

**Module 7**

# **Configuring Network Connectivity**

## Module Overview

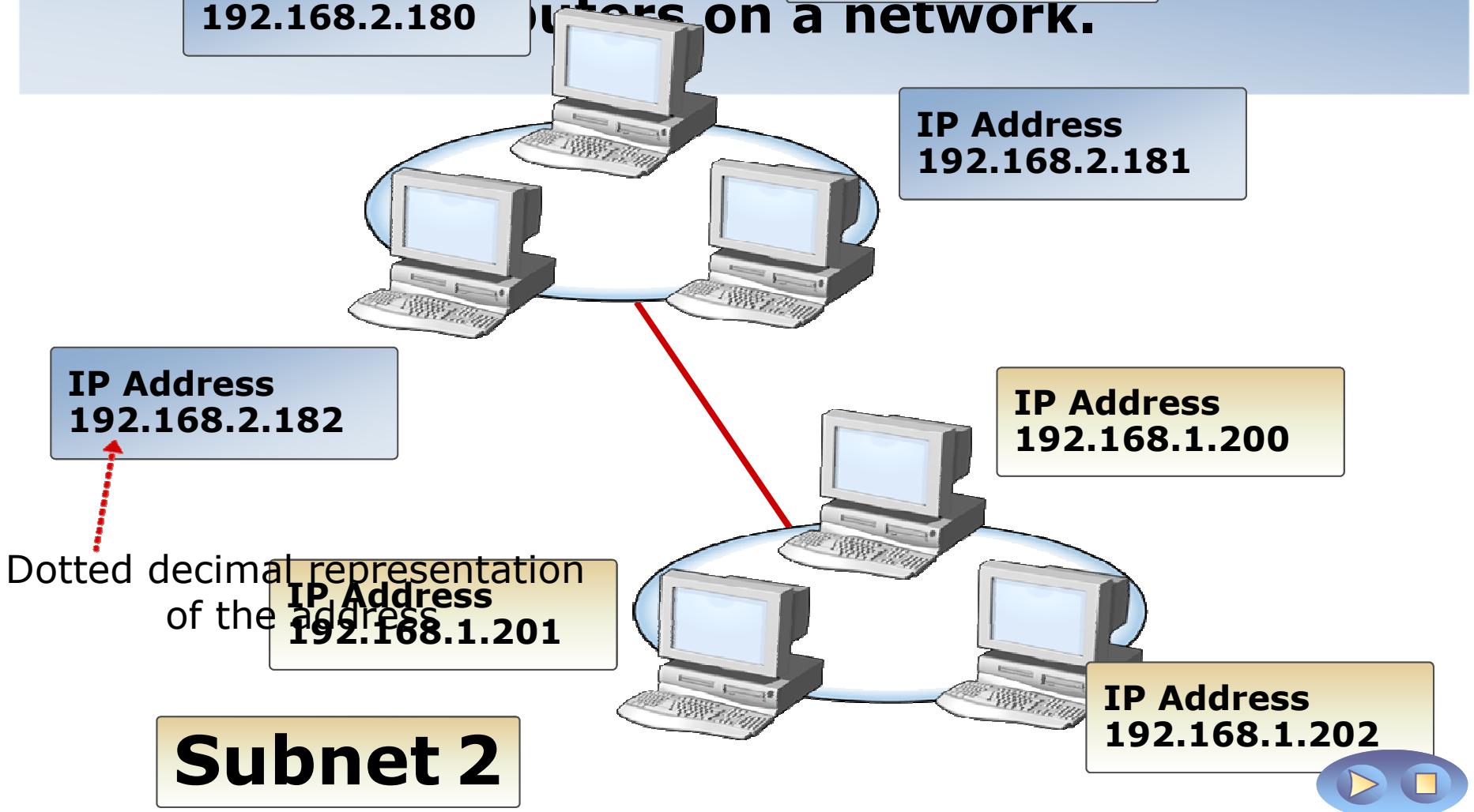
- Configuring IPv4 Network Connectivity
- Configuring IPv6 Network Connectivity
- Implementing Automatic IP Address Allocation
- Overview of Name Resolution
- Troubleshooting Network Issues

# Lesson 1: Configuring IPv4 Network Connectivity

- What Is an IPv4 Address?
- What Is a Subnet Mask?
- What Is a Default Gateway?
- What Are Public and Private IPv4 Addresses?
- Demonstration: Configuring an IPv4 Address

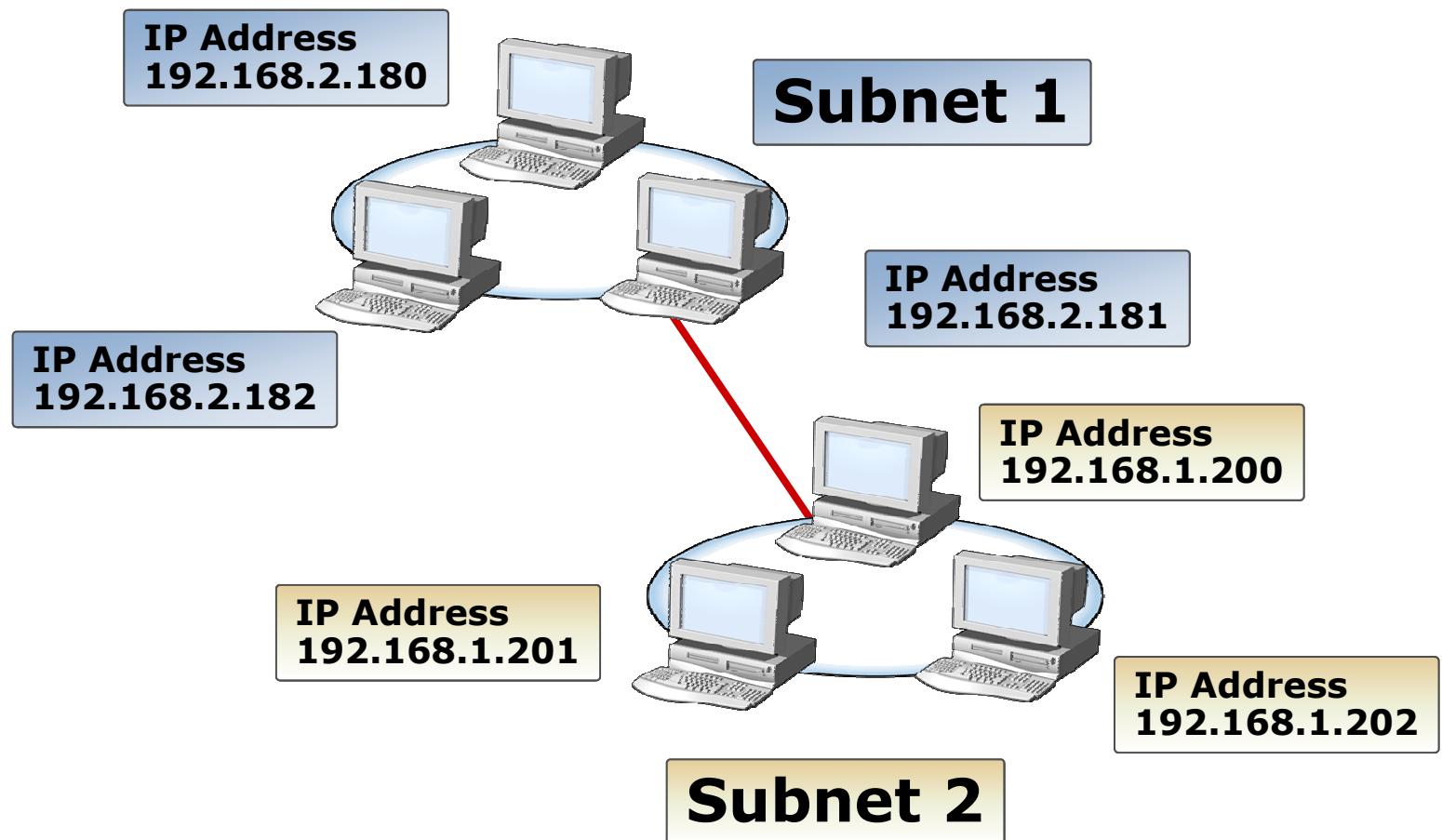
# What Is an IPv4 Address?

An IP Address identifies Subnet 1 to other routers on a network.



# What Is an IPv4 Address?

An IPv4 address identifies a computer to other computers on a network.

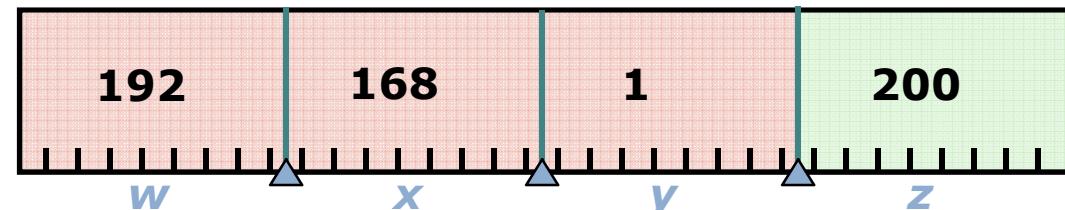


# What Is a Subnet Mask?

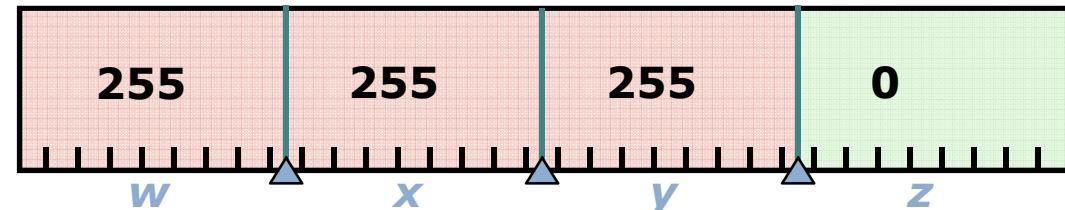
**This is the host ID in the fourth octet.**

**Note: This host ID is 200 of 254 hosts on this specific subnet.**

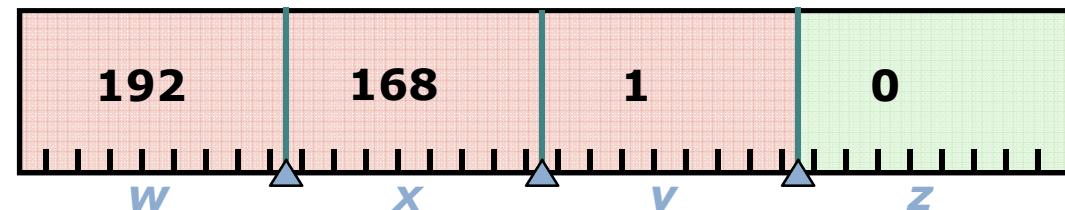
**IP address**



**Subnet mask**



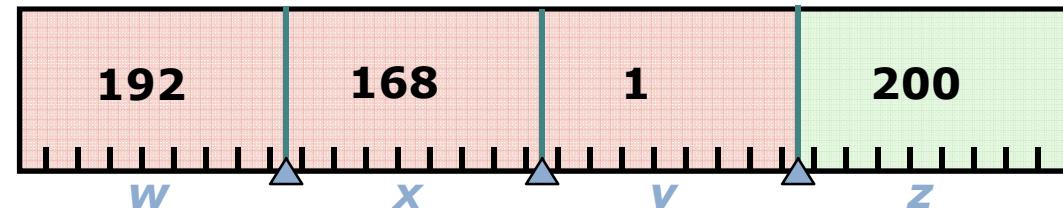
**Network ID**



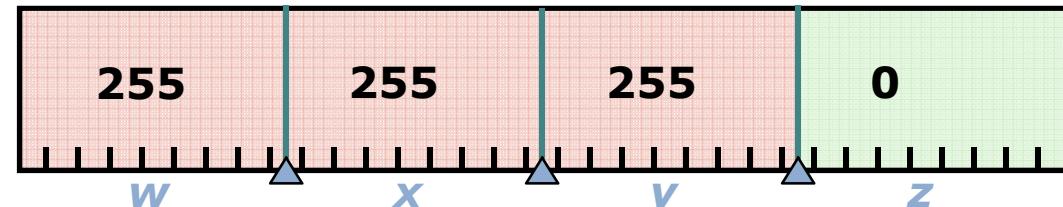
# What Is a Subnet Mask?

