

## DHCP, DNS, AD, SCCM, Windows Server

### What is DHCP and how does it work?

The host in any network can be assigned the IP address manually or dynamically. In a small home network having 2 or 3 computers, we can assign the IP addresses manually but imagine a network having hundreds of computer and you have to assign the IP addresses to all of them. It can be a nightmare for network administrators!! No two hosts can have the same IP address and assigning them IP address manually can lead to errors and confusion. So, to resolve this problem **DHCP** is needed. The DHCP is needed to simplify the assignment of IP addresses on a network. So, let's learn more about DHCP as we go through this blog.

### **DHCP**

**Dynamic Host Configuration Protocol** is a network management protocol that is used to dynamically assign the IP address and other information to each host on the network so that they can communicate efficiently. DHCP automates and centrally manages the assignment of IP address easing the work of network administrator. In addition to the **IP address**, the DHCP also assigns the **subnet masks, default gateway** and **domain name server(DNS) address** and other configuration to the host and by doing so, it makes the task of network administrator easier.

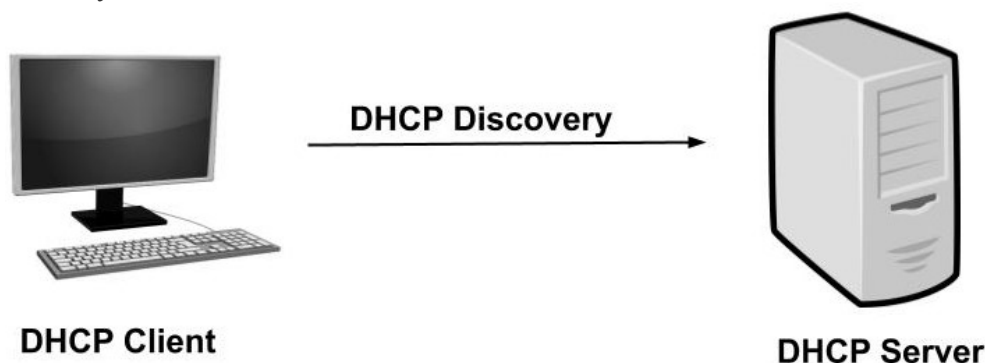
### **Components of DHCP**

1. **DHCP Server:** It is typically a server or a router that holds the network configuration information.
2. **DHCP Client:** It is the endpoint that gets the configuration information from the server like any computer or mobile.
3. **DHCP Relay Agent:** If you have only one DHCP Server for multiple LAN's then the DHCP relay agent present in every network will forward the **DHCP request** to the servers. This because the DHCP packets cannot travel across the router. Hence, the relay agent is required so that DHCP servers can handle the request from all the networks.
4. **IP address pool:** It contains the list of IP address which are available for assignment to the client.
5. **Subnet Mask:** It tells the host that in which network it is currently present.
6. **Lease Time:** It is the amount of time for which the IP address is available to the client. After this time the client must renew the IP address.
7. **Gateway Address:** The gateway address lets the host know where the gateway is to connect to the internet.

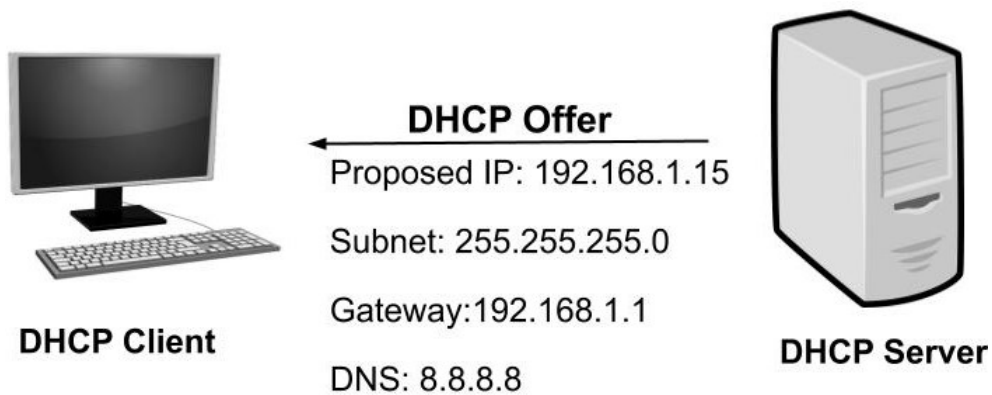
### **How do DHCP works?**

DHCP works at the application layer to dynamically assign the IP address to the client and this happens through the exchange of a series of messages called DHCP transactions or DHCP conversation.

