to make a communication model which will contain management facility distributor as the holder of the controlling facilities. From the designing point of view, the cloud platform will host the services and illustrates the function and request information to the service log. Service log manages the data about management services, and provides user the specific function that he requires. The end user can get a management service's data immediately after the management system authenticates the user through cloud. Cloud communication is heavily depended on internet and also known as internet-based communication. Every service provided by the cloud such as storage, server, applications are handled by a third party though internet. Cloud communication increases the boundary of cloud services for clients. At the end, the requester can start communication with the service provider to achieve specific management operations.

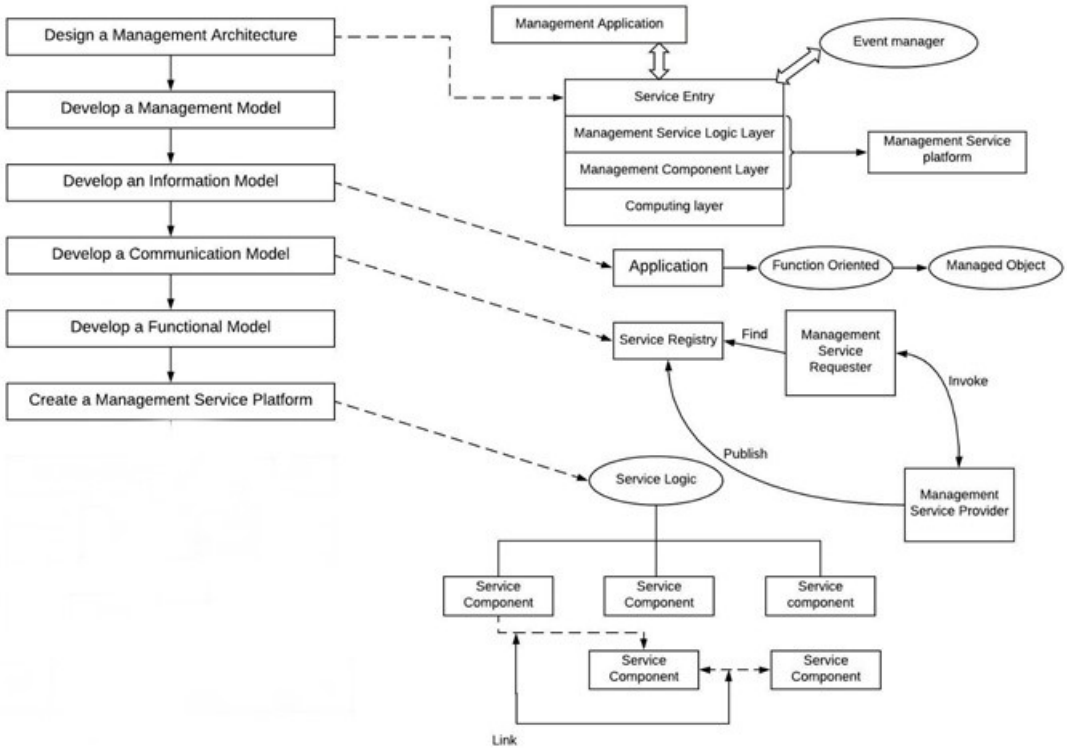

Figure 4.1: Design of the model

4.4 Functional Model

Our functional model will be a multi-tiered hierarchy structure such as services at a higher level are built from lower level component services. We have to create a simple, user-friendly function with one purpose at a time and also connected to the cloud providing services through our system. Cloud system service will be developed as it can automatically scale resources that user requires. As the cloud system will provide the required hardware and software RMG company does not need employee to manage the service. Infrastructure services should provide the data partitioning, create an isolated environment, well protected security, data backup etc. Application services has to make sure that services will be cheap, protect information and data of users and has to be reliable so user can use the services that he needs at that time also billed accordingly. Cloud integration must have improved connectivity and visibility so that RMG organization could benefit from it greatly. Cloud integration helps organizations to synchronize data and application to make an organization much more efficient.

