Tab 1

Topics added to reference toc to enhance the blog

1. **Firewall Configuration Best Practices for Maximum Protection**
2. **Difference Between Traditional Firewalls and Next-Gen Firewalls**

Improvised toc

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Tab 2

Meta Title: What Is a Firewall in Computer Networks? - Intellipaat
Slug (URL): same (Revamp)
Meta Description: Learn what a firewall is, why you need a firewall in computer networks, types of firewalls, advantages and disadvantages, how to use a firewall, and more.

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https://www.geeksforgeeks.org/computer-networks/introduction-of-firewall-in-computer-network/
URL 3- https://www.kaspersky.com/resource-center/definitions/firewall

What Is a Firewall in Computer Networking?

With growing cyber crimes and fraud that have infected the world, network security is compulsory. A computer network firewall is a shield that blocks, checks, and manages outgoing and incoming traffic according to the security provisions that have been programmed. Firewalls can be used whether you are securing an individual device or are in charge of infrastructure at an enterprise level. Firewalls make it possible to combat unauthorized access, malware infection, and data breaches. The blog describes what a firewall is, its types, the way it functions, the distinction between a conventional and a next-gen firewall, and how to employ a firewall to keep an organization secure.

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What is the Purpose Firewall in a Computer Network?

Try to think of your network as a safe building that has a small number of doors to enter. You would not leave them open and allow anybody to come walking into them, would you? That is when a firewall comes into place. In computer networking, a firewall is a security guard that blocks everything entering and leaving the network using a given set of rules. It has the mandate to pass or reject data packets based on whether they pass the security standards set or not. Essentially, a firewall in computer networking will assist in avoiding unauthorized users, hacking, viruses, and information loss. Whether you use a small-scale home setup or a huge business network, the main function of a firewall is to provide a security net between your local system and the potentially harmful external world, such as the **internet**. It tracks traffic in real-time and also ensures that the trusted sources pass through.

Firewalls are the backbone of any **cybersecurity** approach. With the increase of cyber threats, the importance of a correctly configured firewall is not only critical, but it is also necessary. A firewall will assure your safety, especially when you are doing business or even when you are just surfing in the comfort of your home. A firewall will keep your network traffic clean and safe.

A Brief History of Firewalls in Computer Networks

The theory of firewalls in networking goes back to the late 1980s, when the usage of the internet spread not only in institutions of research but also in commercial and general sectors. Originally, the networks were trusted and open by default to the public, but later on, cyber attacks rose, and it was evident that some sort of protection line had to be set up. The first kind of firewall was a basic packet filter that only observed the details of header data packets to either pass or block them according to pre-determined rules.

Check Point Technologies introduced the first stateful inspection firewall in the year 1993, and it was a significant breakthrough in security. With the passage of time, firewalls were developed to deal with more advanced traffic and application-level threats. Later in the mid-2010s, Next-Generation Firewalls (NGFWs) were introduced, which added more powerful capabilities, such as deep packet inspection, intrusion prevention, and threat intelligence. Such innovations do indicate an increasing level of digital attacks and the means necessary to fight them.

Evolution of Firewall Generations in Network Security

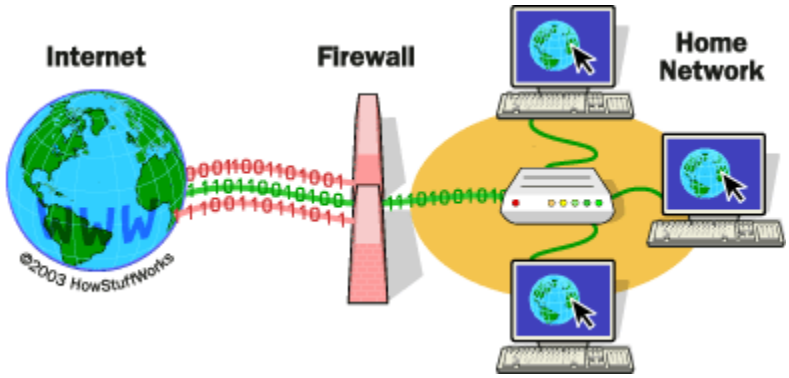
Over the years, firewalls have evolved in a number of generations to accommodate the needs of increasing cybersecurity threats. The first were referred to as packet-filtering firewalls, as the only thing they analyzed was IP addresses, ports, and protocols, which is not much protection.

Then there were stateful inspection firewalls, where the active connections were monitored and intelligent decisions on the filtering were made. The third generation, or user application-layer firewalls, had the potential to examine up to the application level, recognizing abuse in policies such as HTTP and FTP. Current Next-Generation Firewalls (NGFWs) add deep packet inspection, intrusion prevention, SSL decryption, and identity-based access to protect against sophisticated, modern attacks.