- **DHCP Discovery:** The DHCP client broadcast messages to discover the DHCP servers. The client computer sends a packet with the default broadcast destination of **255.255.255.255** or the specific subnet broadcast address if any configured. **255.255.255.255** is a **special broadcast address**, which means "**this network**": it lets you send a broadcast packet to the network you're connected to.

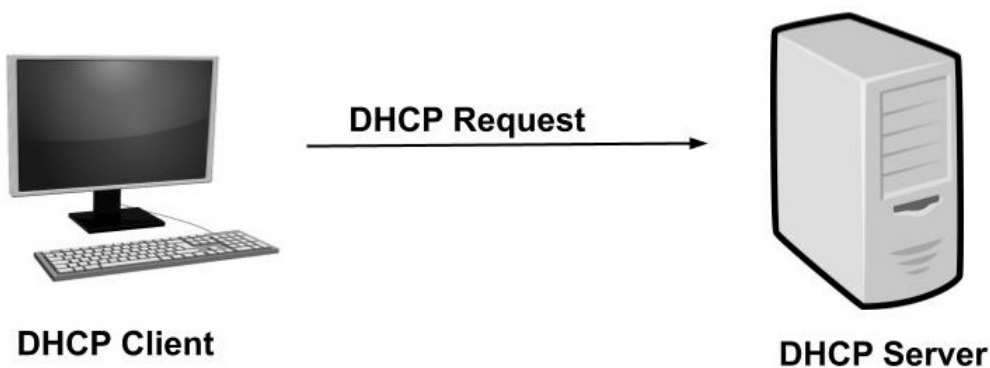


- **DHCP Offer:** When the DHCP server receives the DHCP Discover message then it suggests or offers an IP address(form IP address pool) to the client by sending a DHCP offer message to the client. This DHCP offer message contains the proposed IP address for DHCP client, IP address of the server, MAC address of the client, subnet mask, default gateway, DNS address, and lease information.

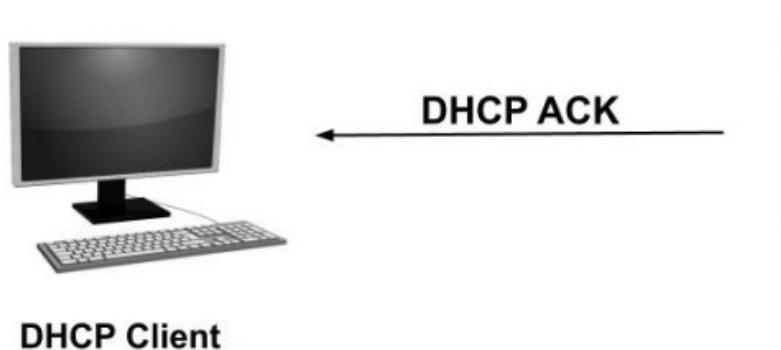


1. the proposed IP address for DHCP client (here 192.168.1.11)
2. Subnet mask to identify the network (here 255.255.255.0)
3. IP of the default gateway for the subnet (here 192.168.1.1)
4. IP of DNS server for name translations (here 8.8.8.8)

- **DHCP Request:** In most cases, the client can receive **multiple DHCP offer** because in a network there are many DHCP servers(as they provide fault tolerance). If the IP addressing of one server fails then other servers can provide backup. But, the client will accept only one DHCP offer. In response to the offer, the client sends a **DHCP Request** requesting the offered address from one of the DHCP servers. All the other offered IP addresses from remaining DHCP servers are withdrawn and returned to the pool of IP available addresses.



