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To Design and Implementation of Framework for Firewall Policy with Minimum Rule Set

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Abstract

Firewall is a most crucial element to implement security policies in a network and also crucial to success of network rather say to success of an organization. Despite of its important in any network it has many problems and one of them is increasing number of rules in firewall's rule set. Since in today's environment, enterprises looking to provide strongest security to their users and also want to secure their data at maximum level and hence they have increased rules in firewall's rule set. However increasing number of rules in firewall rule set is not an efficient way to provide maximum security. And this study shows that how can the use of minimum number of rules in firewall rule set to implement optimum security is possible. It has also proved that this problem of minimizing maximum firewall rule set in network is NP complete. One point is noteworthy to mention here that in today's time as enterprises are moving towards cloud technology the complexity at data center is increased and it is being difficult to implement security in clouds. So by having highly optimized firewalls, it is possible that they can be used to provide security in clouds.

1. Introduction

Firewall's is most crucial element in implementing security policy in an organization. It is always desired that number of rules in firewall's rule set should be minimum without compromising security concerns in an organization. However once an organization opt a firewall, the task of configuring the access rule set is most difficult. A set of access rule is comprise of many components like source address , destination address , source port , destination port and various protocols . Depending on these rules a firewall's decides fate of a packet. I mean firewall decides to accept or deny the packet that is possible decisions made by firewall. However some other decisions are also supported by firewalls like propagating packet through VPN tunnel. In an organization a rule set of firewall contains thousand of rules and as the number of rules increases, complexity is also increases. I would like to mention one point is here that more number of rules in firewall lead to more number of configuration errors in firewall. And more configuration errors lead to more security loops and that is not good to organization. Above statement clarify that how the problem of "Minimizing maximum firewall rule set in a network with multiple firewalls **"** is important but despite of its importance. After analyzing rule set from many organizations including telecommunication companies and institutions WOOL define the complexity in rule set as R= R+O+i (i-1) /2 , where R is the number of rule sets in network and O is number of network objects referenced by rules and I is number of network interfaces on fire wall. In this paper I am not only concerning the local optimization of rule set at single firewall but global optimization at multiple firewalls in a network**.**

A firewall's difficulty is known to enlarge with the size of its rule set. An experimental studies show that as the rule set grow larger, the number of pattern errors on a firewall increases sharply, while the presentation of a firewall degrades. When designing a security sensitive network, it is critical to construct the network topology and its routing structure carefully in order to reduce the firewall rule sets, which helps lower the chance of security loopholes and prevent performance restricted access. Also it states the necessary step that should be taken whenever a new rule is added or the old one is deleted from the already installed and existing firewall as the action performed can have some adverse effects on the network security,

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2. Firewall Rule Set

A set of directives that govern the access control functionality of firewall. The firewall uses the directives to determine how packets should be routed between its interfaces. Rule set consist of rules whereas each rule consists of an action and an associated condition. The action is either accept or deny, whereas associated specifies the source, destination IP address, protocol, port number etc. of the packet. To reach a decision concerning a packet, the rules in the sequence are examined one by one until the first that's condition is satisfied by the packet field, is found example of rule set show in table:

Table: 1. Rule Sets Parameters

Order	Protocol	Source_Ip	Dstination_Ip	Dstination_Port	Action
1	TCP	164.0.0.7	178.0.0.*	22	Accepted
2	TCP	142.186.40.0	160.0.0.30	80	Accepted
3	TCP	170.0.0.*	174.0.0.7	21	Deny
4	TCP	170.0.0.4	174.0.0.*	21	Accepted
5	TCP	170.0.0.*	174.0.0.*	21	Deny
6	TCP	Any	Any	Any	Aeny

3. Problem Statement

The complexity of firewall increases with the size of firewall's rule set. Firewall's complexity is proportional to

rule set size and rule set size is proportional to configuration of firewall, which leads to access cost for organization in term of time and money. The objective is to minimize the Firewall's rule set so that its complexity can be minimized.

4. Problem Definition (Network Model)

It assumes that interdomain security is appropriately enforced. Thus this focuses on intradomain access control Dynamic routing is turned off on firewall, while static routing are used to direct interdomain traffic Static routing has advantage that it ensures that traffic flows are going through their designed firewall. And predictable routing path simplify the security analysis in a complex network environment.

