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Evolution of Cloud Computing: A State-of-the-Art Survey

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ABSTRACT: This paper reviews methods developed for anonymizing data from 2008 to 2009. Publishing microdata such as census or patient data for extensive research and other purposes is an important problem area being focused by government agencies and other social associations. The traditional approach identified through literature survey reveals that the approach of eliminating uniquely identifying fields such as social security number from microdata, still results in disclosure of sensitive data, k-anonymization optimization algorithm ,seems to be promising and powerful in certain cases ,still carrying the restrictions that optimized k-anonymity are NP-hard, thereby leading to severe computational challenges. k-anonimity faces the problem of homogeneity attack and background knowledge attack . The notion of l-diversity proposed in the literature to address this issue also poses a number of constraints , as it proved to be inefficient to prevent attribute disclosure (skewness attack and similarity attack), l-diversity is difficult to achieve and may not provide sufficient privacy protection against sensitive attribute across equivalence class can substantially improve the privacy as against information disclosure limitation techniques such as sampling cell suppression rounding and data swapping and pertubertation. This paper aims to discuss efficient anonymization approach that requires partitioning of microdata equivalence classes and by minimizing closeness by kernel smoothing and determining ether move distances by controlling the distribution pattern of sensitive attribute in a microdata and also maintaining diversity.

KEYWORDS: Data Anonymization, Microdata, k-anonymity, Identity Disclosure, Attribute Disclosure, Diversity

I. INTRODUCTION

Need for publishing sensitive data to public has grown extravagantly during recent years. Though publishing demands its need there is a restriction that published social network data should not disclose private information of individuals. Hence protecting privacy of individuals and ensuring utility of social networ data as well becomes a challenging and interesting research topic. Considering a graphical model [35] where the vertex indicates a sensitive label algorithms could be developed to publish the non-tabular data without compromising privacy of individuals. Though the data is represented in graphical model after KDLD sequence generation [35] the data is susceptible to several attacks such as homogeneity attack, background knowledge attack, similarity attacks and many more. In this paper we have made an investigation on the attacks and possible solutions proposed in literature and efficiency of the same.

II. CLOUD COMPUTING AND GRID COMPUTING 360-DEGREE COMPARED

In the case of distributed systems, cloud computing has become another buzzword after web 2.0.cloud computing is not completely new concept, it has initicate connection to the relatively new but thirteen year established Grid computing paradigm and other relevant technologies such as utility computing ,cluster computing and distributed systems in general. In this paper, the above authors strives to compare and contrast cloud computing with Grid computing from various angles and give insights into the essential characteristics of both cloud computing and grid computing . Cloud computing is hinting at a future in which we won't compute on local computer. But we will concentrate on centralized facilities operated by third party and storage utilities. The author says that in the mid 1990's, the term Grid was coined to describe technologies that would allow consumed to obtain computing power on demand. Grid is for large-scale federated systems like open science Grid, Tera grid that provide not just computing power, but also data and software

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on demand. The author's gave the answer for that cloud computing is the new name for Grid? The authors says that yes , as because to reduce the cost of computing , increase reliability and increase flexibility by transforming computers from something that we buy and operate ourselves to something that is operated by a third party. The authors says that the answer seems to be no if things are different now than they were 10years. We people need to analyze massive data, thus motivating greatly increased demand for computing. The authors says that the answer is nevertheless, yes as because the problems are mostly the same in clouds and grids. There is a common need to be able to manage large facility. Details differ, but the two communities are struggling with many of the same issues. A related definition for cloud computing is given by the authors. That definition has a few points in it. Cloud computing is a specialized distributed computing paradigm. It is an massively scalable, can be encapsulated as an abstract entity that delivers differ levels of to customers outside the cloud and it is driven by economics of scale.

The definition of the cloud computing overlaps with many existing technology such as grid computing, utility computing, services computing and distributed computing in general. The authors says that cloud computing not only overlaps with grid computing, it is indeed evolved out of grid computing and relies on grid computing as it backbone and infrastructure support.