4.5 Controlling Service Framework

Lastly, we are going to create a controlling service framework which is the main part of the entire system. Our management service platform can be divided into two levels such as management service logic level and controlling element level. The two levels have to perform alongside simultaneously to lay out management services to the higher levels. Our developed controlling requisitions can supplicate necessary control tasks to complete insider operations when the user is authorized and wants to do specific tasks. Cloud management platform is combination of software components that will help organizations and us to look upon the cloud deployments. Our management service platform is mainly focused on useful features, pliability, easier to use qualities. Some of the functions that we are willing to create a cloud portal which will work as a web interface and client will interact with it without any errors. They will request for the resources via this portal. Then we are also interested in putting a management functionality layer which will provide virtual machines, storage, productivity and computerization to the users. Lastly, a network layer that will maintain the security, observation and capacity of the cloud management system.

Chapter 5

Components

In the proposed model, we have tried to create a cloud management system which will help our RMG sector greatly. We will need some of the following components in order to successfully implement out system.

5.1 Server

Server is the most important part of the system because our application will be hosted on a DNS server from which the entire application will be distributed to the network. Server maintains the accessibility of the entire application.

Figure 5.1: Server

If the server goes down or any error occurs then the entire application could be unavailable for the end users. As we are going to host our application using cloud we don't need a server physically because cloud server will be active on the internet and cloud provider will maintain the server we deployed our application to.

5.2 Switch

Switch is used to connect from one network to another from router. In our case switch will play a very important role as our department network in RMG will be connected with each other by switches. With having multiple ports to connect

Figure 5.2: Switch

one node to another and because of that switch plays a very important role in our system. Switch allows data to pass from the server to multiple pc. Switch supports unicast and broadcast data transmission which is also needed in our system.

5.3 Router

Router: In our system 4 switches will be connected to one router to make it cost efficient. Router routes the following request generated by the pc to another department or to the DNS server. When an authenticated user sends request to use the hosted requisition that request will first go to the switch which we explained below then it will go to the router. Router will make sure that the request goes in right direction.

Figure 5.3: Router

5.4 Storage

Storage is needed in our system because as we are developing an RMG based project we have to keep track of every details that gets updated or not. Storage will be connected to the server where we are going to host our management system through cloud. As we are using cloud as our host we actually do not need storage because in cloud storage is pay-as-you-go but if we want access of the server of our application that is deployed in we need storage.

Figure 5.4: Storage

Chapter 6

Preliminary Development

6.1 Network Model

After research we have identified that our model in RMG industry will look a lot like fig 7 given below. Here, circled sections are different sectors in RMG industry. There will be much more sectors in a RMG company. For simplicity, we have shown only four sectors for now. When we implement our model in RMG industry we can see different sector users are all connected by switch and switch is connected to routers. Using these routers, user can access the cloud via browser and request for resources. Cloud will acknowledge these requests and provide the requested service to the user. Cloud is connected to the Authoritative DNS server and Authoritative DNS server hosts the web server that contains all the resources in the management system. Due to the pandemic and budgetary reasons, we had to work on virtual environment and simulation software in order to create the network model. When we host our application in the cloud, service provider will give us certain amount of storage that our system needs. As our system gets populated that cloud storage will increase and we will be charged accordingly.

