

Microsoft® Official Course



Module5

Implementing TCP/IP

Microsoft®

Module Overview

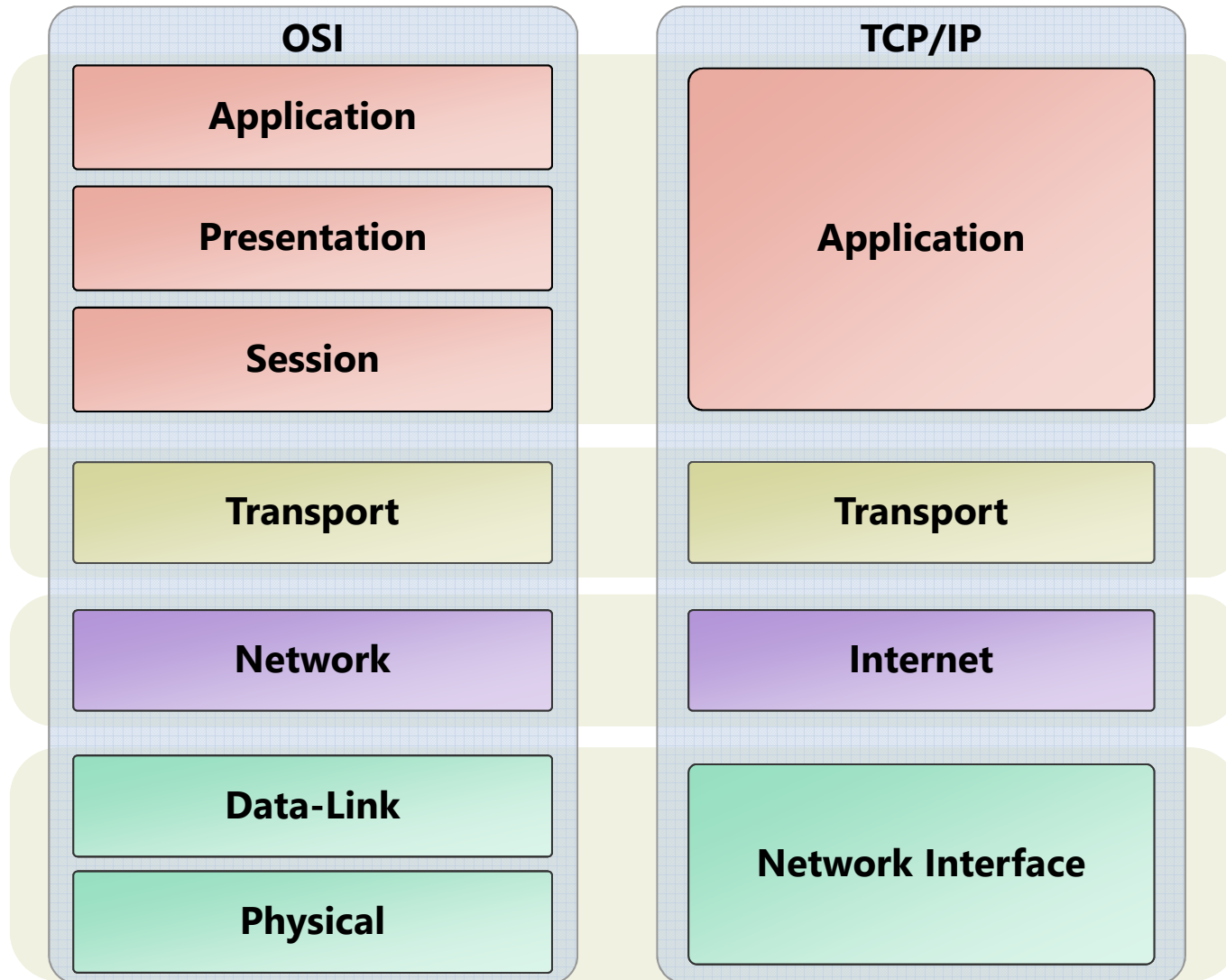
- Overview of TCP/IP
- IPv4 Addressing
- IPv6 Addressing
- Name Resolution