The authors compared the cloud computing and grid computing in six different models. Initially, the authors compared two paradigms in the business models. In the case of business model, the cloud based business model has the need of pay by the customer on consumption basis. But the business models for grids is project oriented in which the user s are community represented by that proposal have certain number services units they can spend. Next, the two paradigms are compared based on their architecture. Grid computing is a five layered architecture which contains fabric layer, connectivity layer, resource layer, collective layer and application layer. But it differs in cloud computing paradigm. Cloud computing is a four layer architecture which contains fabric layer, unified resource, platform layer and application layer. Next to the architecture , resource management is concerned. In this model, the authors defined computing model, data model, visualization, monitoring and provenance for both paradigms. Fourthly, the authors discussed the similarities of two paradigms based on programming perfectly. Fifthly, application model for two paradigms are discussed. Finally, security model for cloud and grid is discussed by the authors. Hereby, the author concluded that clouds and grids share a common functionalities in their vision, architecture and technology. But the clouds and grids differs various aspects such as security, programming model, business model, computing model, data mode, application model and abstraction. The authors also stated the opportunities and challenges in both clouds and grids. And also we will meet the centralized scale of today's cloud utilities, and the distribution and interoperability of today's grid facilities.

III. MARKET-ORIENTED CLOUD COMPUTING: VISION, TYPE AND REALITY FOR DELIVERING IT SERVICES AS COMPUTING UTILITIES

This is one of the keynote papers. In this paper, the authors present a 21st century vison of computing. In this paper the authors noted that Leonard Klein rock who is one of the chief scientists of original advance research projects agency network (ARPANET) project which seeded the internet, said: "As of now, computer networks are still in their infancy, but as they grow up and become sophisticated, we will probably see the spread of "Computer utilities" which, like present electric and telephone utilities, will service individual homes and office across the country". Similarly, computing services uses called as consumers need to pay providers only they access computing services. And also consumer's no longer need to invest heavily are encountered difficulty in building maintaining complex IT infrastructure. This paper identifies various computing paradigms promising to deliver vision computer utilities. It defines cloud computing and provides the architecture for creating market-oriented clouds by maximizing technologies such as virtual machine and provides thoughts on market-based resource management strategy. Those strategies connects both customers driven service management and computational risk management to sustain service level agreements present some representative cloud platforms especially those developed industries along with realizing market-oriented resource allocation of clouds. In particular, the customers can determined the required service level through quality of service parameters and service level agreements of all these computing paradigms, the two most promising ones appear to be grid computing and cloud computing. A grid enables the sharing, selection and technologies like science, engineering and commerce. To make greater impact on the 21st century as much as the electric power grid did on the 20th century, grid computing has been hailed as the next revolution after the internet and web. But today the latest paradigm to emerge is that of cloud computing. Cloud computing promises reliable services

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delivered through next generation data centers that are built on compute and storage virtualization technologies. As per this technology, consumers will be able access application and data from a "Clouds" anywhere in the world on demand. It can also be stated as the cloud appears to be a single point of access for all the computing needs of consumers. In this paper, the authors defined the perfect definition for the cloud. hereby, A cloud is a type of parallel and distributed system consisting of a collection of interconnected and virtualized computers that are dynamically provisional and presented as on or more unified computing resources based on service level agreements established through negotiation between the service provider and consumers. The author states and presents a high level architecture for supporting market-oriented resource allocation in data center and clouds. The high level architecture contains basically four main entities such as users/brokers, SLA resource allocator, virtual machines and physical machines. The authors defined the global cloud exchange and market infrastructure for trading services. It includes enterprise IT consumer, which is connected with the intermediate brokers from one to 'N'. Global cloud Market which includes 2 compute cloud, 2 storage cloud and directory, bank, auctioner. As of now, cloud computing is a new and promising paradigm delivering IT services as computing utilities. As clouds are designed to provide services to external users, provides needs to be compensated for sharing their resources and capabilities. In this paper, the authors proposed architecture with representative platforms for cloud computing covering the state of the cut. As cloud platforms becomes ubiquitous, the authors expected the need for internetworking them to create a market oriented global cloud exchange for trading services. several challenges need to be addressed to realize this vision. This includes market-marker for bringing services providers and consumers; market registry for publishing and discovering cloud house service providers and their services; clearing house and brokers for mapping service requests to providers who can meet QOS expectations and payment Management and accounting infrastructure for trading services. Finally, the authors stated that they need to address regulatory and legal issues, which go beyond technical issues. It is concluded that with the need for convergence of cloud computing IT paradigms for delivered our 21st century vision.