**A subnet mask specifies which part of an IPv4 address is the network ID and which part of the IPv4 address is the host ID.**

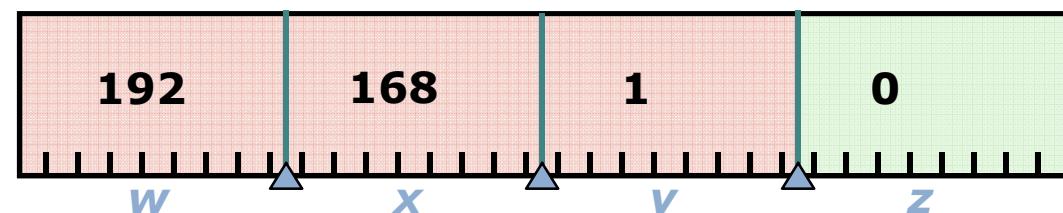
**IP address**



**Subnet mask**



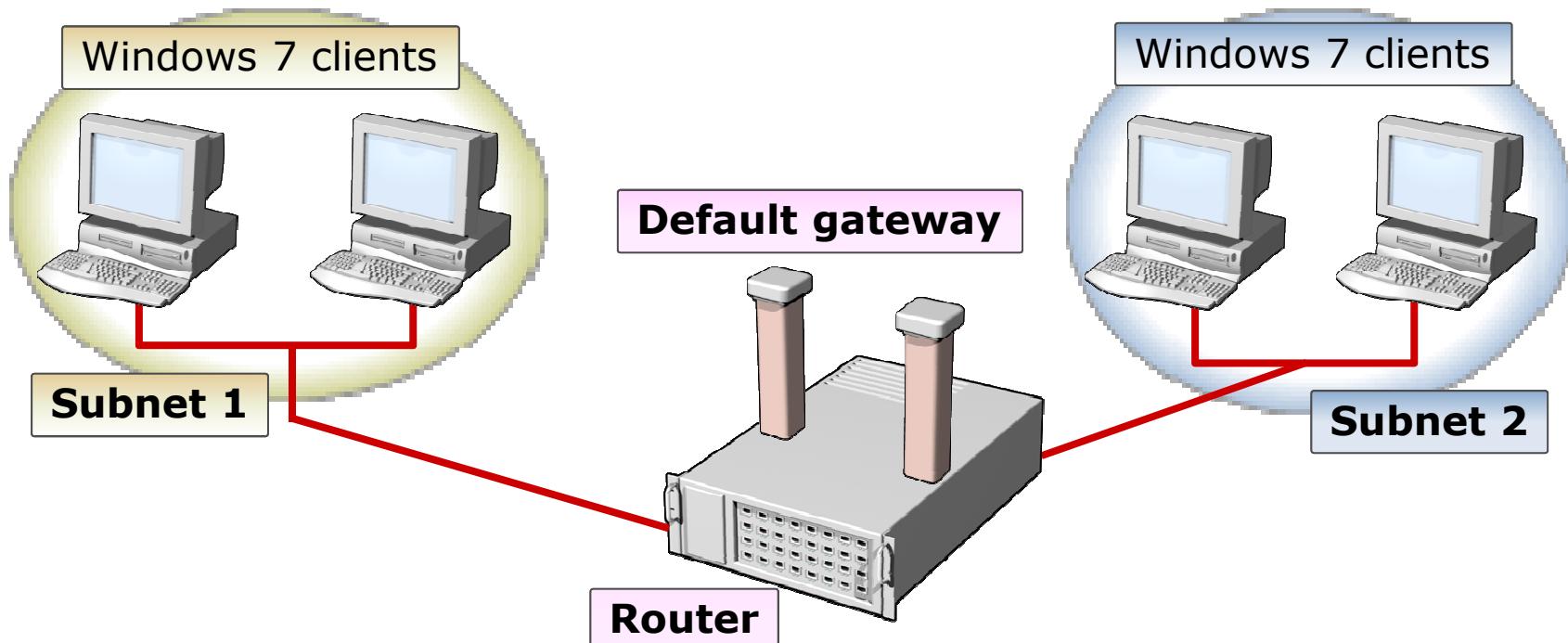
**Network ID**



# What Is a Default Gateway?

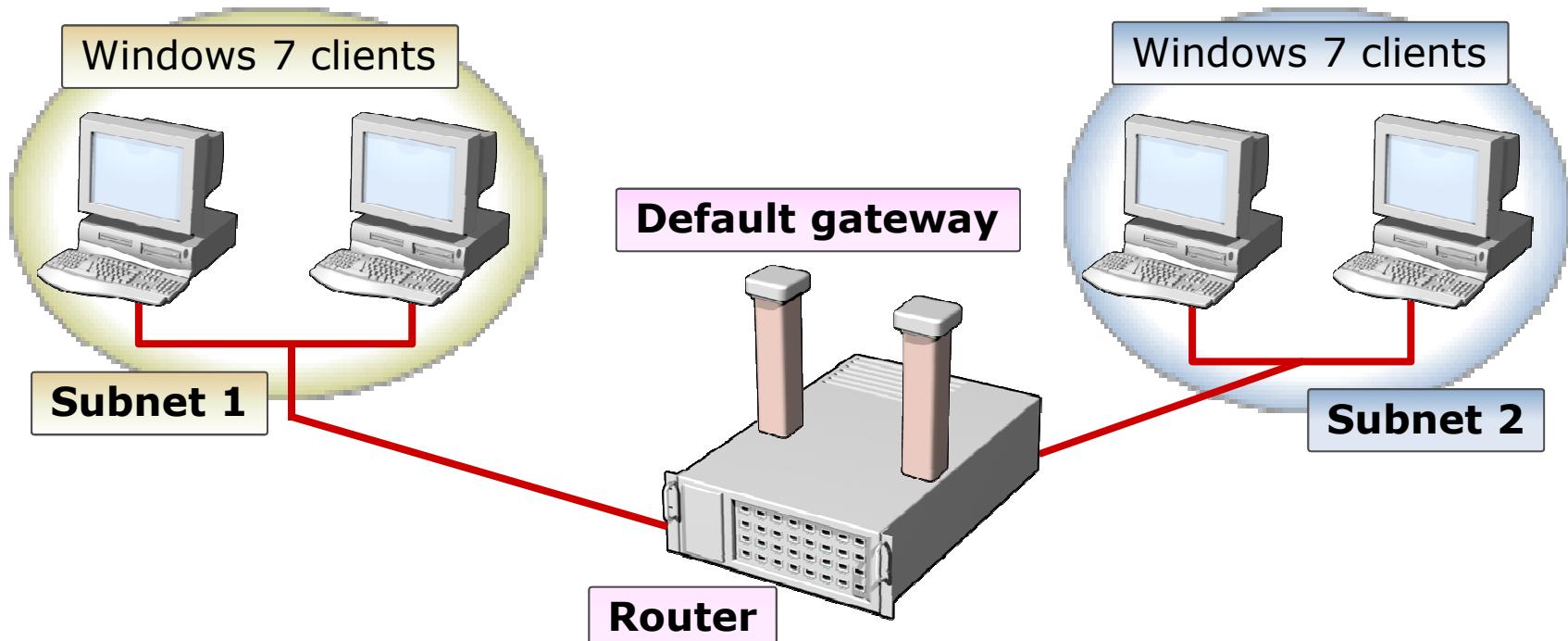
A

**Use a default gateway when the internal routing table on the host has no information about the destination subnet.**



# What Is a Default Gateway?

**A default gateway is a device, usually a router, on a TCP/IP internet that forwards IP packets to other subnets.**



# What Are Public and Private IPv4 Addresses?

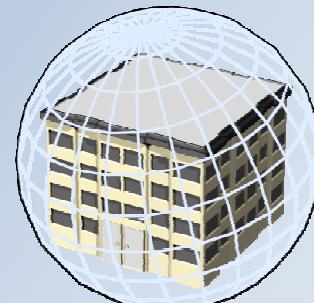
## Public

- Required by devices and hosts that connect directly to the Internet
- Must be unique
- Routable on the Internet
- Must be assigned by IANA