How Firewalls Operate: Behind the Scenes of Network Filtering

Any firewall can boil down to a group of regulations, which are basically meant to curb incoming or outgoing data through your network. Upon the reception of a data packet, the firewall scans its source and destination IP address, destination port number, and protocol in order to determine whether to permit, reject, or drop the packet. This filtering is in real time, depending on pre-defined security policies. The Next-Gen Firewalls (NGFWs) are more advanced in that the system goes further--to examine packet content including malware, and even inspecting traffic that is encrypted through SSL/SSH decryption.

The type of firewall can work at a different level of the OSI model. As an example, packets are normally blocked by packet-filtering firewalls acting on the network layer of the OSI model, whereas application-layer firewalls check data on the highest layer to prevent dangerous applications or data. Other firewalls also have state tables, which are used to monitor sessions, and only the understood traffic is permitted. When this flow is monitored and controlled, firewalls can become the alert guards as they provide protection to your internal systems against unpermitted access, malware, or cyberattacks.



Major Types of Firewalls in Network Security

There exist several types of firewalls, each having a particular security requirement and complexity. The simplest one is **packet-filtering firewalls**. They look into individual packets of data on predetermined guidelines like IP addresses, ports, protocols, and whether to permit or block the traffic. Nevertheless, they do not monitor the state of connections, so they are faster

yet less secure in case of complex traffic. **Stateful inspection firewalls** are a step further and keep a record of the active connections. This enables them to decide whether a packet coming in is part of a known conversation or a request that is suspicious. There are also the so-called **application-layer firewalls** or **proxy firewalls** that inspect the traffic on the application layer. They are able to filter certain content or applications, such as FTP and HTTP, according to actions. **Next-Generation Firewalls (NGFWs)** integrate all the above with some advanced functionality such as deep packet Inspection, intrusion prevention, and SSL termination. There are other forms, such as the circuit-level gateways, **cloud firewalls**, and the **Unified Threat Management (UTM) systems**, which protect your network differently depending on your network's needs.

Core Functions of a Firewall in Securing Your Network

- **Predefined Rule-based Traffic Filtering:** Firewalls filter all the incoming and outgoing packets according to a group of security rules. Such rules may rest on IP addresses or port numbers or protocols, or application-level identifiers. The firewall filters traffic access by either allowing or disallowing any traffic that does not meet pre-approved standards, thus restricting unauthorized access and exposure to a risk that is untrusted.
- **Implementation of access control:** The ability to be able to control who or what gets to access your internal network is one of the most imperative firewall roles. Firewalls can also be configured with policies that may authorize or deny internet access to certain users, IP segments, or devices so that only endpoints that can be trusted to communicate with sensitive resources can do so.
- **Network Activity Monitoring and Logging:** Firewalls gather network traffic information to reveal user patterns, trace attempted intrusion, and audit access habits. This logging assists in identifying anomalies, responding to events, and meeting regulatory requirements such as GDPR, HIPAA, or PCI-DSS by preserving security audit trails.
- **Intrusion Detection Prevention (IDP):** The new generation of firewalls has incorporated intrusion detection and prevention systems that monitor the traffic to detect known attack signatures or abnormal patterns. Before they land within the network, brute-force attacks, SQL injections, DDoS attacks, and other threats that take place in real-time may be blocked with these systems.
- **Blocking Data Exfiltration:** Firewalls also prevent unauthorized shipping of internal data by screening the outbound traffic that does not match the permitted use cases. This will keep malicious insiders or malware might sending critical information such as customer records, intellectual properties, or login credentials to external command and control servers.
- **Zone Isolations and Segmentation:** The firewalls have a capability to partition a network into secure areas, e.g., the DMZs (demilitarized zones), internal and external segments, isolate critical assets, and decrease the propagation of breaches. The rules set may be different in each zone, which enables fine-grained access control between the zones.

- **Application-Level Protection:** Firewalls in the application layer are able to identify the abuse of a protocol like HTTP, FTP, or DNS. They determine and select traffic using the real application as opposed to ports or IPs. It particularly comes in handy in the prohibition of unsafe applications, such as remote desktop applications or web applications that have not been approved.
- **Defense against Malware and Zero-Day Exploits:** Some features provided by next-generation firewalls are antivirus, antimalware, and sandboxing. These modules scan files and executable code to filter out malicious materials before they get to your environment, and even scan compressed files or encrypted packets.