IV. VIRTUALIZATION AND HARDWARE BASED SECURITY

Virtualization is the process of presenting something as being genuine when infact it is not (i.e) virtual reality. virtualization may involve language-level runtimes providing high-level abstract architectures for applications or a thin hardware virtualization layer of software situates between system hardware and the operating system layer providing logical views to physical resources. while virtualization comes in many forms, including process, storage and network virtualization, this paper focuses on security and hardware virtualization layer, often termed as virtual machines monitor or hypervisor. The authors first focused on hypervisor virtualization. Early virtual machines were essentially computing environment that simulated or emulated the existing hardware features of the host system while arbitrating access to shared system resources. It allows multiple instances. Hypervisor became an attractive option for large data centers and medium to small enterprises. In addition to increased utilization, the general flexibility afforded by modern hypervisors and their support of systems that have become relative commodities is also apparent and clear. By concentrating on hypervisor and its security the authors stated that hypervisors are a few basic but very strong. Separation can be achieved through the use of different hardware facilities for different workloads like physical separation, logical separation which involves the use of a reference monitor. The authors defined the schematic diagram of a reference monitor which includes subject, security policy, object which are connected to the centralized reference monitor. Next, the authors focuses on Hardware virtualization support. Virtualization contains advantages like consolidation and isolation but it also contains disadvantages like large performance overhead to counter this disadvantage, the CPU manufacturers have been developing hardware support for virtualization where part or all of the emulation takes place in the CPU itself. The authors stated the architectural overview of a virtualized system. It includes Random Access Memory, central processing unit of virtual CPU's, PCI bridge IOMMU, Disk controller, Network controller and video controller located on a PCi bus. Then the author focuses on SHype-Hypervisor security architecture . The authors illustrated the Shype security architecture and its integration into a virtual machine Monitor environment. SHype is implemented in various stages for multiple hypervisors including Xen open source hypervisor. It includes the functions like strong isolation and mediates sharing, Attestation and integrity, resources control and accounting and secure services.Then the authors concentrated on SHype Access control architecture. They concluded the controlled sharing of direct VM to VM, VM to VM through local peripheral resources through resources VM and VM to VM through distributed networking resources. The purpose of virtualization and hypervisor security as discussed in this paper is the development of secure computing foundation. Enabling and managing what will essentially become a distributed trusted computing base, built upon the secure hardware and virtualization foundations discussed throughout this paper.

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V. CONCLUSION AND FUTURE WORK

Various methods developed for anonymizing data from 2008 to 2009 is discussed. Publishing microdata such as census or patient data for extensive research and other purposes is an important problem area being focused by government agencies and other social associations. The traditional approach identified through literature survey reveals that the approach of eliminating uniquely identifying fields such as social security number from microdata, still results in disclosure of sensitive data, k-anonymization optimization algorithm ,seems to be promising and powerful in certain cases ,still carrying the restrictions that optimized k-anonymity are NP-hard, thereby leading to severe computational challenges. k-anonimity faces the problem of homogeneity attack and background knowledge attack . The notion of l-diversity proposed in the literature to address this issue also poses a number of constraints , as it proved to be inefficient to prevent attribute disclosure (skewness attack and similarity attack), l-diversity is difficult to achieve and may not provide sufficient privacy protection against sensitive attribute across equivalence class can substantially improve the privacy as against information disclosure limitation techniques such as sampling cell suppression rounding and data swapping and pertubertation. Evolution of Data Anonymization Techniques and Data Disclosure Prevention Techniques are discussed in detail. The application of Data Anonymization Techniques for several spectrum of data such as trajectory data are depicted. This survey would promote a lot of research directions in the area of database anonymization.

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