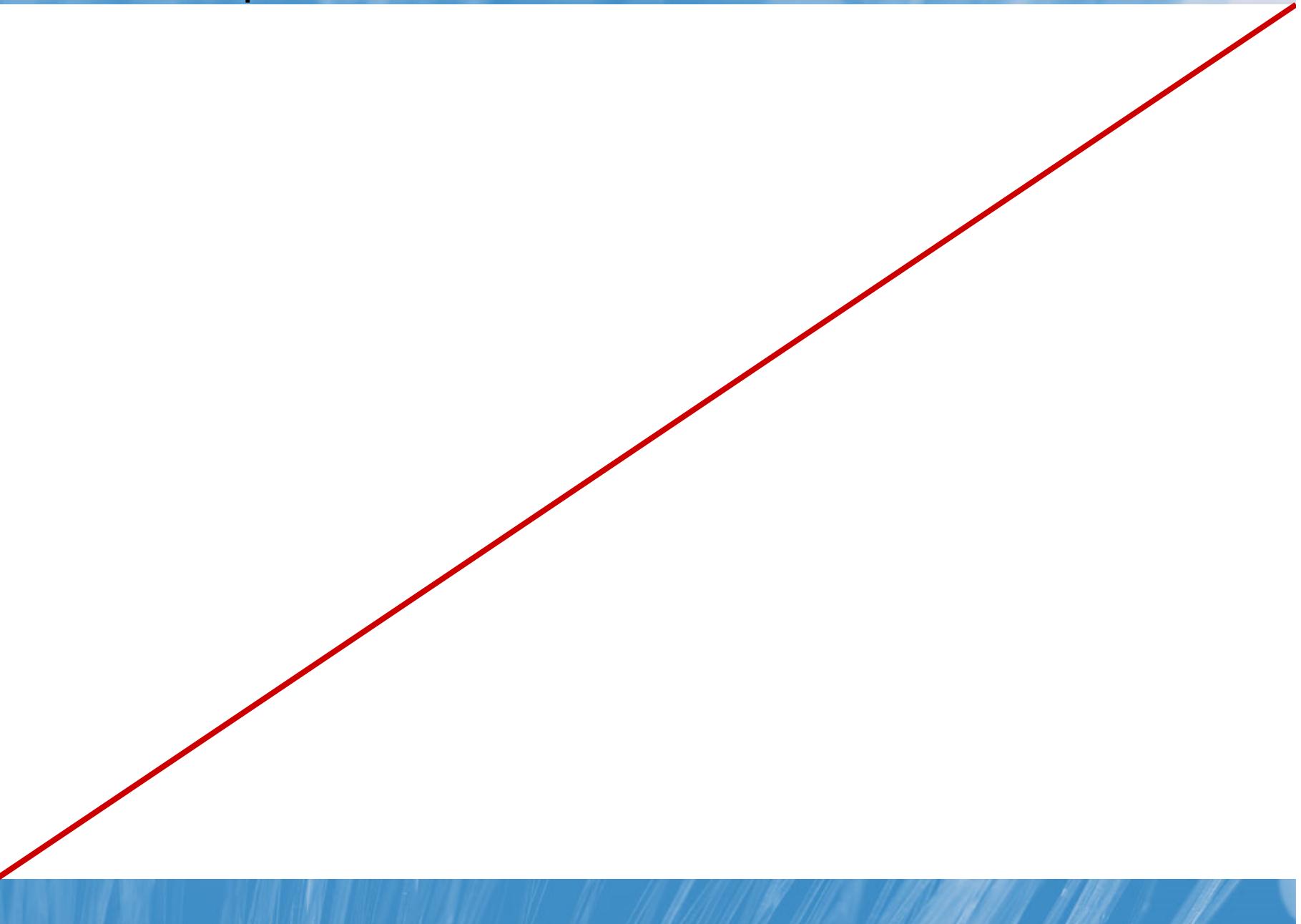


## Private

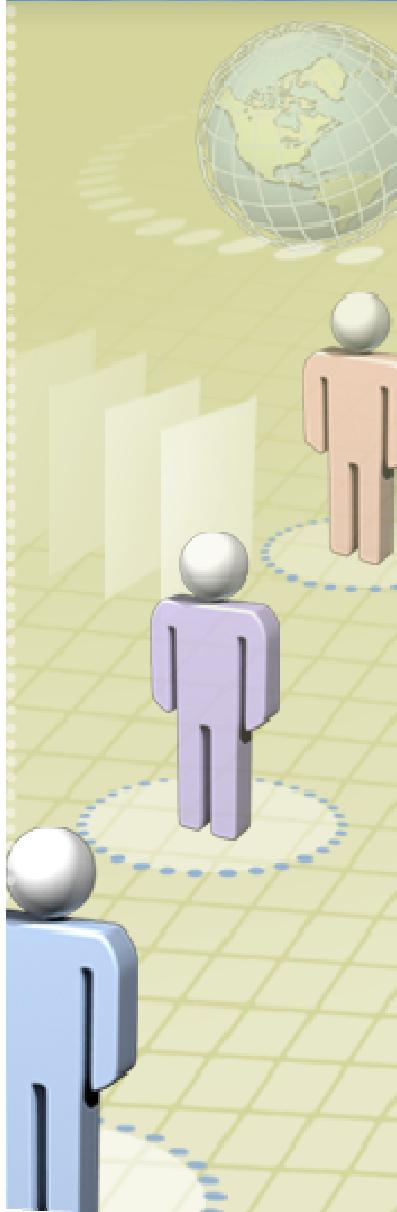
- Non-routable on the Internet
- Can be locally assigned by organization
- Must be translated to access the Internet



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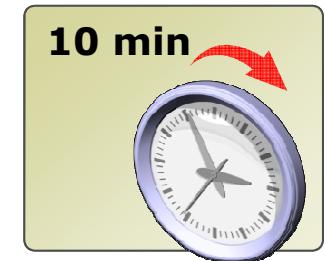


# Demonstration: Configuring an IPv4 Address



In this demonstration, you will see how to configure a Windows 7 computer with:

- An IPv4 address
- A subnet mask
- A default gateway



## Lesson 2: Configuring IPv6 Network Connectivity

- Benefits of Using IPv6
- Windows 7 Support for IPv6
- What Is the IPv6 Address Space?
- IPv6 Address Types
- Demonstration: Configuring an IPv6 Address

# Benefits of Using IPv6

## **Benefits of using IPv6 compared to IPv4**



Larger address space



More efficient routing



Simpler host configuration



Built-in security



Better prioritized delivery support



Redesigned headers

# Windows 7 Support for IPv6

## **IPv6 is Enabled by Default**

Windows 7 uses IPv6 by default to support security needs and additional features

## **Windows 7 Dual Stack**

Windows 7 facilitates the dual stack to use IPv4 and IPv6 simultaneously

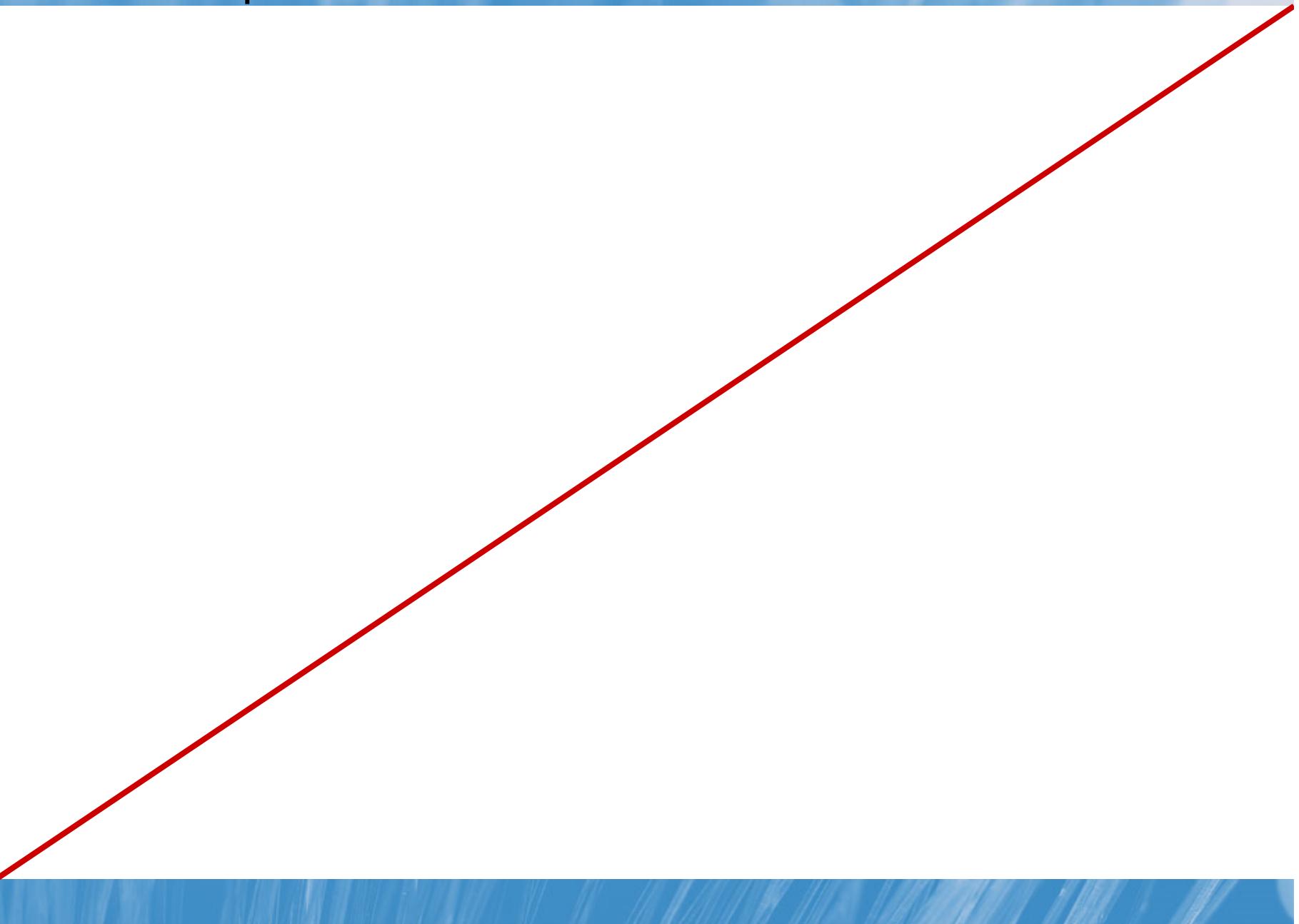
## **Direct Access requires IPv6**

Windows 7 clients can use Direct Access which facilitates client computers connecting to the enterprise domain

## **IPv6 uses Remote Desktop**

IPv6 supports Windows 7 File Sharing Security and Echo System features such as Remote Access and Direct Access

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# What Is the IPv6 Address Space?