Common Limitations of Firewalls

- **Impotent in Fighting Against Internal Threats:** Firewalls are mainly oriented to protection against outside infiltration, not attacks carried out internally on the network. In case of a compromised user account of a trusted user or a rogue insider, the firewall cannot be the line of defense on its own, i.e., without being combined with other products and capabilities, such as endpoint detection or behavior analytics.
- **Minimum Malware and Phishing Security Protection:** Although contemporary firewalls provide certain malware prevention, these are not infallible. These malware, particularly of the zero-day type, or phishing emails that lure users into divulging confidential data, usually evade firewall settings. Such threats should be handled by firewalls combined with endpoint security, email filters, and training of users.
- **Has no Protection on Compromised Devices:** Once a system in a network is attacked by malware, a firewall is not able to clean or delete the malware. When a machine is already infected, it is via a USB stick, faulty software, or even the carelessness of the user; the firewall by itself does not save the day. It is not a cure, it is a preventive layer.
- **Prone to misconfiguration:** The quality of firewalls is dependent on their configuration. In case of Three, the set rules are not properly established, too liberal, or obsolete, attackers have a chance to go through. A gap of any kind, even a non-permitted open port or a forgotten rule, can turn into an entry point. Repeated checks and rule maintenance will be necessary.
- **Not able to control Non-Network Threats:** Firewalls are security controls of a network nature and, as such, cannot be used to prevent threats such as those propagated through physical access, removable media, and social engineering. Such attacks as shoulder surfing, insider sabotage, or evil USBs do not even require network-layer defenses.
- **Bottlenecks in Performance during Heavy Load :** Firewalls may also represent a bottleneck when not appropriately sized or optimized, in an enterprise environment with high traffic. By examining additional data packets, searching applications, and implementing deep packet inspection, they may experience a loss in performance, which may lead to slowing the network or loss of valid traffic.
- **Is not able to Encrypt or Decrypt end-to-end traffic independently:** Some firewalls may allow inspection of the SSL traffic, but in most cases, the firewalls are not able to

scan the encrypted traffic without being configured appropriately. The encrypted traffic can be circulating without the firewall catching on to it, and the threats remain hidden with no eyes to spot them unless the firewall is implemented with a decryption proxy that has blind spots.

Advantages and Disadvantages of Firewalls

Difference Between Traditional Firewalls and Next-Gen Firewalls

Best Practices for Maximum Protection

- **Allow Default Deny Policy:** Basing your system on a zero-trust model, begin by blocking everything coming in, and then permit only essential connections. This guarantees that any threat that is not known is automatically denied unless it is explicitly allowed.
- **Ensure that the firmware of firewalls is updated on a regular basis:** Make sure that the firewall software or firmware is kept current to add vulnerability patches and to improve threat detection functions. Most of the updates contain the correction of recently found exploits.
- **Introduce Rule, Clean up, and Prioritization:** Disengage unneeded or obsolete firewall rules and sort the live ones in order of precedence. This avoids complexity, enhances performance, and avoids loopholes caused by outmoded settings.
- **Traffic Log and Monitoring With Consistency:** Facilitate the logging to follow all access attempts, missing packets, and strange actions. Unceasing surveillance gives you the chance to realize and act on possible penetration or misconfiguration.
- **Limit the administrative privilege:** Restrict users to the management console of the firewall. Assign high-level authentication procedures and access to your system by secure and in-house IP addresses to minimize the exposure to unauthorized amendments.

Conclusion

Firewalls are indispensable when it comes to protecting your network against any external threats, and when it comes to protecting your network in non-enterprise setups, a firewall is your first layer of defense. You should take into account the fact that whether you use a traditional or a next-generation firewall, it is really important to understand how it functions and how to configure it appropriately. With increasingly smart cyberattacks, introducing yourself to a good firewall solution and aligning your best security practices in place, your data, applications, and devices will be safe against unwanted access.

FAQs

Q1. Will I still require a firewall provided I possess antivirus software?
Yes, antivirus guards against the bad files, and the firewall regulates both the incoming and outgoing network traffic, both are vital layers of security.

Q2. Does this mean that there are no ways that firewalls can help in the elimination of hacking?
Although firewalls make the risk very minimal, there is no security measure that can protect 100 percent. Firewalls should be used with other computer security provisions such as intrusion detection, encryption, and upgradation.

Q3. What can I do to know my firewall is functional?
It is possible to check it by viewing your firewall configurations on your system, conducting port scans, or monitoring the network to observe whether unauthorized traffic is being denied.

Q4. Can a home use just a software firewall?
A software firewall, together with a router-implemented one, is usually adequate in most home environments. To further deal with security issues, particularly on smart home applications, upgrade to hardware-based solutions.

Q5. Are there firewalls that can influence the speed of the internet?
Indeed, in the case of the use of deep packet inspection or complex filtering rules, in particular. Contemporary firewalls are, however, more focused on ensuring they pose little to no performance costs on an average machine but remain secure to a great extent.