5. Firewalls Configuration

Access control rules specifying:
Source address
Destination address
Destination port

One or more protocol id's and appropriated action accepted or denies the performance of firewall degrades as the numbers of rules increases, a complex rule set can easily leads to mistake.

Therefore it is very important to keep a firewall's rule set as small as possible in order to lower the chance of security loopholes.

6. Problem Formulation

Rule-Set complexity thus obtains the following simple, intuitive measure of rule-set complexity

RC=Rules + Objects + Interfaces (Interfaces-1)/2

Where RC denotes rule complexity, rules denotes the raw number of rules in the rule set, Objects denotes the number of work objects, and Interface denotes the number of interfaces on the firewall We can say that a slight change in the rule set alters the wanted firewall policy and has a major impact on the firewall configuration and intensive study on the rule sets needs to be done once they are altered. Rule in the sequence are examined one by one, from top to bottom, until the first rule whose condition is satisfied by the packet fields is found. There are two matching strategies single trigger & multi trigger. In single trigger method action associated with first matching condition is performed and in multi trigger all rules will be matched and action from last matching rule is performed. Rule sets consist of rules whereas each rule consists of an action and an associated condition. The action is either accepted or deny, where as associated condition specifies the source, destination IP address, protocol, and port number etc. of the packet. To reach a decision concerning a packet, the rules in the sequence are examined one by one until the first rule that's condition is satisfied by packet field, is found. For most firewalls, the rule set is much larger and detailed. When a packed arrives to the firewall, the firewall will inspect its protocol, the source and destination address and ports. Firewall compares the details of the packet against the rules in the rule set, from top to bottom until a match occurs the firewall will execute the action of the first rule matched regardless of any following rules that may match The problems arises that how to place the firewalls in a topology during network design and how to construct the routing tables during operations such that the maximum firewall rule set can be minimized.

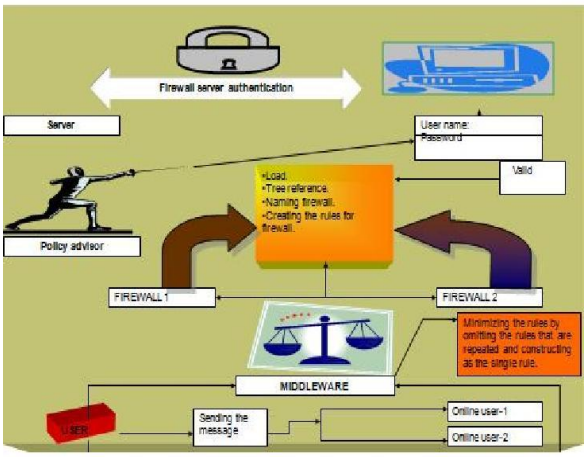
7. Existing System

1. Having very large rule set.
2. The number of pattern errors on a firewall increases sharply.
3. Critical to construct the network topology.
4. Very hard to design the routing tables.

8. Proposed System

A new architecture is proposed to minimize the rule set size among all firewall in a network. The problem is to optimally place the firewalls in a network topology and find the routing structure such that the maximum size of the firewall rule sets in the network is minimized. It proves that the problem is NP-complete and proposes a heuristic algorithm, called HAF, to solve the problem approximately. The algorithm can also be used to solve the firewall routing problem as well as weighted firewall placement/routing problems. Under the proposal investigate that how to place the firewall in a network topology during network design, the so called FPP is to find out the optimal placement of firewalls that connects a set of domains in such a way that minimizes the maximum numbers of rules on any firewalls.

BLOCK DIAGRAM OF PROPOSED FIREWALL FRAME WORK



FLOW CHART OF PROPOSED FIREWLL FRAME WORK

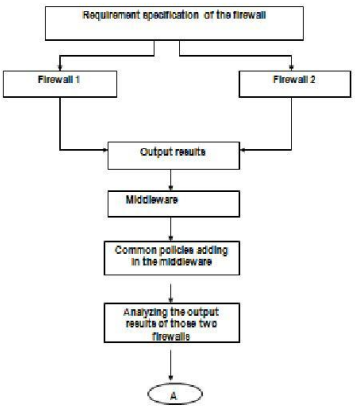


Fig: 1. Firewall Frame Work

9. Related Work

The firewalls are analysed on the basis of the following configuration errors in this paper:

- No stealth rule
- Check point implicit rules
- Insecure firewall management
- Too many management machines
- External management machines
- NetBIOS service
- Portmapper /Remote Procedure Call
- Service Zone spanning objects
- Any service on inbound rules
- Any destination on outbound rules

The conclusion that we draw is that limiting a firewall's rule set complexity as defined by RC is safer.[1] A firewall is like a screening gate for internet or intranet traffic in computer networks. It scans each and every packet entering or leaving the network. Scanning is done with the help of rule sets.