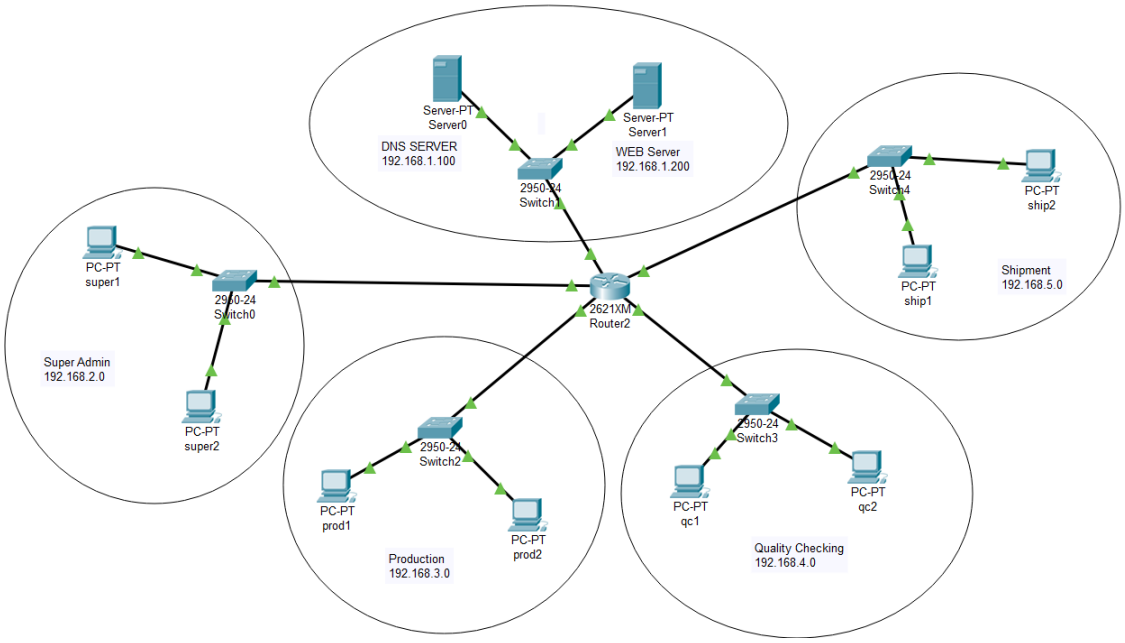

Figure 6.1: Network Model in RMG

After thoroughly research we have come up to this conclusion that, our system is solely depended on internet. User will request and access resources from the internet using web browser. So we have to buy a domain and create a web application for the users to interact with management application. Management application will contain certain features and information about the system, list of resources and so on. Our management application must be user-friendly so that the system does not get too complex for the users. As our model is cloud management system we must create a database for better management of resources, user data and keeping system up to date all the time. In our model storage devices would be connected to server and server will process request from the cloud. After acknowledging the request server will provide necessary resources a user needs. We have come up with this structure for our cloud management system.

Chapter 7

Development Process

7.1 Development of the System

In development process, firstly we had to talk to some of the managers of existing RMG companies to gather information's about how the process works in real life. Because of that, we contacted Vancot ltd. which is a RMG company under ShinShin group based on Hongkong and Intimate Apparel ltd. which is a local RMG company. These companies provided us their contact information of the managers of different sector. At first, we talked to the Manager from Vancot ltd. and we found out that they already have an inventory management system, sales management system etc. As we talked more, we found out that the working hour for the workers is 10 hours per day and they have minimum 100 machines in each sector to produce ordered goods much faster. He also mentioned that a machine can produce minimum 5 to maximum 20 products per day. He also added that their company does not take emergency orders as they prefer quality of the product first. Summarizing the entire conversation, we have found out that they have three major departments.

1. Production
2. Quality Checking
3. Shipment

Their workflow management system between department does not allow them to communicate with other departments. Which we thought as a limitation to their entire system. After talking to the Vancot ltd. we contacted Intimate Apparel ltd. which is a local RMG company that provides Ready made goods in renowned shopping mall stores. We talked to one of their manager to find out the working process of the produced goods. They also have inventory system which keeps track of their product materials and created products. Moreover, they also have a very extensive sales management system which contains customer information's, profits, invoices etc. We talked some more about the processes in the company and identified that they also does not have a proper workflow management system between departments at the time of produced goods. Which creates inefficiency in their Garments. Novelty of our model is the garments managers that we talked to their garments did not have the collaboration between departments.

