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Zombie Avoidance using Attack Analyzer in Cloud Environment

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***Abstract*-- Cloud Computing refers to On-demand network access to a shared pool of manageable computing resources which are applicable to both software and hardware services. Cloud Computing makes use of available resources on "on-need" basis. Security problem plays the most Significant role in cloud computing. Due to this nature, attackers launch Distributed Denial of Service to make resources unavailable to potential users. Usually, Denial of Service easily attacks the virtual machines as Zombies but it is extremely hard to detect Zombies. In this paper, we have proposed a viable approach to prevent the vulnerable virtual machine from Zombies through multi-phase distributed susceptibility detection, measurement and countermeasure selection mechanism called NICE. This experimental model shows a more secure and reliable network access to reconfigure the virtual network.**

***Index Terms*-** *Cloud Computing, Attack Graph, Zombie Detection, Network security*

I. INTRODUCTION

The current adoption of Cloud Computing enables us to utilize the available resources on the basis of On-demand network access and computing resources such as networks, storage, service, application and servers. The five vital characteristics of cloud computing includes on-demand service, rapid elasticity, location-independence, ubiquitous network access and measured service, which are geared toward using clouds flawlessly and visibly. DDoS is one of the major threats that break the business continuity service availability, accessing the resources and making more traffic as legitimate as web traffic in order to launch various attacks.

II. VIRTUAL MACHINE AS ZOMBIES

Compromised machines are one of the major challenges in cloud system which are used to launch various security threats to make the resources unavailable. Such compromised virtual system grouped together are called virtual machine as Zombies. Within the cloud system, particularly the Infrastructure-as-a-Service (IaaS) clouds, the detection of such zombie exploration attacks is tremendously difficult because cloud users may install vulnerable applications on their virtual machines. To prevent such susceptible virtual cloud system from being compromised, we proposed NICE mechanism to provide countermeasure against Zombies with help of an attack graph-based model.

III. INFRASTRUCTURE AS-A-SERVICE

Infrastructure-as-a-Service (IaaS) is a service delivery model that provides the basic computing utility infrastructure such as servers, software and network equipment on the basis of on-demand services. The major purpose is to avoid the basic hardware components and software components purchasing, housing, and managing those infrastructure components, instead achieve those resources as virtualized objects from service interface. The cloud consumer usually has wide options to choose the operating system and development environment to be hosted. Thus, the detection of zombies at Infrastructure as-a service makes it difficult because users may install vulnerable application software on their virtual machine system and the combined effect of vulnerability is not measured.

IV. ATTACK ANALYZER

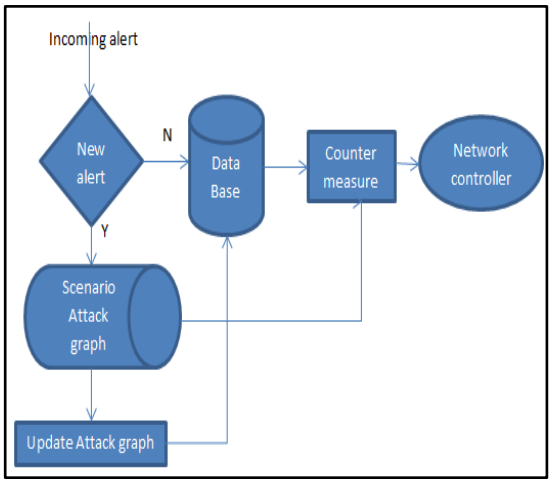


Fig. 1 Monitoring and Updating Attack Graph

NICE-Agent scans the whole cloud network periodically, once it discovers vulnerability in cloud network it generates an alert and sends it to attack analyzer. Each path is a successful attack. Attack analyzer checks whether the alert is new or not. If the incoming alert is of

new vulnerability and is not present in the attack graph, the attack analyzer inserts the alert into the attack graph and then reconstructs it. Once construction gets completed, attack analyzer provides the countermeasure that is applied by the network controller based on the severity of evaluation results. Thus, we implement NICE mechanism to provide countermeasure against attacks.