## The IPv6 address space:

- Uses 128 bits as compared to 32-bits that the IPv4 address space uses
- Allocates 64-bits for the network ID and 64-bits for the host ID
- Uses a prefix to define the network ID

## IPv6 uses hexadecimal notation

2001:0DB8:0000:0000:02AA:00FF:FE28:9C5A/64

Shorten  
Each digit represents four bits

2001:DB8:0:0:2AA:FF:FE28:9C5A/64

Shorten  
2001:DB8::2A:FF:FE28:9C5A/64

Shorten the address by dropping leading zeros and using zero compression

2001:DB8::2A:FF:FE28:9C5A/64

The prefix is a forward slash followed by the number of bits in the network ID

Continue shortening the address by dropping contiguous groups of zeros



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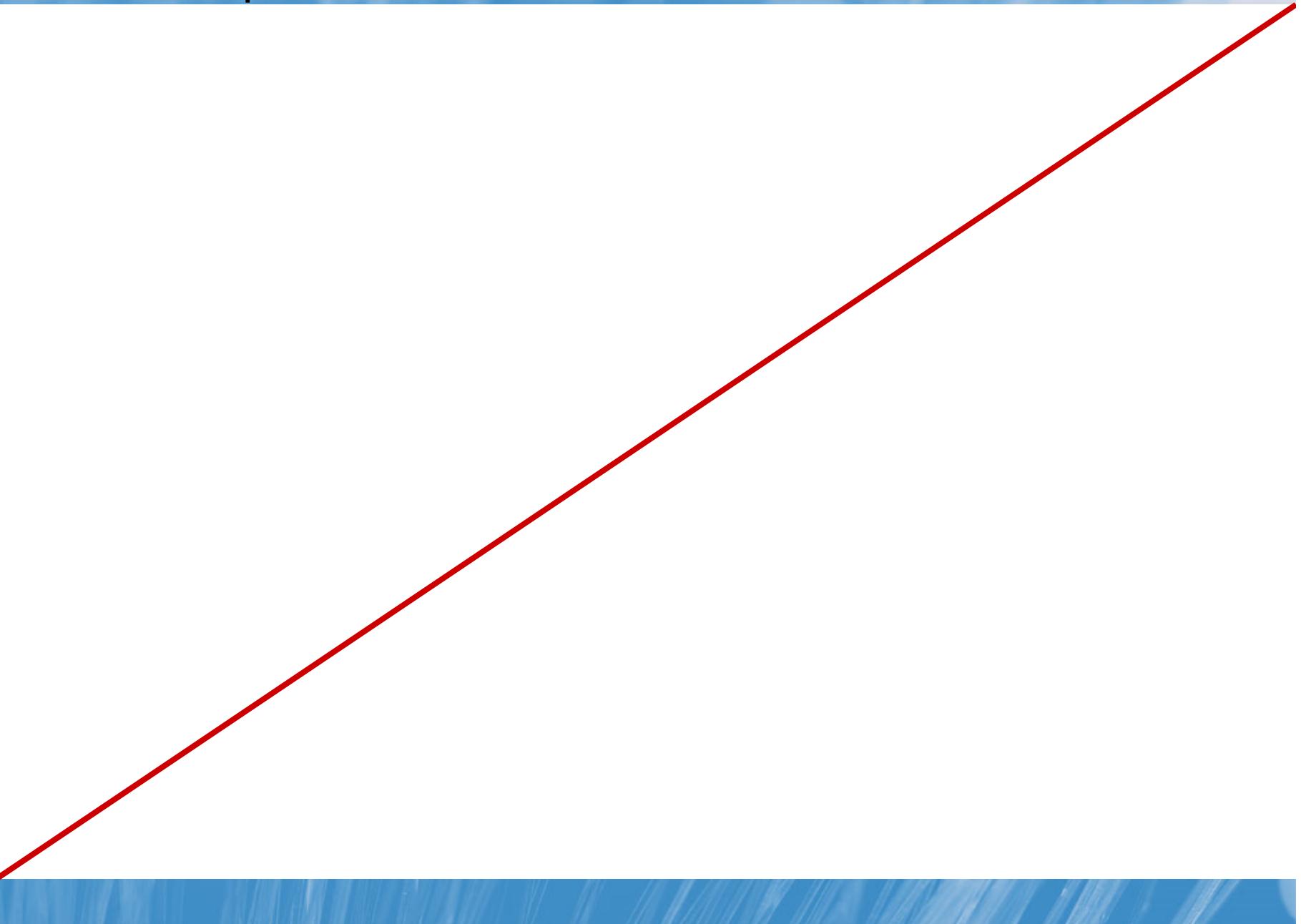
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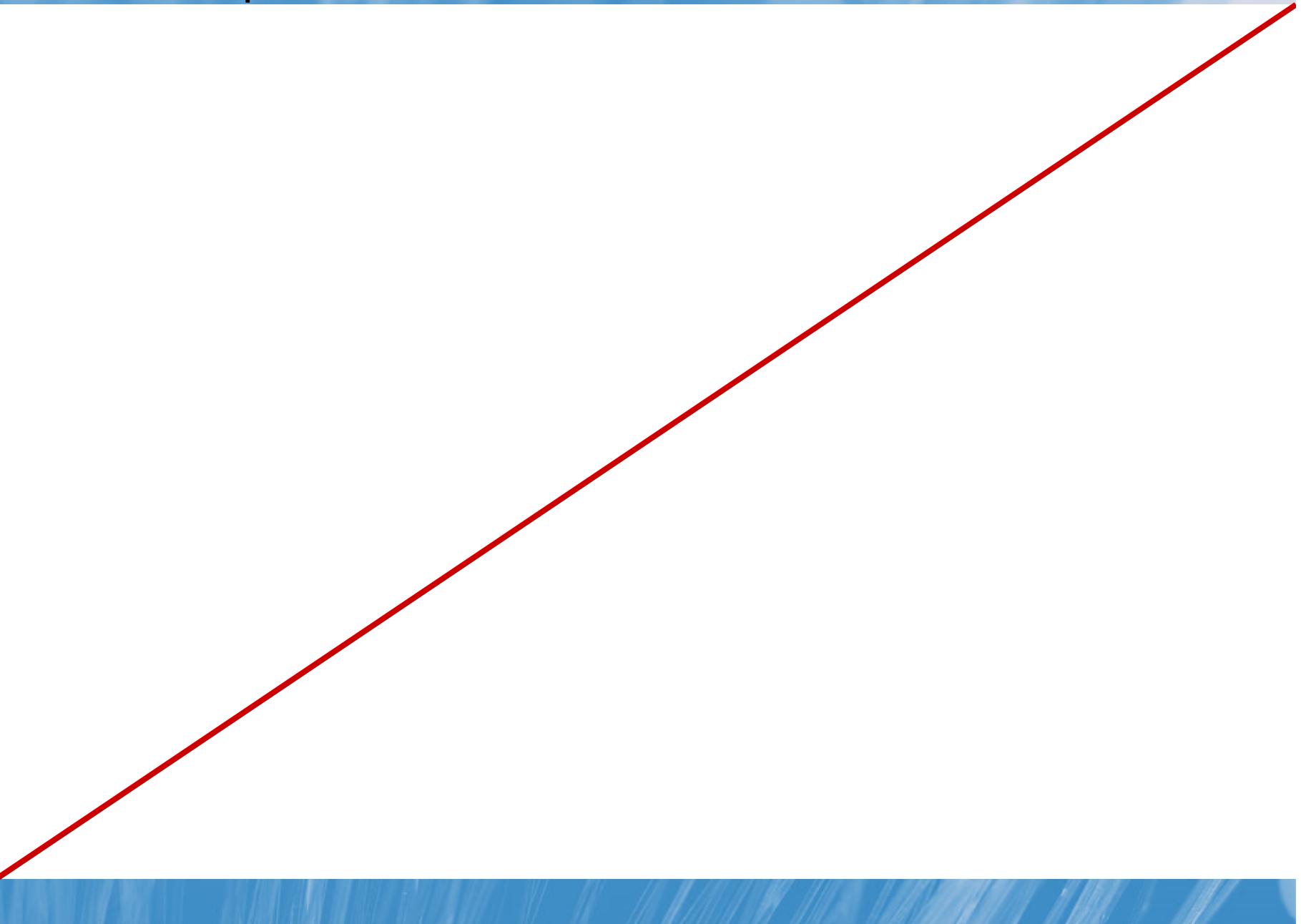
2001:DB8::2AA:FF:FE28:9C5A/64



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# IPv6 Address Types

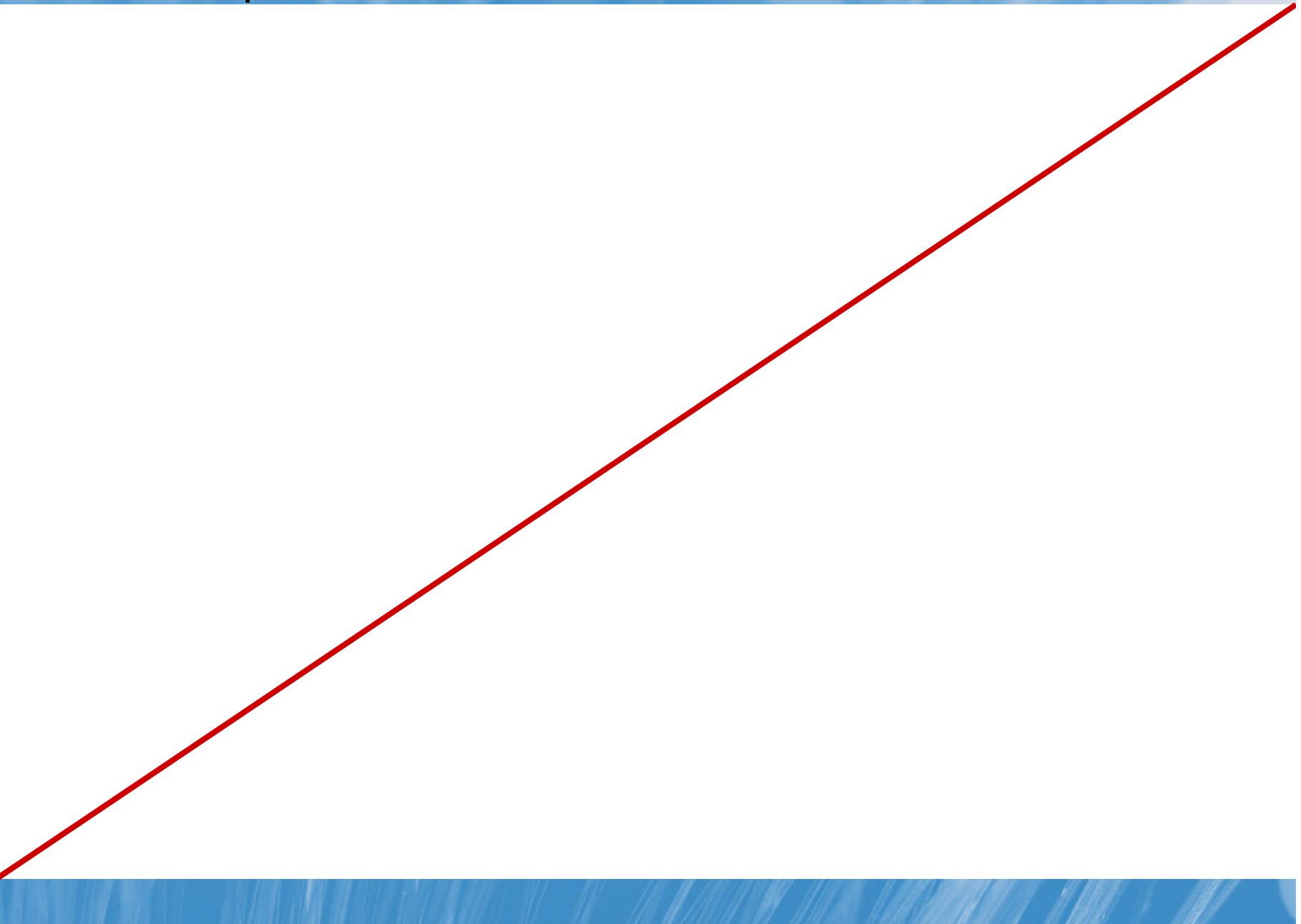
## IPv6 Address Types

- **Unicast** – use for one-to-one communication between hosts
- **Multicast** – use for one-to-many communication between computers that are defined as using the same multicast address
- **Anycast** – use for locating services or the nearest router