It was done separately and we tried to create a model that would help them to collaborate within the system and which would also take very little amount of money to implement. Also which would result in the quality assurance of produced goods.

So, we decided to make a workflow management system specifically for the major departments as Production, Quality checking and Shipment. Our system will work as a pipeline between these major departments as produced goods will be passed from departments to departments. We also created sections to manage employees, products and orders. As Vancot ltd. did not took any emergency orders for quality assurance we tried to create a delivery date calculator based on working machines, product created per hour and working hour information's. We have used Django python framework to develop the system and Heroku to deploy the system in the cloud. As we used Django framework we have a superuser to maintain the database who creates user and department admins such as managers and assistant managers etc. who is also employee in the system. Every department in the system is separated from one another and the user will only see the orders that are currently processing in his department and employee information of his department. After completing the following task of that department they will send it to the next department and if the requirements of the product does not match company standard that department can send back the order to the previous department with specific information's. Comments can be pass through departments so that communication stays strong among department employees. That way we believe that products can be evaluated properly in processing. An order has to pass through the three department as we mentioned above. Moreover, if product requirement does not match it will not proceed to next department. Our last phase is in Shipment department. When a product passes Quality checking it goes to Shipment department. When shipment employees confirms the order and sends it to delivery process that amount of product will be decremented from product inventory as production employee adds that product while produced.

Primary goal of our system was to make the RMG system distributive so that employees from different department can use that system at the same time to keep the process running and produced products can reach a certain company standard. We have deployed our system on Heroku and tested if our system was distributive or not. We can confidently say that our system works as distributive system and also employee role based on department stays exactly same and all the data stays the same and changes accordingly while using the system.

Secondary goal of our system was to maintain Atomicity, Consistency, Isolation and Durability of the data that is continuously changing and updating in our system. We can say that Atomicity was maintained when 2 shipment employee forwards same product produced for different customer that product amount in the product inventory gets decremented accordingly and if the product is not in the inventory it will show a message that amount of product is not in inventory. After that comes consistency which is achieved by using Django. In Django admin database every data changed or updated stays consistent and in different process the values change accordingly. Following that, there is Isolation. Every data is created or updated under one primary key in the database. So, that primary key changes similar values

in the database and separates one key from another. As our system is role based, other department can not see other department activities. So we can say that, our system data is isolated. Lastly, durability of the data comes. In our case, when a shipment is out for deliver then that data will be saved under all shipments section. So we can say that our system is durable.

Third goal of our system was to make it accessible from other database software so that employee who maintains the database can see how much resources the system is taking and how and when data entry happens in order to keep track of the organization. We successfully achieved to connect to a remote database of our system to the cloud platform database which is updating and changing frequently. pgAdmin 4 is widely used database management system. It is very consistent with acid properties and very advanced than any other database management application. As we stated before that we used heroku as PaaS(Platform as a Service) it comes with free PostgresSQL database connection. Because of this challenging time, we had to rely on free services. We configured pgAdmin 4 with the heroku PostgresSql and after that any changes in our system on the heroku was visible in pgAdmin 4 and as our system was distributed anywhere from the world with an internet connection with user verification could access the system and it could be maintained in the pgAdmin 4. Data put on the system stays consistent and it also shows how much resources we are using. According to that information we could get assurance of the specific resource prices that we are using and because of being pay-as-you-go service we can maintain budgetary issues.