Each rule set consists of 2 parts:

{Predicate}→ {Decision}

Predicate is the condition that consists of source and destination IP, protocol, port number, etc. and matches these with the respective packet attributes. If conditions are satisfied, associated decision or action is taken (which is usually accept or deny).

Rules in the sequence are examined one by one from top to bottom, until the first rule whose condition is satisfied by the packet fields is found.

There are two matching strategies:

Single Trigger: Action associated with first matching condition is performed.

Multi Trigger: All rules will be matched and action of the last matching rule is performed.

Firewall rule set is analyzed using two structural methodologies:

Policy Tree: A tree is prepared whose nodes represent the attribute name and edges represent the field values. Each rule has a separate branch and they are compared with each other at the last node.

Relational Algebra: In this 2 or 3 rules are taken together and then their conditions are compared with the help of raining 2D box model. [2] A firewall's complexity is known to increase with the size of its rule set. Studies show that as the rule sets grows larger, the number of configuration errors on a firewall increases sharply, while the performance of the firewall degrades. When designing a security sensitive network, it is critical to construct the network topology and its routing structure carefully in order to reduce the firewall rule sets, which lowers the chances of security loopholes and prevent performance restricted access.

The following are some problems that are encountered while performing the above task:

FPP (Firewall Placement Problem) Partial FPP

FRP (Firewall Replacement Problem) Partial FRP

Weighted FPP/FRP

The basic goal of any network is to find the optimal network topology or routing paths that minimize the maximum weighted number of rules at any firewall. The maximum size of all firewall rule sets produced by our algorithm is 2-5 times smaller than those produced by others. There are many ways to connect a set of domains via a set of firewalls. For any network topology, there are different ways to lay out the routing path. By optimizing the routing paths, It reduce the maximum rule set major portion of this paper is devoted to analyzing the properties of stateful firewalls that are specified using our model. Firewall compares the packet together with its tag value against a sequence of rules in the stateless section to identify the first rule that the packets are matched. This model of stateful firewalls has several favourable properties. First, despite its simplicity, it can express a variety of state tracking functionalities. Second, it allows us to inherit the rich result in stateless firewall design and analysis Third, it provides backward compatibility such that a stateless firewall can also be specified using our model itself, serving as the first line of defence against unauthorized and potentially malicious traffic, firewalls have been widely deployed in most business and institutions for securing private networks.[4] The ability to measure the quality of protection of a firewall policy is a key step to assess the defence level for any network. The ability to measure the quality of protection of a firewall policy is a key step to access the defence level for any network. Firewall behaviour depends on the policy written to accommodate a specific task in the global network policy. Some criteria that must be addressed to ensure metrics usability can be summarized as follows:

Accuracy

Validation against the right thing Repeatable

Scalable

Inexpensive [5]

A firewall policy consists of a sequence of rules, where each rule is of the form-

Predicate ⟶ Decision

The decision of a rule can be accept, discard or a combination of these decisions with other options such as logging option. Diverse firewall methods consist of three phases:

Design Phase: The specification requirement of firewall policy is given to multiple teams and they design their firewalls independently.

Comparison Phase: The firewalls designed by the teams are compared to detect functional discrepancies between them.

Resolution Phase: All discrepancies are resolved and a firewall is designed which is accepted by all teams. This policy will be an effective one for the, networks evolve, and new threats emerge. Then finally our system can be used directly to compute the impact of firewall policy changes by computing the inconsistencies between the policy before changes and policy after changes.