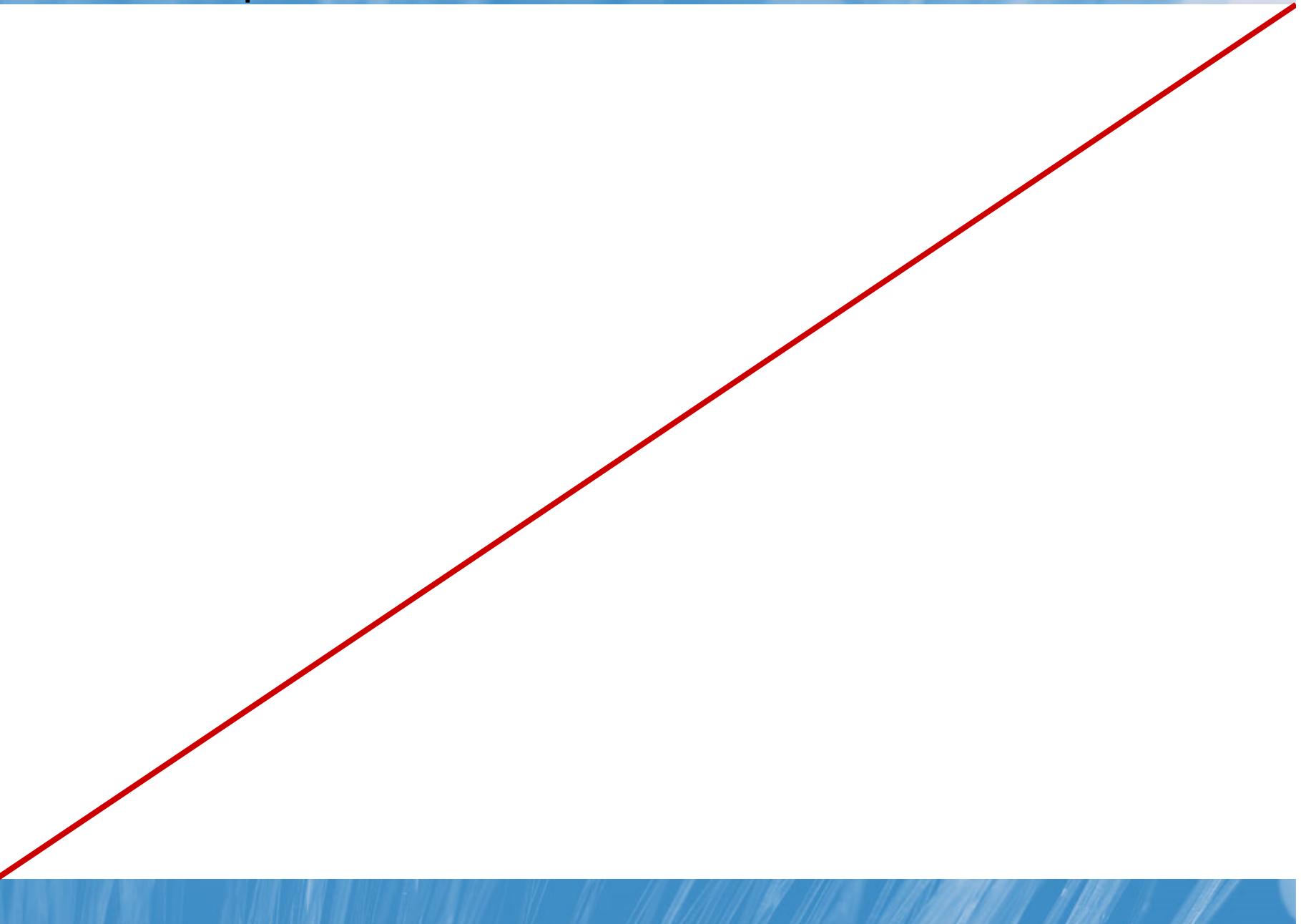
## IPv6 Unicast Address Types

- **Global Unicast** – globally routable and reachable on the IPv6 portion of the Internet
- **Link-Local** – use when communicating with neighboring hosts on the same link
- **Unique Local Unicast** – equivalent to IPv4 private address spaces, such as 10.0.0.0/8, and have the prefix FD00::/8

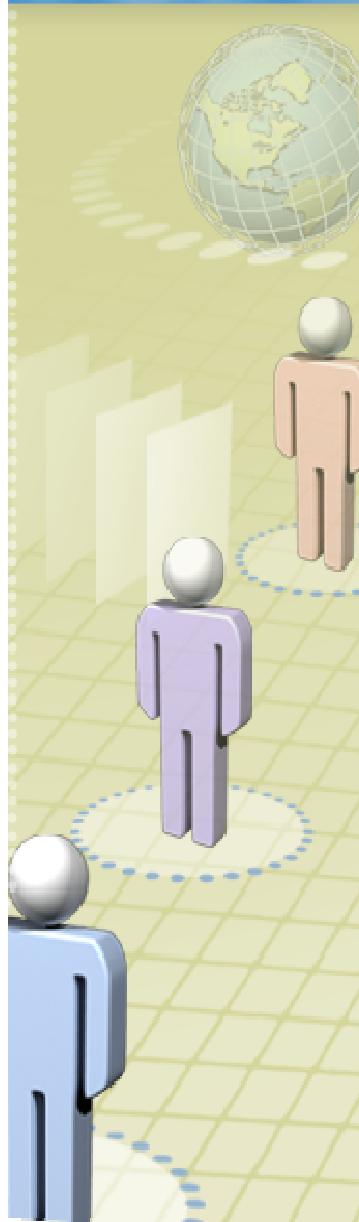
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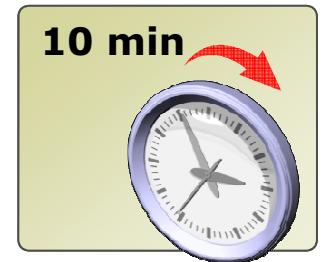


# Demonstration: Configuring an IPv6 Address

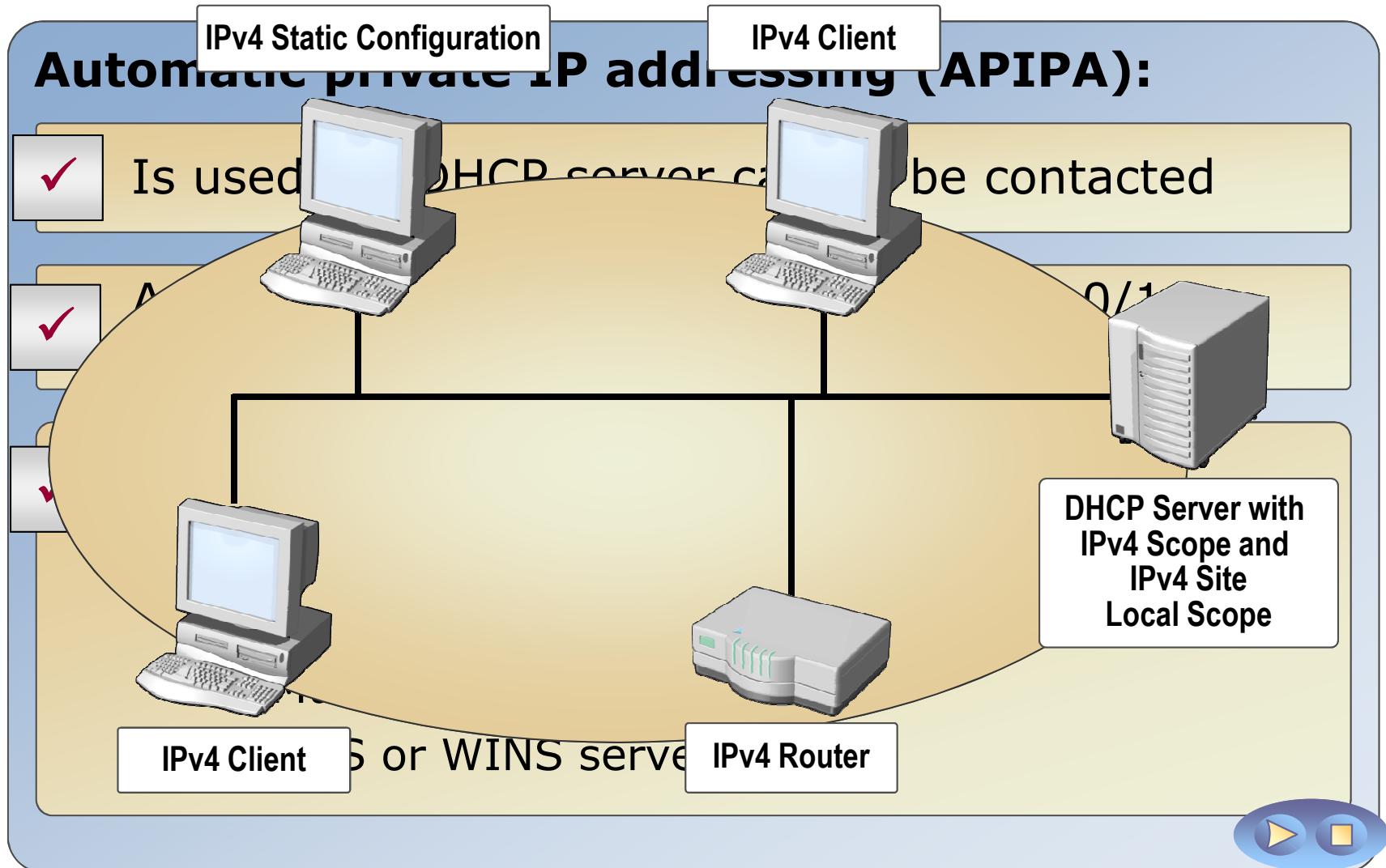


In this demonstration, you will see how to:

- Manually configure a Windows 7 computer with an IPv6 address
- Verify the IP configuration