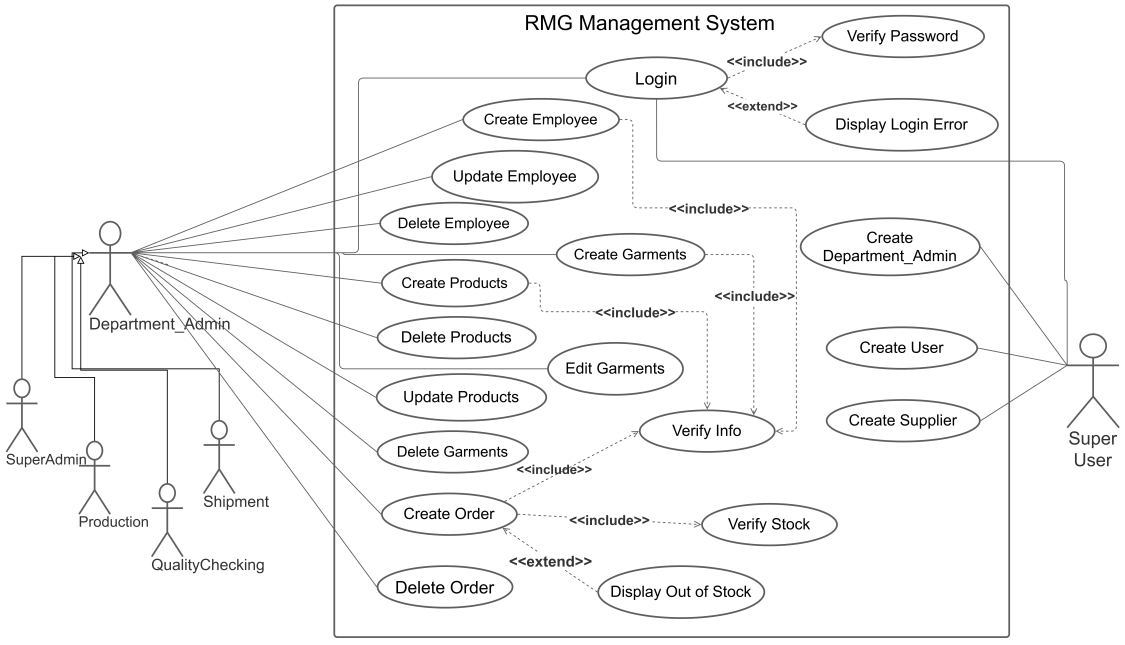

Figure 7.1: Usecase Diagram

In Fig-7.1 we have shown Use case Diagram based on the interview we have taken from the managers and how our process will work. As our system is only for RMG administration employees our primary actor is divided into 4 actors. Super Admin, Production, Quality Checking and Shipment are the 4 child actor of parent Department Admin. Department Admin will get the authorization to use the application

and create order, create employee, create product, calculate delivery date etc. actions which will be updated in the database. As our secondary actor superuser will come in. When it is needed to add a department admin or supplier the superuser will be active. Superuser will first create an user and add him in the Department Admin database. Then he will give him the staff status which will allow the following employee to get access. Super Admin is the director who will oversee ongoing process in the system and other Department Admin will be Manager, Assistant manager etc.