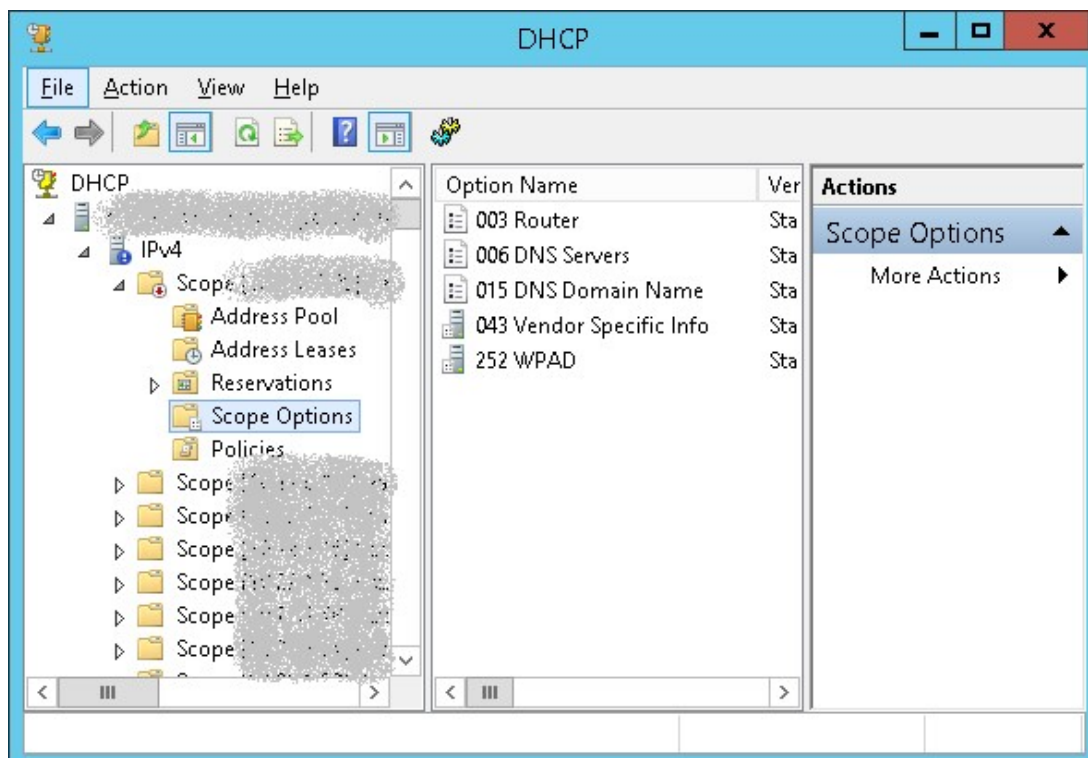
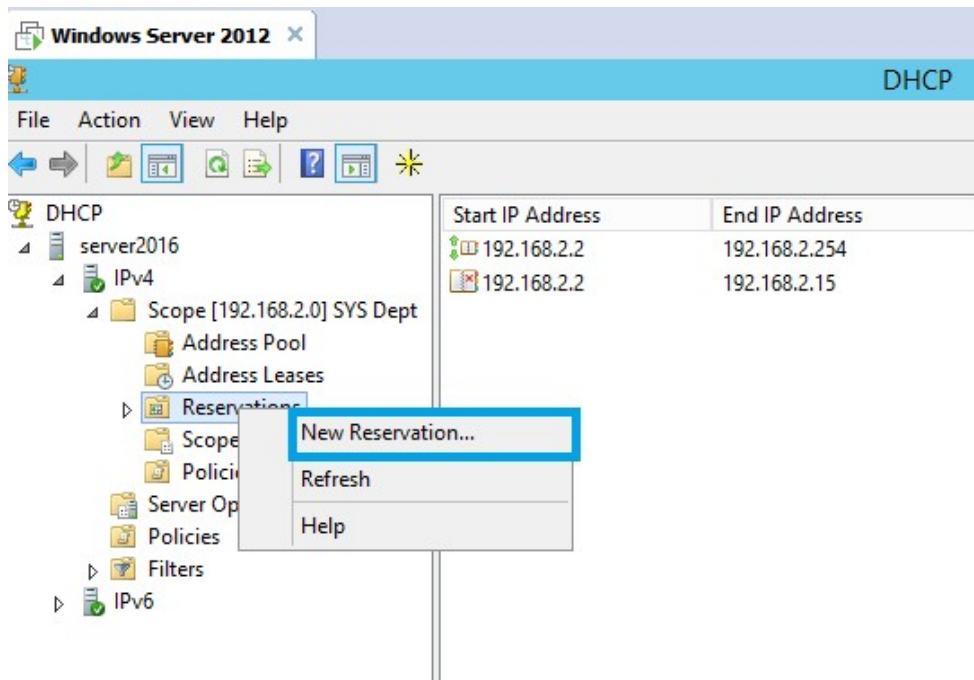
- **DHCP Acknowledgment:** The server then sends Acknowledgment to the client confirming the DHCP lease to the client. The server might send any other configuration that the client may have asked. At this step, the IP configuration is completed and the client can use the new IP settings.