# Automatic IPv4 Configuration Process



# Automatic IPv4 Configuration Process

## **Automatic private IP addressing (APIPA):**



Is used if a DHCP server cannot be contacted



Assigns IP addresses on the 169.254.0.0/16 network

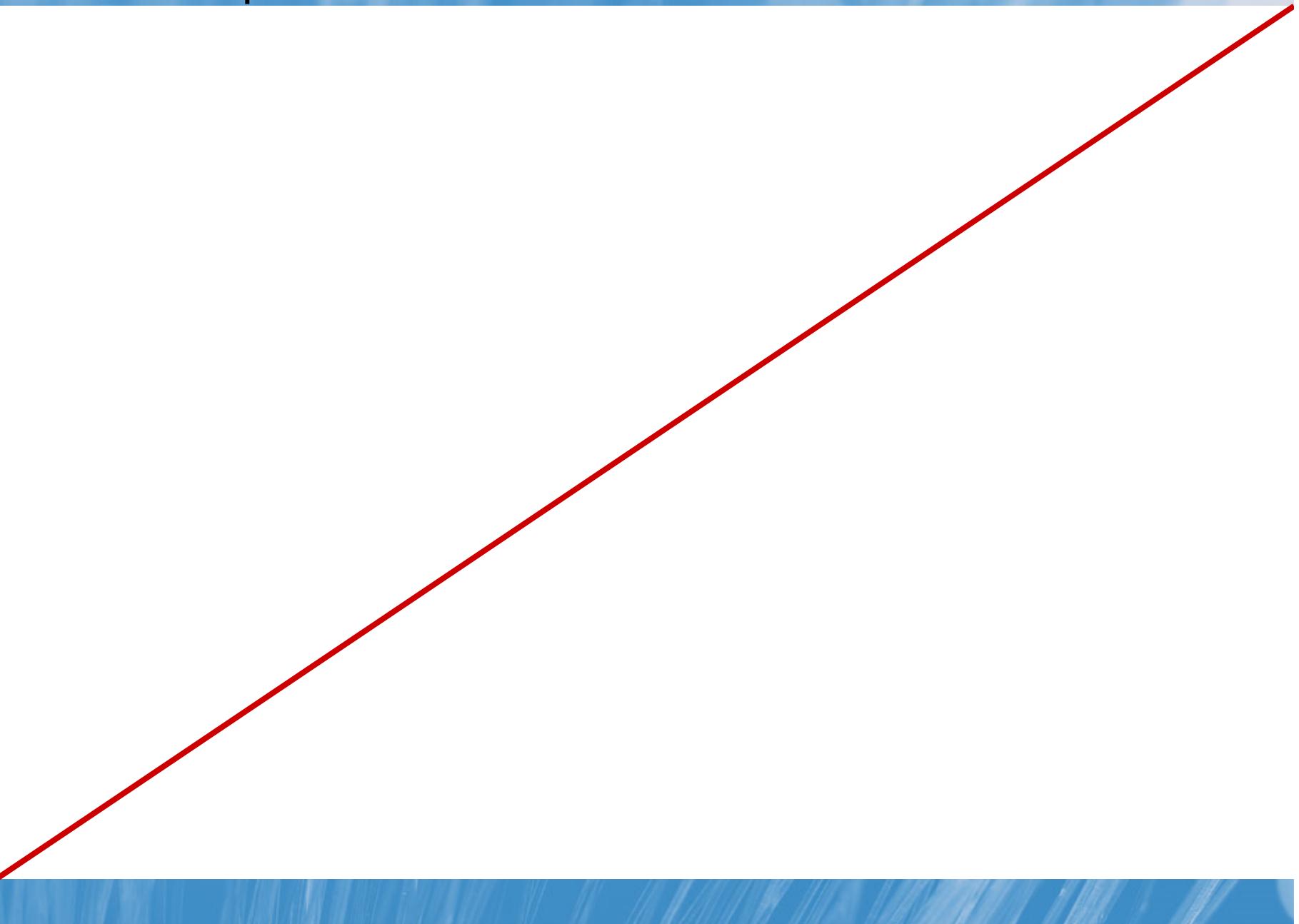


Cannot be used with:

- Active Directory
- Internet connectivity
- Multiple subnets
- DNS or WINS servers



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# Automatic IPv6 Configuration Process

Static Configuration

IPv6 Client

## Automatic IPv6 Configuration Process

- **DHCP V6 Server** – assigns Automatic IPv6 Configuration information to the client.
- **IP V6 Clients** – uses DHCP assigned IP Configuration to access network resources
- **IP V6 Static Client** – does not get automatic configuration from the DHCPv6 Server
- **IP V6 Router** – provides a Gateway to the internet or another Subnet.



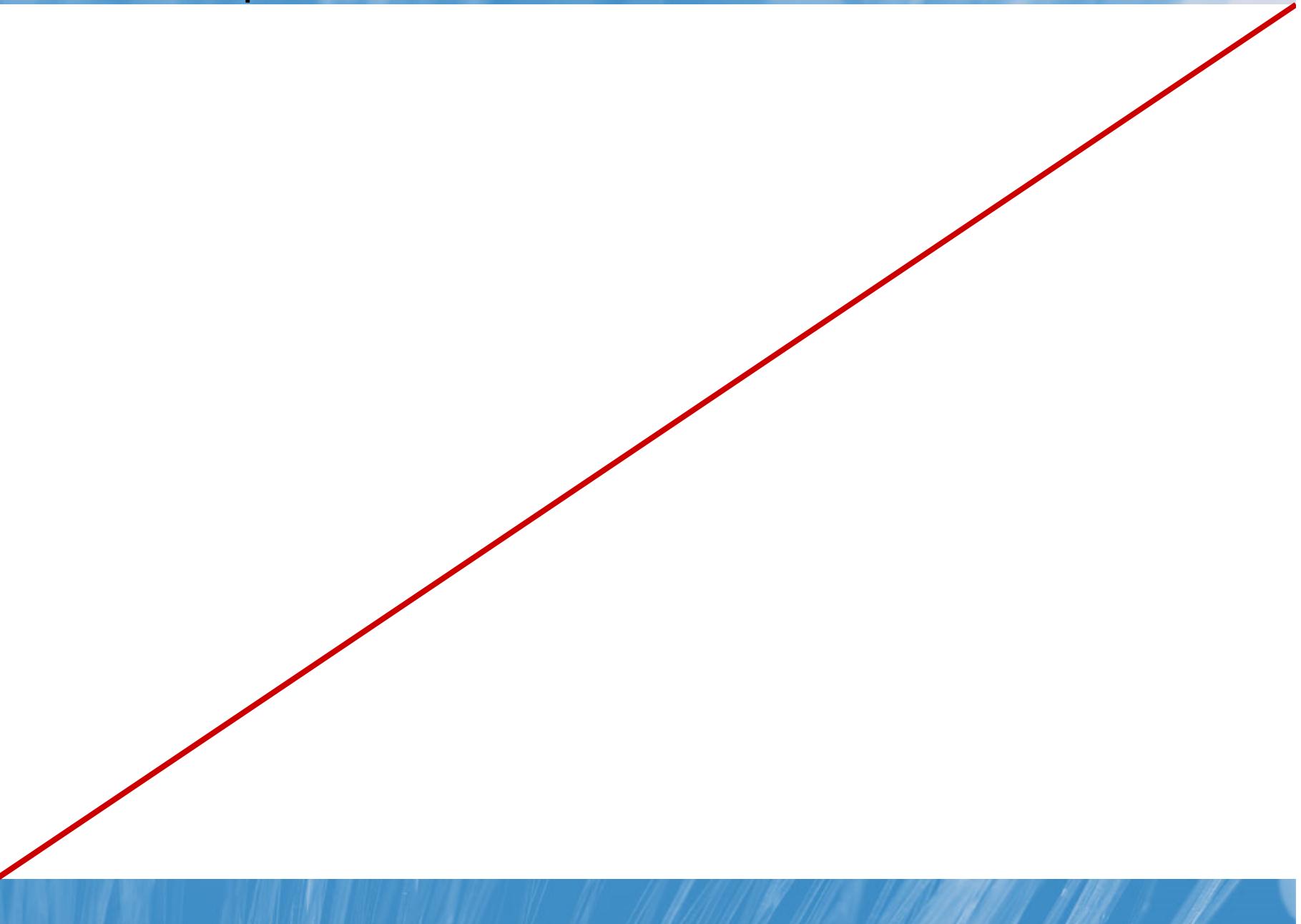
# Automatic IPv6 Configuration Process

## Automatic IPv6 Configuration Process

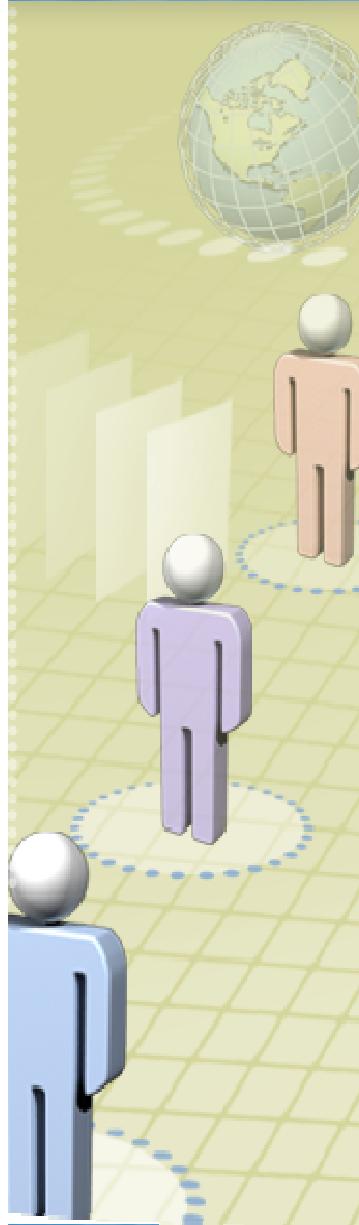
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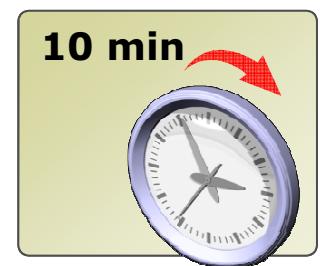


# Demonstration: Configuring a Computer to Obtain an IPv4 Address Dynamically



In this demonstration, you will see how to:

- Automatically configure a Windows 7 computer with an IPv4 address
- Verify the IP configuration