V. IMPLEMENTATION

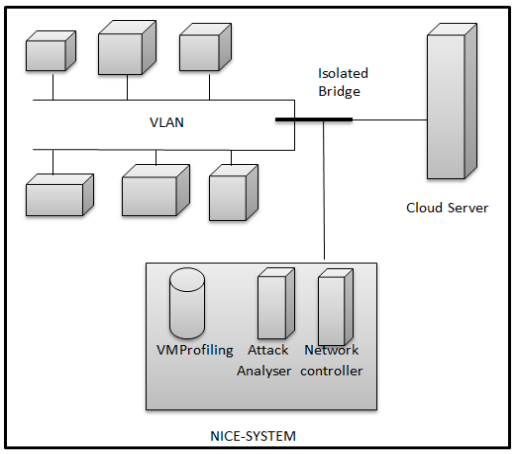


Fig. 2 Architecture of NICE System

NICE- A is implemented in isolated bridges that are located between VM and Cloud server. NICE analyzes the cloud traffic with the help of a light weighted mirroring based detection agent. Traffic generated by attacker through the virtual machine is monitored by NICE-A. Based on vulnerability, it generates and alerts the attack analyser. Attack analyser checks if it is new or not, if alert is old, selects appropriate countermeasure otherwise construct SAG with the information gained from network controller, VM profiling and conducting some penetration test, VM profiling is a database that contains information about state, service running in VM, traffic vulnerability which is from SAG and NICE-A and it select countermeasure which is send it to the network controller, which isused to implement countermeasure and updates SAG.The countermeasure is based on dynamic that reconstruct filtering rules, rearranging allow & deny conditions, achieved by software switch which is controlled by network controller. So we are providing dynamic production against attack. NICE sniffs the traffic generated by attacker using SPAN. So the new affects original traffic. NICE allows the cloud server to provide service to requested client continuously, at the same time it provides security to cloud server.

VI. PERFORMANCE METRICS

Security matrices are needed to assess the risk. The distance to every target node must be determined before countermeasure selection. If the distance is too long, a countermeasure should not be selected, instead we update the ACG for an alert.

A. CPU utilization

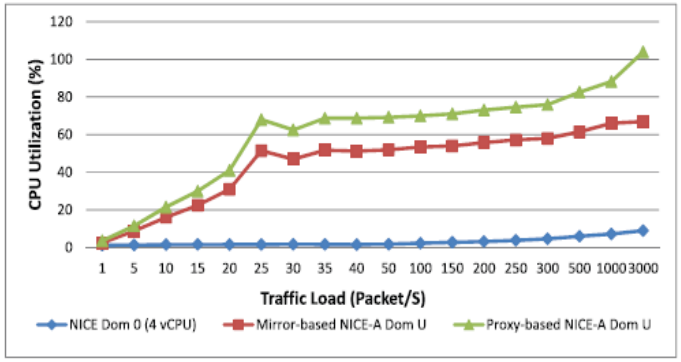


Fig.3 CPU utilization graph

NICE-A Dom O is better way for IDS because it utilizes less amount of CPU process that can be installed at bridges level

B. Network communication delay

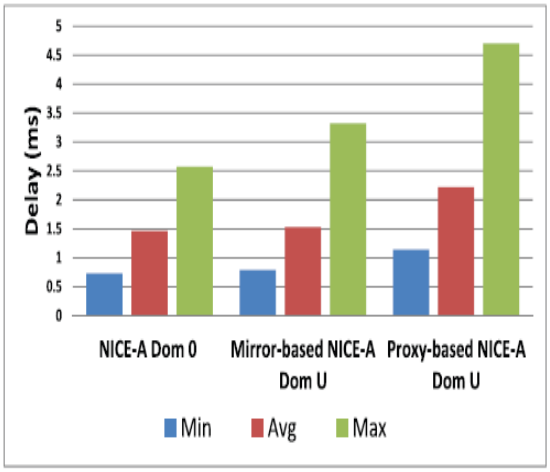
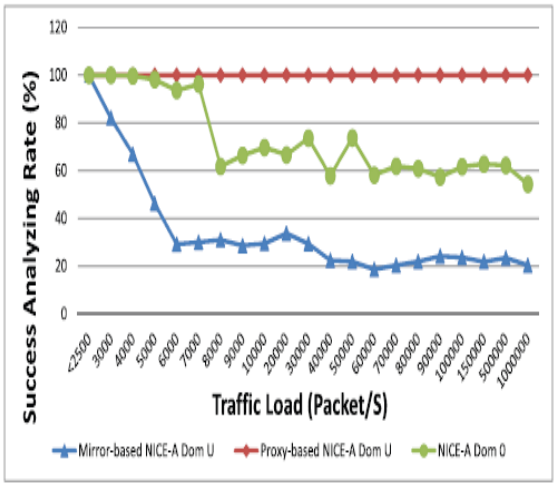


Fig. 4 Performance of Network Communication

NICE–A Dom O is better because it uses SPAN to monitor traffic which makes less amount of delay. NICE-A Proxy based use original traffic to monitor the incoming outgoing packet

C. *Success Measure Rate*



Success analyze rate= No of analyzed packet/Total received packet

NICE-A Dom U is better because it uses original net traffic and it never bothers about packet delay.

With the attack graph, we can get a holistic view of the security condition and make predictions.

VII. CONCLUSION

In this paper, we presented NICE to protect cloud virtual networking environment from DDoS attack. NICE construct attack graph predicts the next step of the attackers and provides optimized countermeasure. NICE software switches implement the countermeasure against zombie explorative attack dynamically. To improve the detection accuracy, NICE are needed to be implement in distributed fashion. The proposed solution can reduce the risk of cloud system being misused by internal and external attack. The experimental results show less amount of CPU utilization and better success measure rate of traffic load.

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