Firewalls are the main support of the enterprise security and of widely adopted technology for protecting the private networks. A small error in firewall policies will create security holes that allow malicious act into the private networks, cause of these malicious acts the normal business process could be lead to irreparable. The most firewall policies on the internet are poorly designed and having many errors. Therefore how one can design firewall policies

correctly is an important issue. In our proposals here we are going to create a new firewall policy which is act effectively by comparing with other firewall policies. Here one middle ware is using to create the new policy, but the middle ware does not know the policies of existing firewalls are using here. In our proposals we are going to give a specific requirement to, two type firewalls which are contains different policies, the firewalls will act depends upon them policies so the output of the firewalls will be different. That means one firewall may be accept the requirement and another firewall may be rejecting. Because of these inconsistencies unauthorized person can enter to our system or authorized person may be rejected. Therefore how one can design firewall policies correctly is an important issue. In our proposals the middle ware will analyze the output of those two firewalls and learn about those outputs from the databases which contain policies, then create a policy which are overcoming the inconsistencies of two firewall policies. That policy will be an effective one for the, networks evolve, and new threats emerge. Then finally our system can be used directly to compute the impact of firewall policy changes by computing the inconsistencies between the policy before changes and the policy after changes.[6] This method starts by designing a firewall decision diagram (FDD) whose consistency and completeness can be checked systematically by an algorithm. We can apply a sequence of five algorithm to this FDD to generate reduce and simplify the target firewall rules while maintaining the consistency and completeness of the original FDD. A firewall is often placed at the entrance of each private network in the Internet. The function of a firewall is to examine each packet that passes through the entrance and decide whether to accept the packet and allow it to proceed or to discard the packet. A firewall is usually designed as a sequence of rules. To make a decision concerning some packets, the firewall rules are compared, one by one, with the packet until one rule is found to be satisfied by the packet: this rule determines the fate of the packet. In this paper, we present the first ever method for designing the sequence of rules in a firewall to be consistent, complete, and compact. Consistency means that the rules are ordered correctly, completeness means that every packet satisfies at least one rule in the firewall, and compactness means that the firewall has no redundant rules. Our method starts by designing a firewall decision diagram (FDD, for short) whose consistency and completeness can be checked systematically (by an algorithm). We then apply a sequence of algorithms to this FDD to generate, reduce and simplify the target firewall rules while maintaining the consistency and completeness of the original FDD.

Consistency: Means that the rules are ordered correctly.

Completeness: Means that every packet satisfies at least one rule in the firewall.

Compactness: Means that the firewall has no redundant rules.[7] Due to large size and complex structure of modern networks, firewall policies can contain several thousand rules.

The network traffic flow is controlled according to a firewall policy. A policy deployment policy is the process by which the running policy is replaced by a new policy. Different firewalls support different policy editing commands: inserting a new rule, appending a new rule at the end, deleting a rule. A policy should issue the minimum number of commands to accomplish the deployment.

Policy Deployment: It's the process by which policy editing commands are issued on firewall so that the target policy becomes the running policy. The set of commands that a firewall supports is called its policy editing language.

Type I editing: only two commands- append (app r) and delete (del r)

Type II editing: allows random editing of firewall, It uses 3 commands- insert rule (ins i r), delete (del i) and move (mov i j).

Deployment Safety: A deployment is safe if no security rule is introduced and no legal traffic is denied at any stage during the deployment. It is particularly important in cases where many changes are to be made to a large firewall policy.

Performance Evaluation: It is clear that efficient deployment takes a fraction of second to calculate safe and most efficient deployment for policies.[8] In recent years packet-filtering firewalls have seen some impressive technological advances (e.g., stateful inspection, transparency, performance, etc.) and wide-spread deployment. In contrast, firewall and security management technology is lacking. In this paper we present Firmato, a firewall management toolkit, with the following distinguishing properties and components: (1) an entity relationship model containing, in a unified form, global knowledge of the security policy and of the network topology; (2) a model definition language, which we use as an interface to define an Instance of the entity-relationship model; (3) A model compiler, translating the global knowledge of the model into firewall-specific configuration files; and (4) a graphical firewall rule illustrator. We implemented a prototype of our toolkit to work with several commercially available firewall products. This prototype was used to control an operational firewall for several months. We believe that our approach is an important step toward streamlining the process of configuring and managing firewalls, especially in complex, multi-firewall installations.