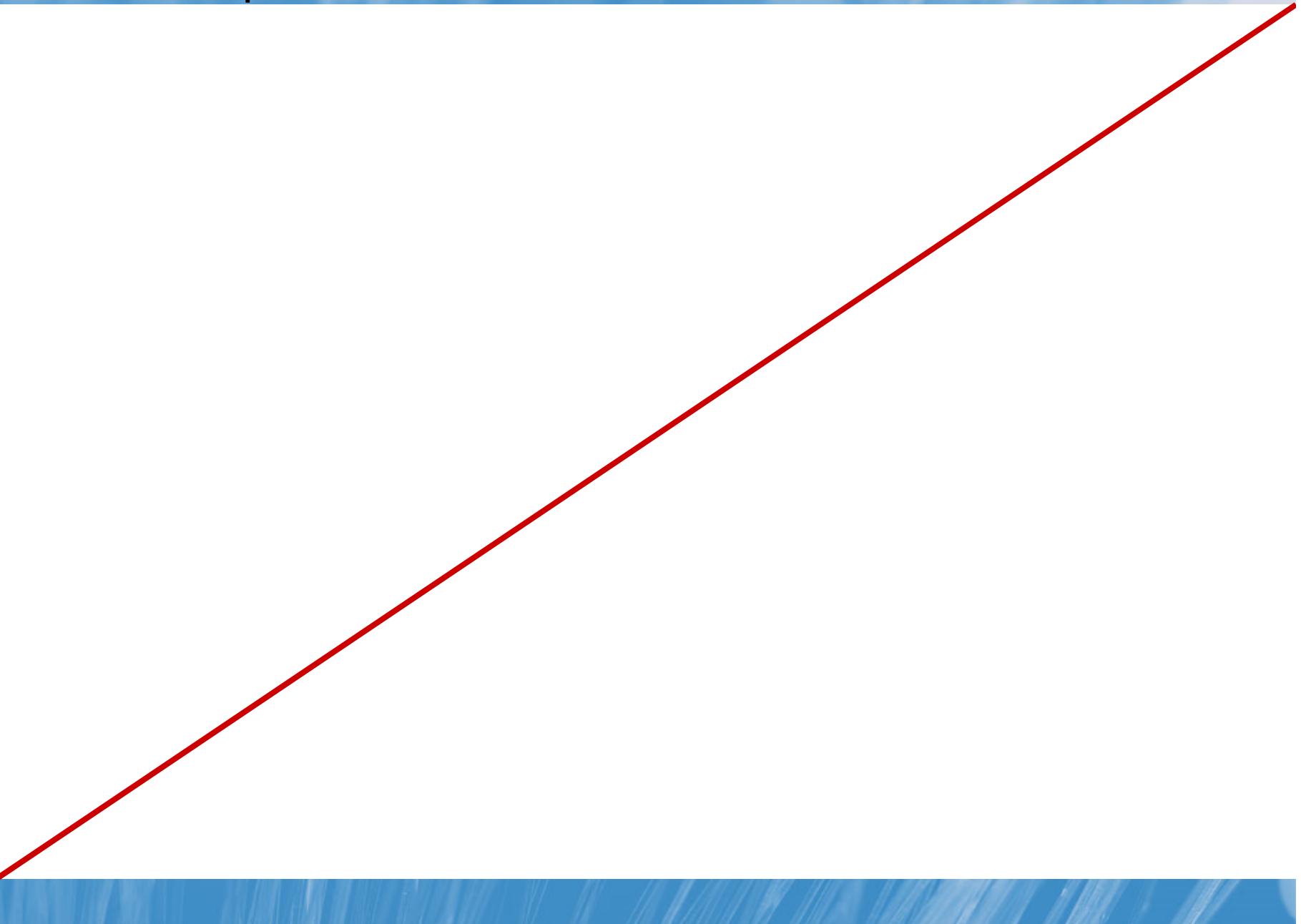


# Troubleshooting Client-Side DHCP Issues

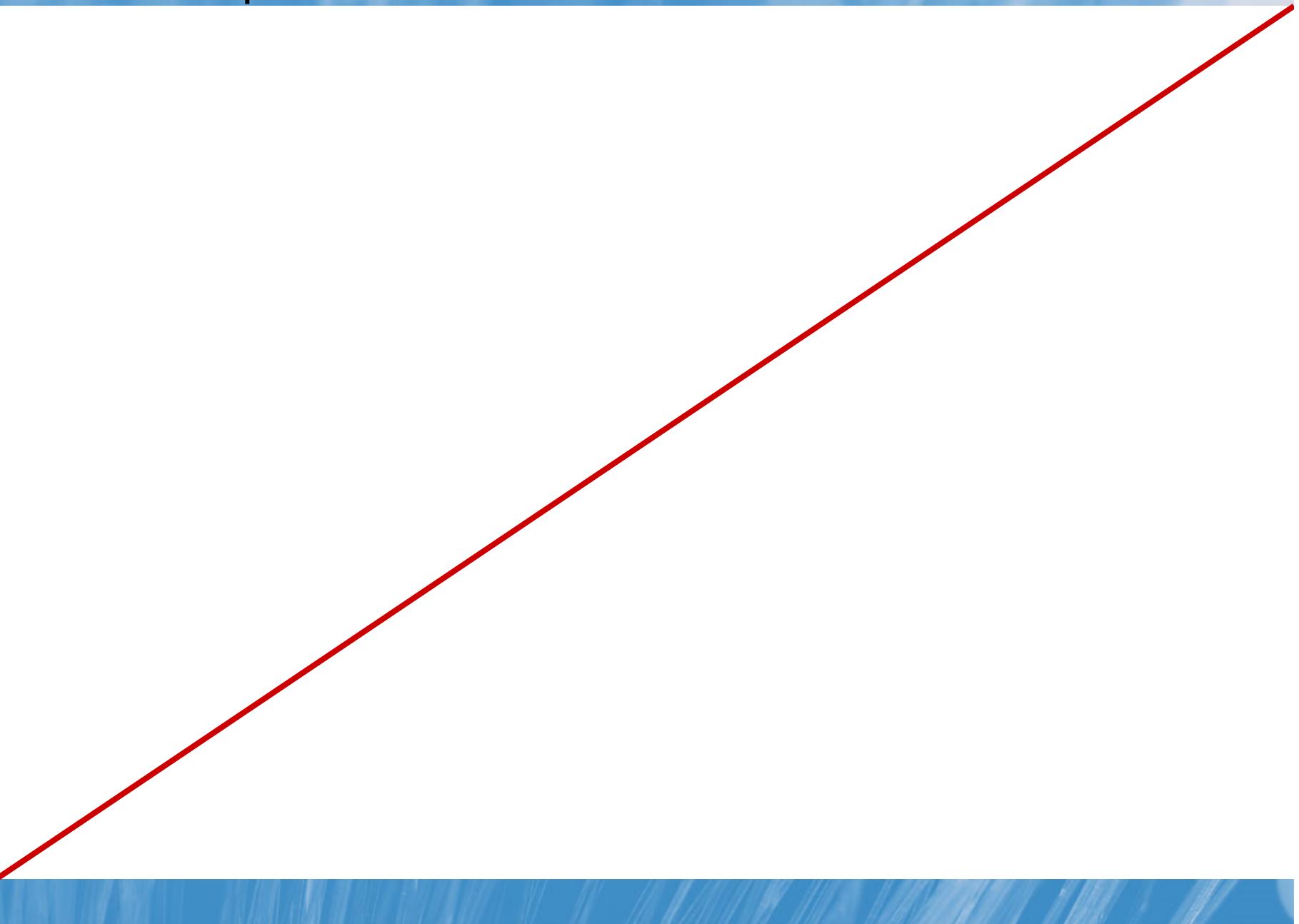
**IPConfig is used to display IP configuration information and to release and renew addresses**

Option	Description
/all	Displays all IP address configuration information
/release	Releases a dynamic IPv4 address lease
/renew	Renews a dynamic IPv4 address lease

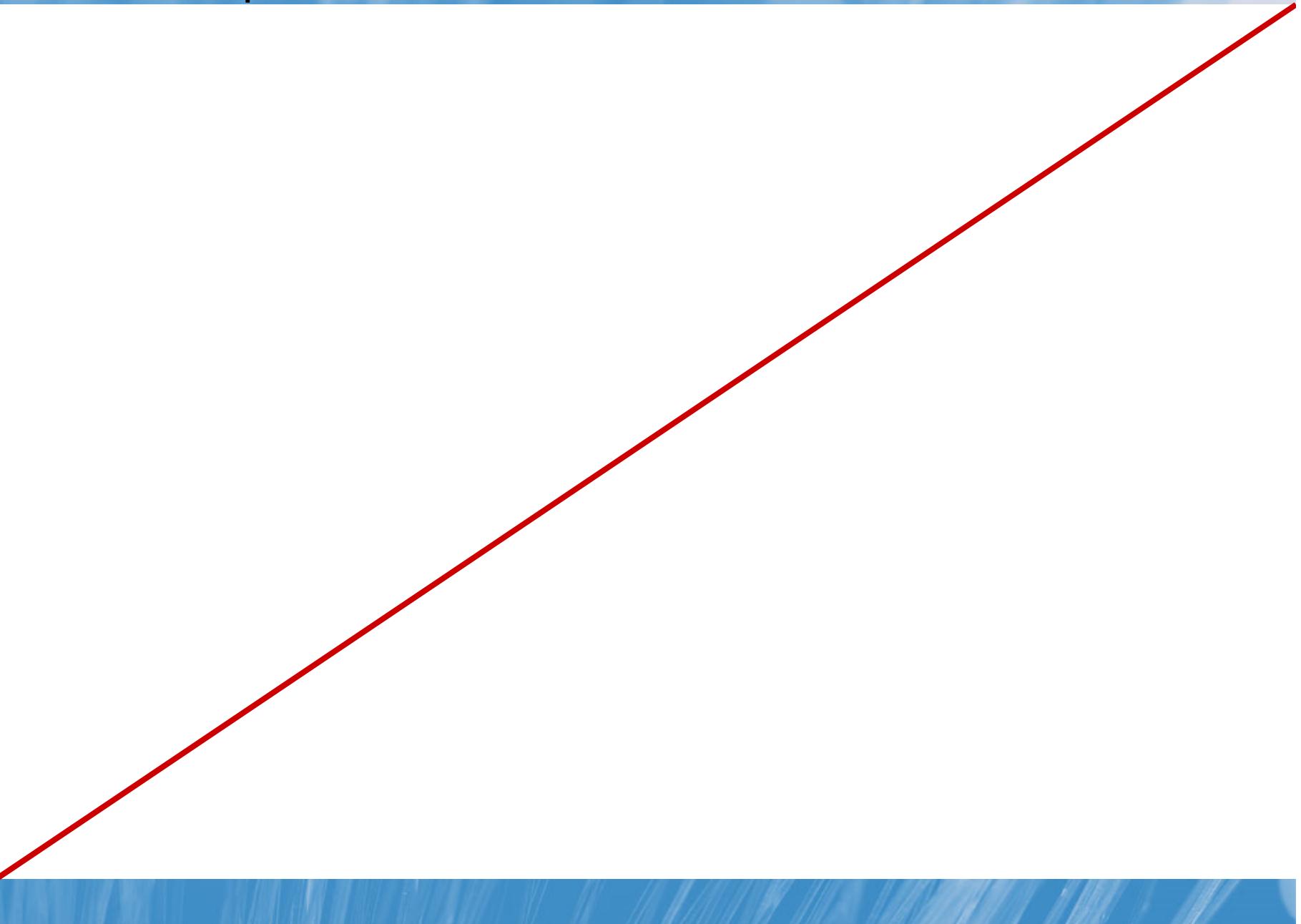
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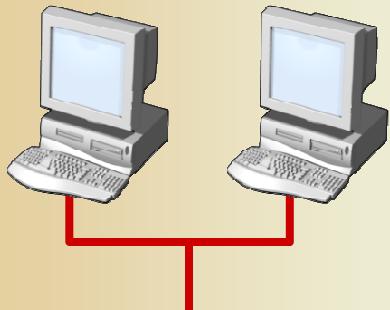
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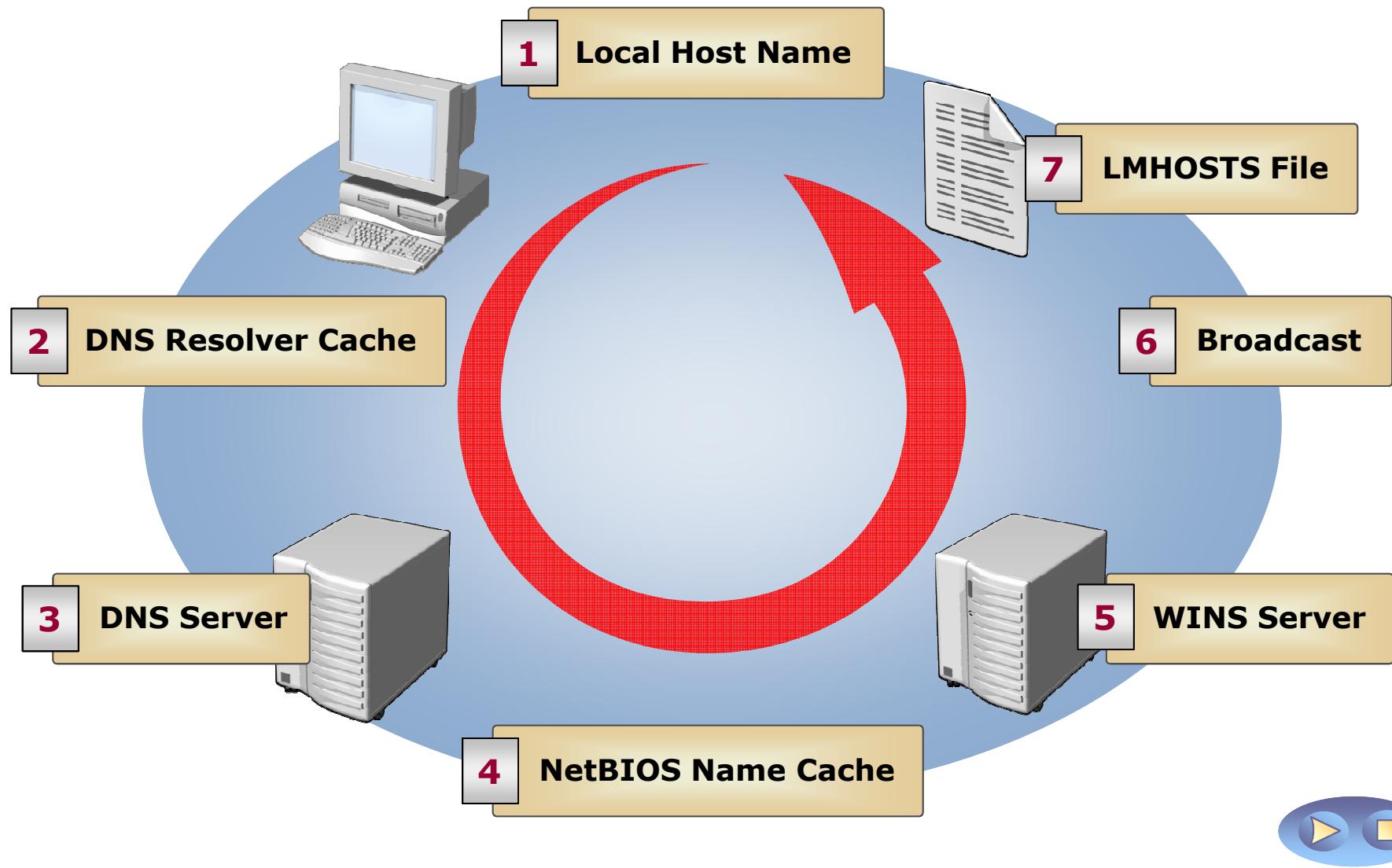
## Lesson 4: Overview of Name Resolution