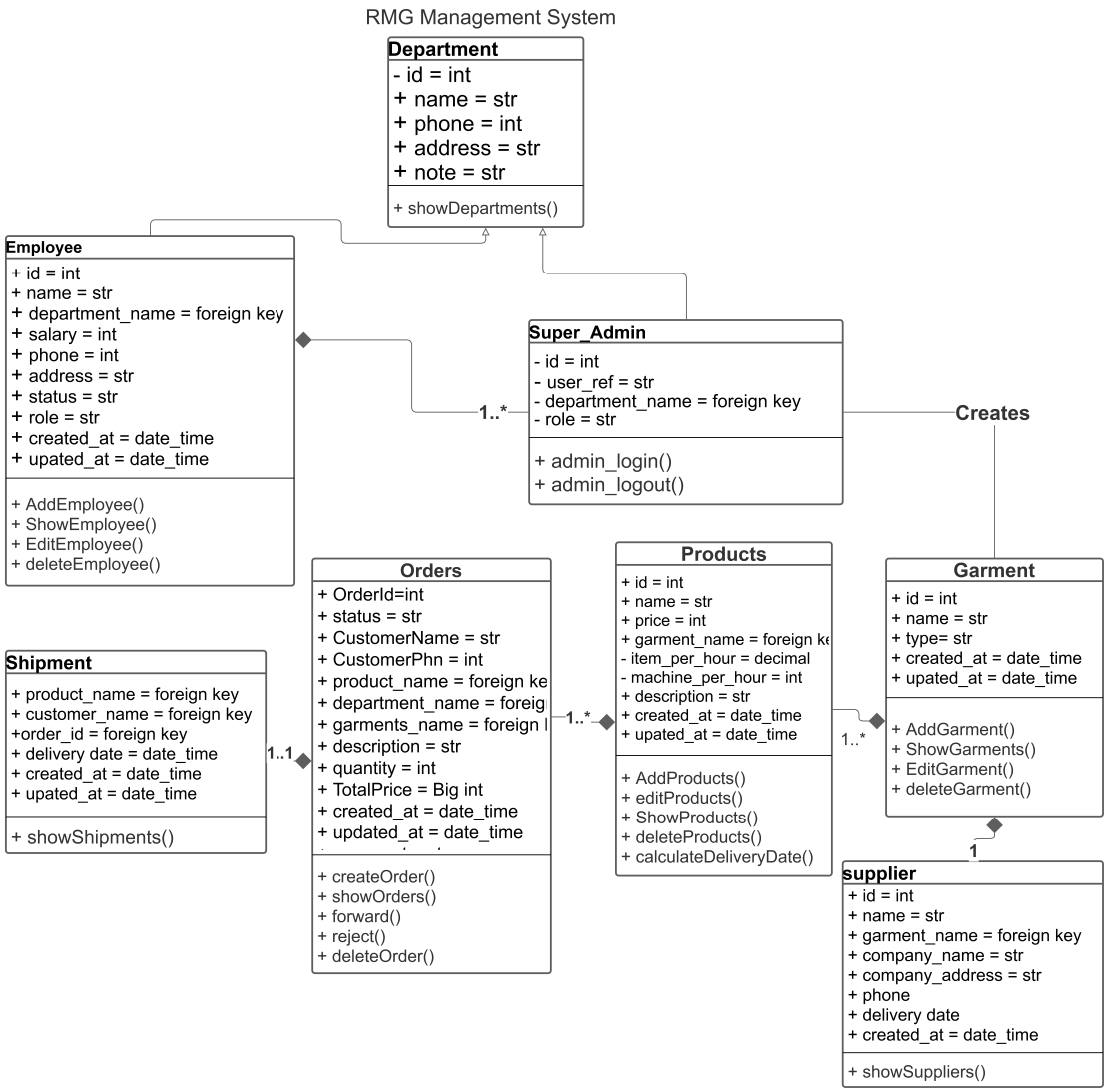

Figure 7.2: UML class Diagram

In Fig-7.2 our UML class diagram starts from the Department. We pointed out how the relationship will be for each classes. Department will have 2 child classes. One is Employee and another is Super Admin which will inherit from Department class. Employee and Department Admin has one to many relationship because Department Admin could be multiple in a department but there has to be at-least 1. However, if there is no employee in the system there will be no Department Admin. Because of that Department Admin is it is connected as composition. Department Admin can create product and garments which is simple association. However there

has to be at-least one product to create an order. Because of that Order class and Product Class has one to many relationship. Same goes for garment and supplier. If there is no garment then there will be no supplier. At-least one garment is needed to have supplier. One garment will have only one supplier. When Order has relationship with Shipment one to one. Because one order can be shipped only once.