A new architecture is proposed to minimize the rule set size among all firewall in a network model of stateful firewalls. In this model, each stateful firewall has a variable set called the state of the firewall, which is used to store some packets that the firewall has accepted previously and needs to remember in the near future. Each stateful firewall consists of two sections: a stateful section and a stateless section. Upon receiving a packet, the firewall processes it in two steps. In the first step, the firewall augments the packet with an additional field called the tag, and uses the stateful section to compute the value of this field according to the current state of the firewall. In the second step, the firewall compares the packet together with its tag value against a sequence of rules in the stateless section to identify the first rule that the packet matches: the decision of this rule determines the fate of the packet. Our model of stateful firewalls has several favourable properties. First, despite its simplicity, it can express a variety of state tracking functionalities. Second, it allows us to inherit the rich results in stateless firewall design and analysis. Third, it provides backward compatibility such that a stateless firewall can also be specified using our model. This paper goes beyond

proposing this stateful firewall model itself. A significant portion of this paper is devoted to analyzing the properties of stateful firewalls that are specified using our model. We outline a method for verifying whether a firewall is truly stateful. The method is based on the three properties of firewalls: conforming, grounded, and proper. We show that if a firewall satisfies these three properties, then the firewall is truly stateful. Serving as the first line of defence against unauthorized and potentially malicious traffic, firewalls have been widely deployed in most businesses and institutions for securing private networks. A firewall is placed at the point of entry between a private network and the outside Internet so that all incoming and outgoing packets have to pass through it. The stateless section is used to decide the fate of each packet based on the information in the packet itself and its tag value. This stateful firewall model has the following favourable properties. First, it can express a variety of state tracking functionalities. Using a set of packets to record communication state provides a great deal of flexibility in expressing state tracking functionalities since the state of a communication protocol is characterized by packets. In a sense, this stateful firewall model captures the essence of communication states. Second, because we separate a firewall into a stateful section and a stateless section, we can inherit the existing rich results in designing and analyzing stateless firewalls because a stateless section alone is in fact a full edged stateless firewall. Third, our model is simple, easy to use, easy to understand, and easy to implement. Last, our model is a generalization of the current stateless firewall model.

Although our model is intended to specify stateful firewalls, it can also be used to specify stateless firewalls, simply by leaving the stateful section empty and keeping the state empty. This paper goes beyond proposing the stateful firewall model itself. A significant portion of this paper is devoted to analyzing the properties of stateful firewalls that are specified using our model. This paper outlines a method for verifying that a firewall is truly stateful. The method is based on three properties of firewalls: conforming, grounded, and proper shown that if a firewall satisfies these three properties, then the firewall is truly stateful[9].

Firewalls are core elements in network security. However, managing firewall rules, particularly in multi-firewall enterprise networks, has become a complex and error-prone task. Firewall filtering rules have to be written, ordered and distributed carefully in order to avoid firewall policy anomalies that might cause network vulnerability. Therefore, inserting or modifying filtering rules in any firewall requires thorough intra- and inter-firewall analysis to determine the proper rule placement and ordering in the firewalls. In this paper, identified all anomalies that could exist in a single- or multi-firewall environment. It also presents a set of techniques and algorithms to automatically discover policy anomalies in centralized and distributed firewalls. These techniques are implemented in a software tool called the "Firewall Policy Advisor" that simplifies the management of filtering rules and maintains the security of next-generation firewalls. Although deployment of firewall technology is an important step toward securing our networks, the complexity of managing firewall policies might limit the effectiveness of firewall security. In a single firewall environment, the local firewall policy may include intra-firewall anomalies, where the same packet may match more than one filtering rule. Moreover, in distributed firewall environments, firewalls might also have inter-firewall anomalies when individual firewalls in the same path perform different filtering actions on the same traffic. Therefore, the administrator must give special attention not only to all rule relations in the same firewall in order to determine the correct rule order, but also to all relations between rules in different firewalls in order to determine the proper rule placement in the proper firewall. As the number of filtering rules increases, the difficulty of adding a new rule or modifying an existing one significantly increases. It is very likely, in this case, to introduce conflicting rules such as one general rule shadowing another specific rule, or correlated rules whose relative ordering determines different actions for the same packet. In addition, a typical large-scale enterprise network might involve hundreds of rules that might be written by different administrators in various times. This significantly increases the potential of anomaly occurrence in the firewall policy, jeopardizing the security of the protected network. Therefore, the effectiveness of firewall security is dependent on providing policy management techniques and tools that network administrators can use to analyze, purify and verify the correctness of written firewall filtering rules. This paper first provides a formal definition of filtering rule relations and then identifies all anomalies that might exist in any firewall policy in both centralized and distributed firewall environments. It also uses a tree-based filtering representation to develop anomaly discovery algorithms for reporting any intra- and inter-firewall anomaly in any general network. It finally develops a rule editor to produce anomaly-free firewall policies, and greatly simplify adding, removing and modifying filtering rules. These algorithms and techniques were implemented using Java programming language in a software tool called the "Firewall Policy Advisor". In the previous work, the intra-firewall conflict analysis was discussed, however, in this paper main focus is on the discovery and resolution of inter-firewall anomalies [10]. A firewall is a security guard placed at the point of entry between a private network and the outside Internet such all incoming and outgoing packets have to pass through it. The function of a firewall is to examine every incoming or outgoing packet and decide whether to accept or discard it. This function is conventionally specified by a sequence of rules, where rules often conflict. To resolve conflicts, the decision for each packet is the decision of the first rule that the packet matches. The current practice of designing a firewall directly as a sequence of rules suffers from three types of major problems:

1. The consistency problem, which means that it is difficult to order the rules correctly
2. The completeness problem, which means that it is difficult to ensure thorough consideration for all types of traffic;
3. The compactness problem, which means that it is difficult to keep the number of rules small (because some rules may be redundant and some rules may combined into one rule).

To achieve consistency, completeness, and compactness, we propose a new method called structured firewall design, which consists of two steps. First, one

designs a firewall using a firewall decision diagram instead of a sequence of often conflicting rules. Second, a program converts the firewall decision diagram into a compact, yet functionally equivalent, sequence of rules. This method addresses the consistency problem because a firewall decision diagram is conflict-free addresses the completeness problem because the syntactic requirements of a firewall decision diagram force the designer to consider all types of traffic. It also addresses the compactness problem because in the second step use two algorithms (namely FDD reduction and FDD marking) to combine rules together, and one algorithm (namely firewall compaction) to remove redundant rules. Moreover, the techniques and algorithms presented in this paper are extensible to other rule-based systems such as IPSec rules [11] Firewalls are core elements in network security. However, managing firewall rules, especially for enterprise networks, have become complex and error-prone. Firewall filtering rules have to be carefully written and organized in order to correctly implement the security policy. In addition, inserting or modifying a filtering rule requires thorough analysis of the relationship between this rule and other rules in order to determine the proper order of this rule and commit the updates. In this paper, present a set of techniques and algorithms that provide (1) automatic discovery of firewall policy anomalies to reveal rule conflicts and potential problems in legacy firewalls, and (2) anomaly-free policy editing for rule insertion, removal and modification. This is implemented in a user-friendly tool called "Firewall Policy Advisor." The Firewall Policy Advisor significantly simplifies the management of any generic firewall policy written as filtering rules, while minimizing network vulnerability due to firewall rule misconfiguration. Although deployment of firewall technology is an important step toward securing our networks, the complexity of managing firewall policy might limit the effectiveness of firewall security. A firewall policy may include anomalies, where a packet may match with two or more different filtering rules. When the filtering rules are defined, serious attention has to be given to rule relations and interactions in order to determine the proper rule ordering and guarantee correct security policy semantics. As the number of filtering rules increases, the difficulty of writing a new rule or modifying an existing one also increases. It is very likely, in this case, to introduce conflicting rules such as one general rule shadowing another specific rule, or correlated rules whose relative ordering determines different actions for the same packet. In addition, a typical large-scale enterprise network might involve hundreds of rules that might be written by different administrators in various times. This significantly increases the potential of anomaly occurrence in the firewall policy, jeopardizing the security of the protected network Therefore, the effectiveness of firewall security is dependent on providing policy management techniques and tools that enable network administrators to analyze, purify and verify the correctness of written firewall legacy rules. In this paper, I've defined a formal model for firewall rule relations and their filtering representation. The proposed model is simple and visually comprehensible. I use this model to develop an anomaly discovery algorithm to report any anomaly that may exist among the filtering rules. Finally develop an anomaly free firewall rule editor, which greatly simplifies adding, removing and modifying rules into firewall policy. This paper used the Java programming language to implement these algorithms in one graphical user-interface tool called the "Firewall Policy Advisor" [12]. Firewall policy management is challenging and error-prone. While ample research has led to tools for policy specification, correctness analysis, and optimization, few researchers have paid attention to firewall policy deployment: the process where a management tool edits a firewall's configuration to make it run the policies specified in the tool. In this paper, we provide the first formal definition and theoretical analysis of safety in firewall policy deployment. I've shown that naive deployment approaches can easily create a temporary security hole by permitting illegal traffic, or interrupt service by rejecting legal traffic during the deployment. It defines safe and most-efficient deployments, and introduces the shuffling theorem as a formal basis for constructing deployment algorithms and proving their safety. Efficient algorithms for constructing most-efficient deployments in popular policy editing languages show that in certain widely installed policy editing languages, a safe deployment is not always possible. It also shows how to leverage existing different algorithms to guarantee a safe, most efficient, and monotonic deployment in other editing languages[13] the all functional discrepancies.