### IP Settings

IP: 192.168.1.15

Subnet: 255.255.255.0



### ***Advantages of DHCP***

1. It is easy to implement and automatic assignment of an IP address means an accurate IP address.
2. The manual configuration of the IP address is not required. Hence, it saves time and workload for the network administrators.
3. Duplicate or invalid IP assignments are not there which means there is no IP address conflict.
4. It is a great benefit for mobile users as the new valid configurations are automatically obtained when they change their network.

### ***Disadvantages of DHCP***

1. As the DHCP servers have no secure mechanism for the authentication of the client so any new client can join the network. This poses security risks like unauthorized clients being given IP address and IP address depletion from unauthorized clients.
2. The DHCP server can be a single point of failure if the network has only one DHCP server.

This is all about DHCP and its working.

## **DNS**

### **What is DNS?**

DNS, or the Domain Name System, translates human readable domain names (for example, www.amazon.com) to machine readable IP addresses (for example, 192.0.2.44).

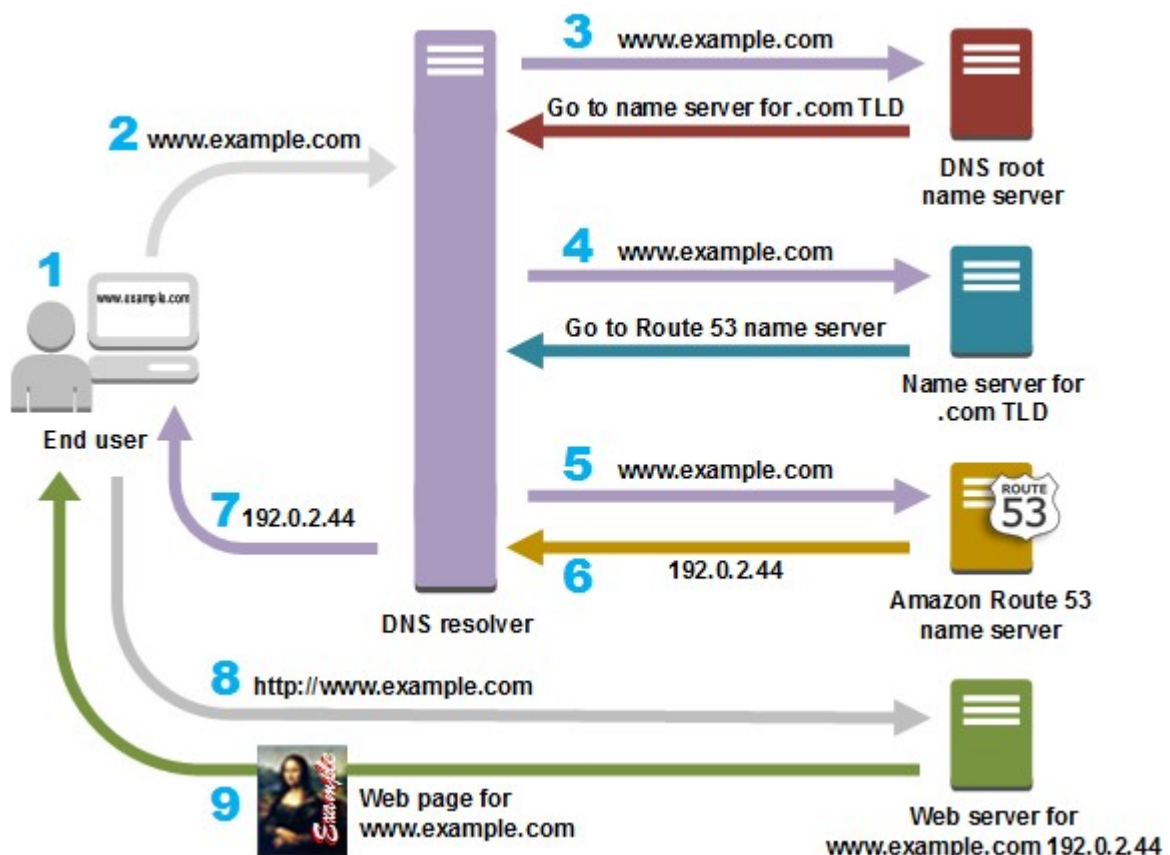
### **DNS Basics**

All computers on the Internet, from your smart phone or laptop to the servers that serve content for massive retail websites, find and communicate with one another by using numbers. These numbers are known as IP addresses. When you open a web browser and go to a website, you don't have to remember and enter a long number. Instead, you can enter a domain name like example.com and still end up in the right place.

The Internet's DNS system works much like a phone book by managing the mapping between names and numbers. DNS servers translate requests for names into IP addresses, controlling which server an end user will reach when they type a domain name into their web browser. These requests are called queries.

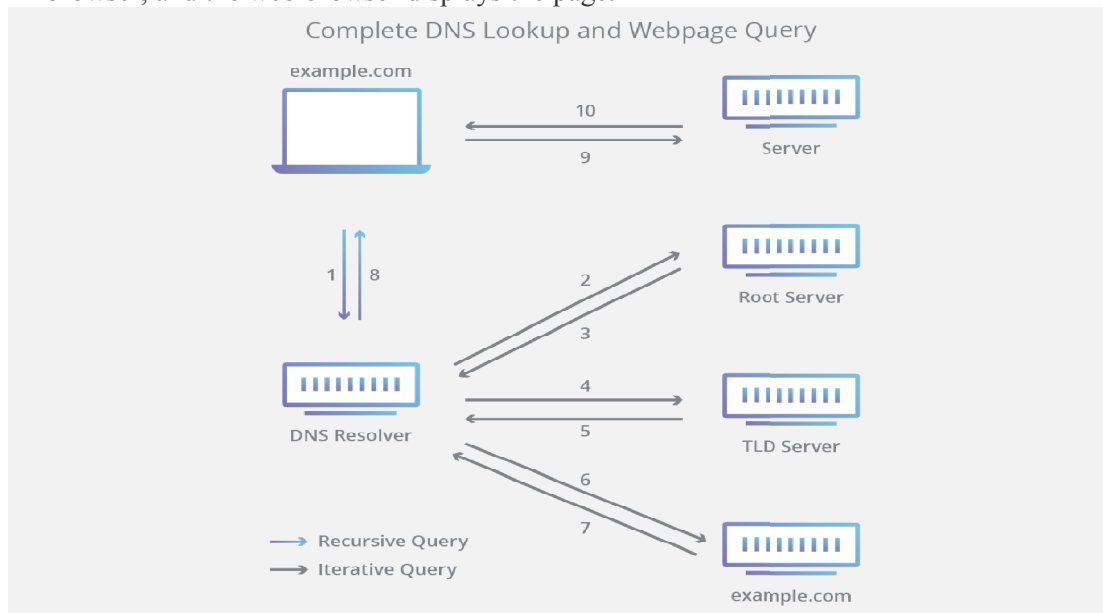