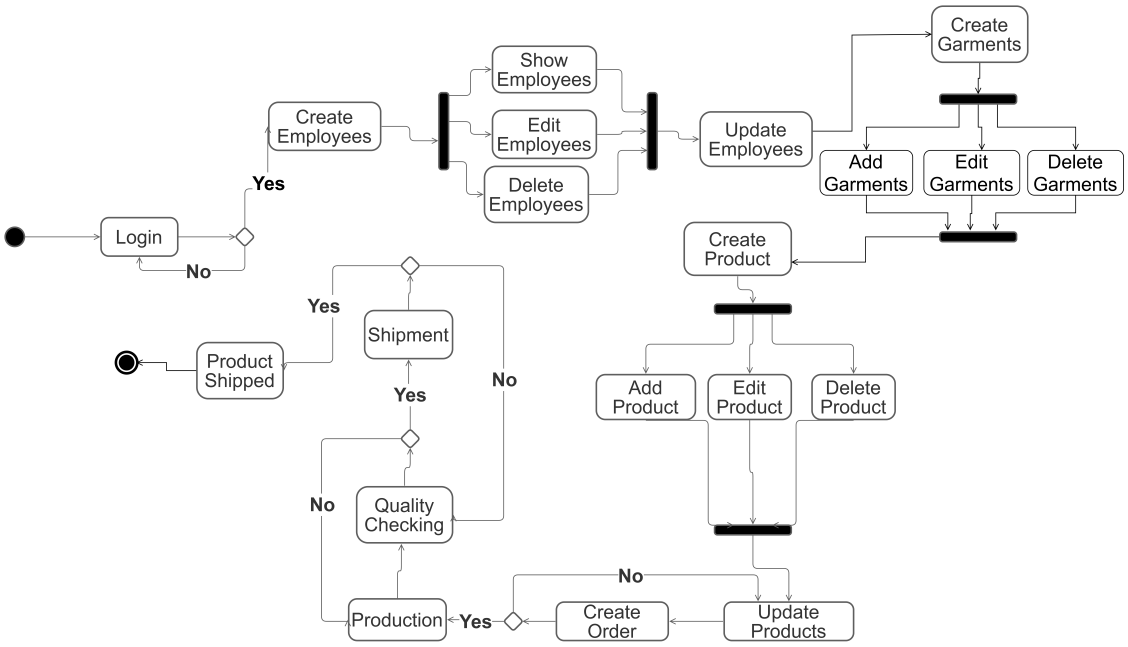

Figure 7.3: Activity Diagram

In Fig-7.3 we have used an Activity Diagram to create a functional model in which a user has to login first. If the user is not in the system he will not get the access to the application. If authenticated the user can Create employee in the system. As you can see a fork node is used to show 3 employee related activity. Same as they can perform to Create garment and Create product. If desired amount of product is not in the product inventory order cannot be placed. Otherwise, order will be placed and go through different departments. Firstly, it goes to production. Production updates the inventory and sends it to quality checking. If quality is not company standard they will send back the order to production again with comment about the specific reason the product was sent back to. If ordered product matches all the requirements, then it will be passed to shipment. If shipment mishandles the product they can also send it back to the quality checking with specific comment. Once the shipment phase is done the ordered product will be decremented. That is how our system will work.

Chapter 8

Comparison Of Efficiency

For the comparison of efficiency, we have stated before the demerits of on-premise infrastructure. We were unable to get the actual result because of the limitations of hardware. So we had to choose theoretical methods. On premise infrastructure is heavily depended on hardware which needs continuous maintenance and if one hardware is malfunctioned the entire grid system could be unavailable. It could turn out to be very bad for an active RMG company. They could face great financial loss in that moment. On the other-hand, cloud services are continuously maintained by the service providers and there is no chance of work stopping. So RMG companies can be assured that they can greatly benefit from cloud service.

On-premise infrastructure is also very expensive. It cannot be scalable because the system is already procured. So in peak situation, on-premise infrastructure is unable to give more resources as needed. However, cloud network is very good for elasticity and gives resources whenever someone requests for it.

Hardware needs to be close in On premise infrastructure. It has to be located near if we implement it in RMG companies. However, in cloud service security is maintained by the distributors and they always stay on top of keeping the customer data safe.

Mobility is a very essential part of cloud computing. We can access any application or software in the cloud from wherever we need with internet connection. In on premise infrastructure we have to be present in the network to use its resources. That is a very big limitation of on premise infrastructure.