- Types of Computer Names
- Methods for Resolving Computer Names

# Types of Computer Names

Name	Description
 <b>Host name</b>	<ul style="list-style-type: none"><li>• Up to 255 characters in length</li><li>• Can contain alphabetic and numeric characters, periods, and hyphens</li><li>• Part of FQDN</li></ul>
 <b>NetBIOS name</b>	<ul style="list-style-type: none"><li>• Represent a single computer or group of computers</li><li>• 15 characters used for the name</li><li>• 16th character identifies service</li><li>• Flat namespace</li></ul>

# Methods for Resolving Computer Names



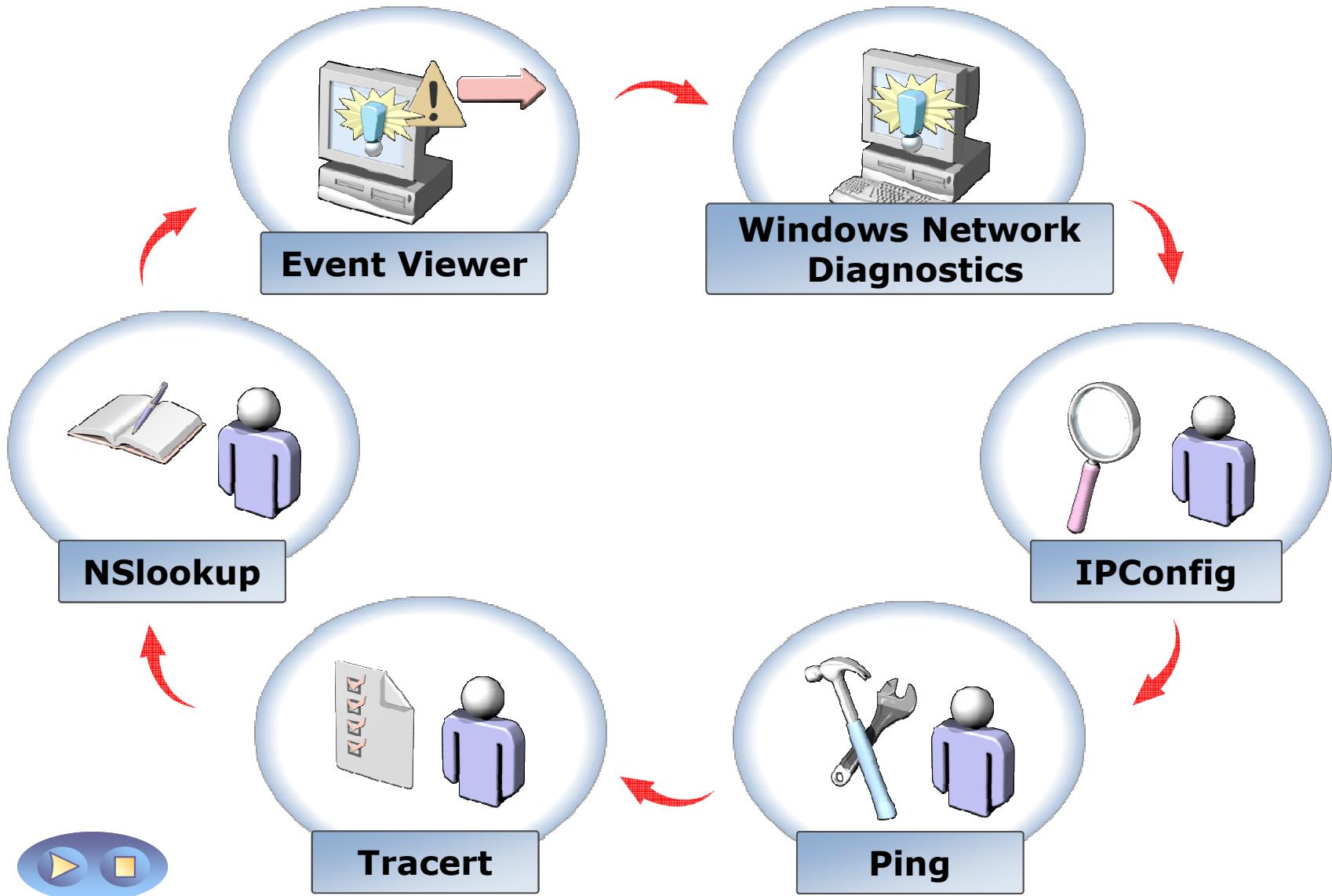
## Lesson 5: Troubleshooting Network Issues

- Tools for Troubleshooting Networks
- Process for Troubleshooting Networks
- Demonstration: Troubleshooting Common Network-Related Problems

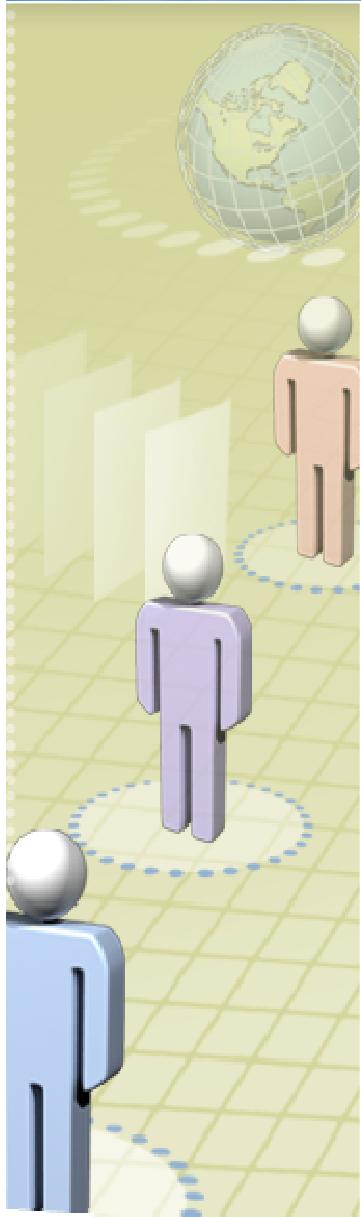
# Tools for Troubleshooting Networks

Tool	Purpose
Event Viewer	Enables you to view errors relating to network activity
Windows Network Diagnostics	Helps to diagnose and resolve network problems
IPCONFIG	Displays IP configuration information and controls the DNS resolver cache
PING and PathPING	Verifies basic IP connectivity
TRACERT	Verifies a routing path
NSLOOKUP	Enables testing of name resolution

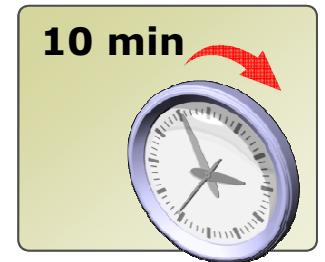
# Process for Troubleshooting Networks



# Demonstration: How to Troubleshoot Network-Related Problems



In this demonstration, you will see how to use the TCP/IP troubleshooting tools to help resolve common connectivity problems.



## Module Review and Takeaways

- Review Questions
- Common Issues
- Tools

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