10. Modules And Technique Used

Designing two types of Firewalls: In this module create two different types of firewalls with different policies, and giving the same specific requirement to both firewalls as input. Those firewalls will act depends upon the policies which are built in the firewalls.

Implementation of Middleware Technique: In this module we create a middle ware for generate the new policies for the given requirement of the two firewalls. The new policies will be more effective than the previous firewall policies. The main aim of this middleware technique is to protect the system from the unauthorized domains. The middleware will contains lot of policies for analyzing the output of those two firewalls but that doesn't know the policies of two firewalls we are taken. The output of two firewalls will be give as an input to the middleware. The middleware do the work of comparison process of those outputs and analyze the outputs with the policies which are already built in the middleware.

Comparison of the Firewall Outputs: In this module the middleware comparing the two outputs of firewalls. The results of those firewalls should be depends upon the policies of those two firewalls. The outputs of those firewalls may be like accept or discard. That firewalls may be accept the malicious domain or may be discard the authorized domain, so the middleware have to create a new policy which are not affect the authorized domain who are accessing the system in the private networks. In this phase the middleware first find the inconsistencies of those two output results, and then analyze the policies by comparing the policies are in the middleware.

New Policy Generation and Updation: In this module the middleware are creating the new policies by comparing the outputs with the inbuilt policies of middleware. Then the middleware find an optimal policy for the given specific

requirement. After finding of the optimal policies that policies will be updated in the previous firewalls which are taken us to check the requirement.

Technique Used: Firewall Policy Advisor **(**Policy visor it is the structural analysis approach**)**

It is an automated tool developed for analysing the firewall rule sets. This is the user needs to enter the conditions and associated actions. It automatically tells the relation between the rules .so that can be minimized.

11. Conclusion

To minimize the firewall's rule set in a network of multiple firewalls's, the firewall placement problem is analyzed and it is proved that it is NP complete. In this paper a topology tree which consists of an optimum topology and routing structure is suggested, which shows that corporate firewall's rule set are not strong enough to provide the better performance. This is study clearly shows that corporate firewalls are often enforcing poorly written rule sets. However, it includes some useful observations for improving rule-set quality as well. Three different approaches in which a network administrator can analyze firewall rule set and verify the firewall security policy are described. The approach is structural analysis of firewall rule set

12. Future Work

In Future a lot of things can explore in this context like same problem in dynamic routing and already mentioned that as the enterprises are moving towards cloud computing, the data at data center is increasing and complexity is also increasing. That is why security loops are in security policy therefore we need highly optimized firewall that can provide maximum security with optimum rule set. Future prospects, this Paper is too much useful for the purpose of network security .This firewall is alterable i.e. It can make changes in the firewall rule sets as per our requirements and then using a program that will analyze all the rules and inform the user about the presence of any discrepancy among the rules. This discrepancy can either be repetition of rules or conflicting rules. Once the discrepancy is known, it will specify the required action that should be taken for the removal of that discrepancy. This paper shall be highly useful in securing a network: either public or private. Even for future prospects, there might be regular updates in the requirements of that particular network and for every update some changes have to be made in the firewall rule sets. So for every change, it must specify how we can reduce or remove the discrepancy occurring out of that change.

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