Pay-as-you-go maybe the biggest benefit of grid computing. If we choose cloud distributors they will only charge us as much resource as we use. We ask for resources and they charge us accordingly. So, cloud computing is very cheap. On the other hand, on premise infrastructure has to be setup onsite. Which takes a large amount of space and requires a very big budget. So, it is very expensive. Nevertheless, cloud services are very much faster than on premise infrastructure service which is beneficiary for our RMG sector.

Chapter 9

Conclusion and Future Work

9.1 Future Work

Our system is a Development Model for the RMG sector to gain more efficiency. We have created a process that we think could be effective for the sector and will increase production and maintain workflow. Our future work is developing the model continuously and make it as better as possible. If we can develop our model to a certain level, the RMG sector will be able to assure quality products to the consumers at any cost. As our resources was limited we were unable to work with WMN. So we had to choose different process. We have to work within our RMG sector to specify other problems which creates an obstacle to gain efficiency.

9.2 Challenges

WMNs covers a large space around it but error in one branch can potentially cause the entire network collapse. Hence, a smart management platform is on demand to look after the network stature and pin-point the failed node automatically within time limit. We have to make sure that our management platform does not fail to take care of the network [7]. The research regarding mesh network management yet to be proven successfully. So, there is not even a constructive solution for WMNs management and network testing [7]. We have to find an effective solution regarding this problem. Could become very expensive to manage and maintaining license of software, physical storage space, and generates low service levels [7]. All the outcome of the network performance are not adequate such as delay time is very long, big network load, great processing unit utilization. This work means to assess to which degree the upgrade of the system execution can be made by actualizing cloud computing [9]. The examined cloud computing is supposed to be composed [9]. Efficiency is very important for network of any size could be either bigger network or smaller. Without considering this issue, the network performance will not achieve efficiency as per requirement. Packet clash, bottleneck, and malware attacks are all the reasons that could be inefficient for good services [9]. To gain efficiency in the grid and facility controller, a large number of issued controlling facilities should be installed in the networks. So that, the grid can lay out assistance for network management system to make it more proficient [1]. Grid control model has to be converted from P2P (Peer to Peer) to C2C (cloud to cloud) which will be difficult to accomplish [1]. Access Grid Controlling is one of the most significant obstacle

in WMN, which gets very challenging for the uniformity of its components [1]. We were unable to work with WMN for the limited resources. As we are working on this management system we have identified that it is much more suitable to develop this system within the RMG industry. As we have also talked to some of the garments manager they did not comply with us about what happens to the rejected product. As we made our entire model based on the information they gave us for the absence of rejected product information we were unable to do anything about the related matter. Because, we have to analyze all aspects of an RMG company to learn about its limitation and how to overcome those limitations. We can imply our management system can help the RMG industry but we cannot possibly know until we have deployed our management system in a RMG company. Also, servers and storages are very expensive. Due to budgetary reasons we have to complete our network server configurations using virtual environment and simulation software's. We all know, this is a very tough situation for all of us during this pandemic and it has created a huge communication gap. Because of that, we faced some difficulties while developing our cloud management model.

9.3 Conclusion

Cloud computing is increasing every year and it does not take long to see why. We can see how initiatives recognize cloud computing benefits and impacts upon their production, collaboration, security and cloud to cloud management service cost and potential benefits could be enormous. An enterprise using cloud-based solutions can solve many problems that depends on plug companies. By C2C it is easy to control everything under one system. Network management in more than one wireless network is main thing to achieve efficiency and dependable network activities. In our work, the theory of cloud computing met management system, then we suggested a structure about how to build up a cloud computing based management system and how does it work in the cloud computing environment. As the requisition of a cloud philosophy guarantees an adaptable and strong management platform. Network load is diminished and a basic and straightforward management stratagem could be achieved by using virtualization. This paper is to show that our system will greatly help the RMG industries.

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