### How Does DNS Route Traffic To Your Web Application?

The following diagram gives an overview of how recursive and authoritative DNS services work together to route an end user to your website or application.



1. A user opens a web browser, enters `www.example.com` in the address bar, and presses Enter.
2. The request for `www.example.com` is routed to a DNS resolver, which is typically managed by the user's Internet service provider (ISP), such as a cable Internet provider, a DSL broadband provider, or a corporate network.
3. The DNS resolver for the ISP forwards the request for `www.example.com` to a DNS root name server.
4. The DNS resolver for the ISP forwards the request for `www.example.com` again, this time to one of the TLD name servers for `.com` domains. The name server for `.com` domains responds to the request with the names of the four Amazon Route 53 name servers that are associated with the `example.com` domain.
5. The DNS resolver for the ISP chooses an Amazon Route 53 name server and forwards the request for `www.example.com` to that name server.
6. The Amazon Route 53 name server looks in the `example.com` hosted zone for the `www.example.com` record, gets the associated value, such as the IP address for a web server, `192.0.2.44`, and returns the IP address to the DNS resolver.
7. The DNS resolver for the ISP finally has the IP address that the user needs. The resolver returns that value to the web browser. The DNS resolver also caches (stores) the IP address for `example.com` for an amount of time that you specify so that it can respond more quickly the next time someone browses to `example.com`. For more information, see [time to live \(TTL\)](#).
8. The web browser sends a request for `www.example.com` to the IP address that it got from the DNS resolver. This is where your content is, for example, a web server running on an Amazon EC2 instance or an Amazon S3 bucket that's configured as a website endpoint.

9. The web server or other resource at 192.0.2.44 returns the web page for www.example.com to the web browser, and the web browser displays the page.



## What Is Active Directory?



Active Directory (AD) allows your IT department to manage and store information about the devices, users, and objects within your organization's network.

### Why Use Active Directory?

- Easily organize users into groups and subgroups.
- Quickly manage file access and appropriately assign access rights to employees.
- Maintain a complete overview of the management of resources and users within the organization.

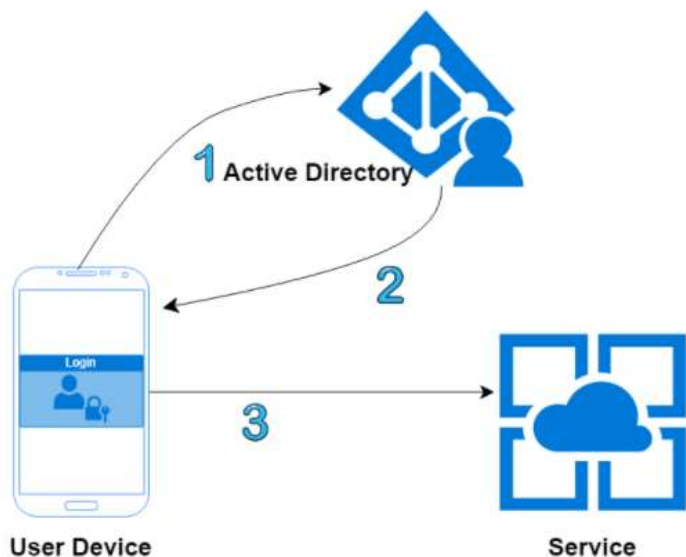


Active Directory is **universally adopted** within countless organizations' infrastructures.



Through Active Directory usage, organizations of all sizes can **provide the centralized management** of their users.

### Basic Active Directory Authentication Process



**1** User application communicates with Active Directory Authentication Library (ADAL), Users enter credentials.

**2** Active Directory authenticates the request and sends an access/refresh token pair.

**3** The access/refresh token passes to the requested service for a continued session.

# System center

The screenshot shows the System Center console interface. The top ribbon includes 'Home' and 'Search' tabs. The 'Search' tab is active, showing options like 'All Objects', 'Current Node', 'All Subfolders', 'Refine', 'Saved Searches', 'Search Settings', 'Save Current Search', 'Save Current Search As', and 'Close'. The breadcrumb path is 'Assets and Compliance > Overview > Devices'. The left-hand navigation pane shows 'Assets and Compliance' expanded, with 'Overview', 'Users', 'Devices', 'User Collections', 'Device Collections', 'User State Migration', 'Asset Intelligence', 'Software Metering', 'Compliance Settings', 'Endpoint Protection', and 'All Corporate-owned Devices' listed. The main pane displays 'Devices Search Results - 393 items shown'. A search filter 'AND Client No' is applied. A table lists search results with columns: Icon, Name, Client, Primary User(s), Currently Logged on User, Last Feature Update Error Detail, and MAC Address. The first row is selected, showing the name '16202220L'.

Icon	Name	Client	Primary User(s)	Currently Logged on User	Last Feature Update Error Detail	MAC Address
	16202220L	No				
	16302122LA	No				
	16302181L	No				
	16400622LL	No				
	16401879L	No				
	16402335L	No				
	16402456-L	No				
	16501992LP	No				
	16502137LA	No				
	16503120L	No				
	16503180LT	No				
	16601835LA	No				

16202220L