Lesson 1: Overview of TCP/IP

- The TCP/IP Protocol Model
- The TCP/IP Protocol Suite
- Sockets and Ports

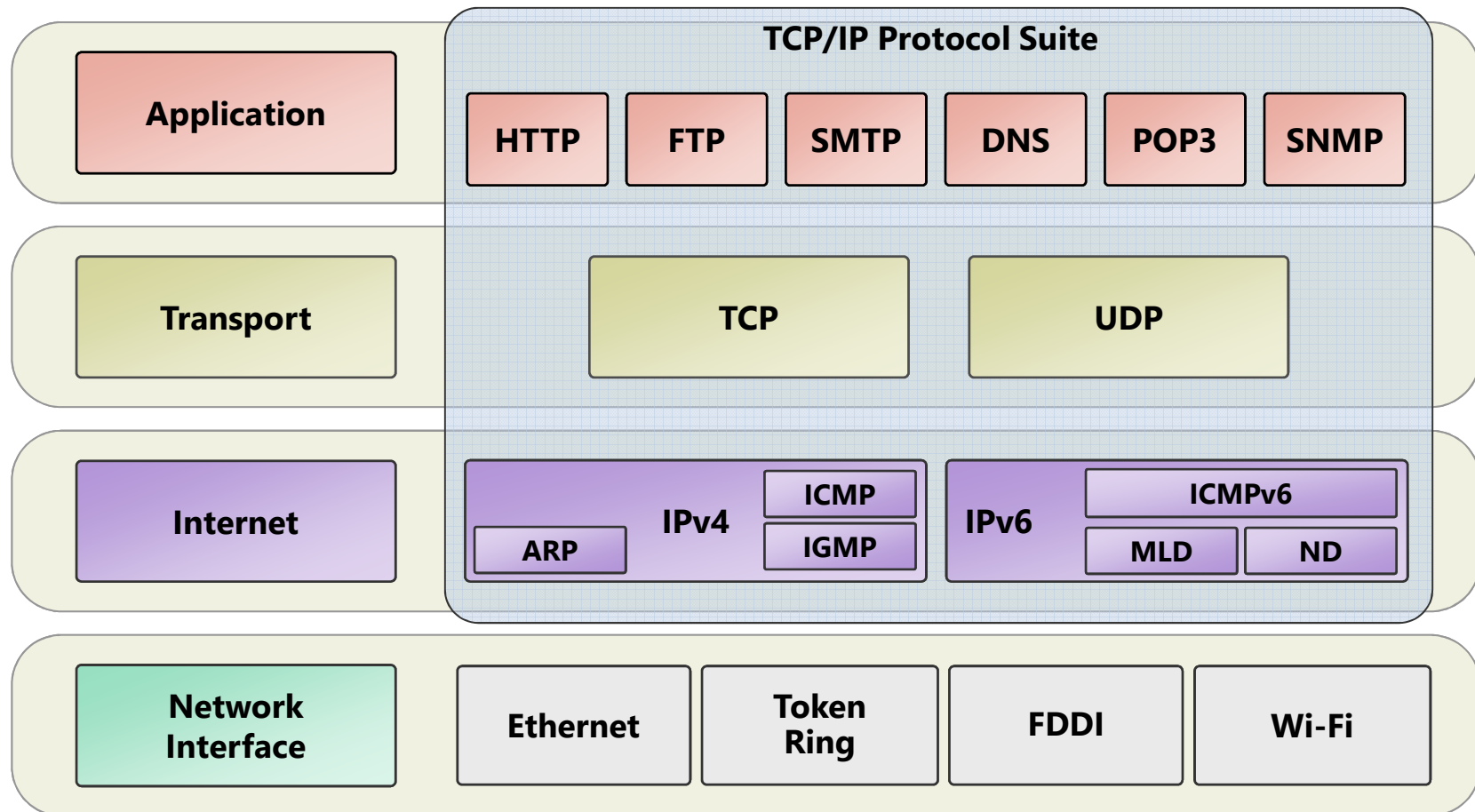
The TCP/IP Protocol Model

- The TCP/IP model corresponds with the OSI model



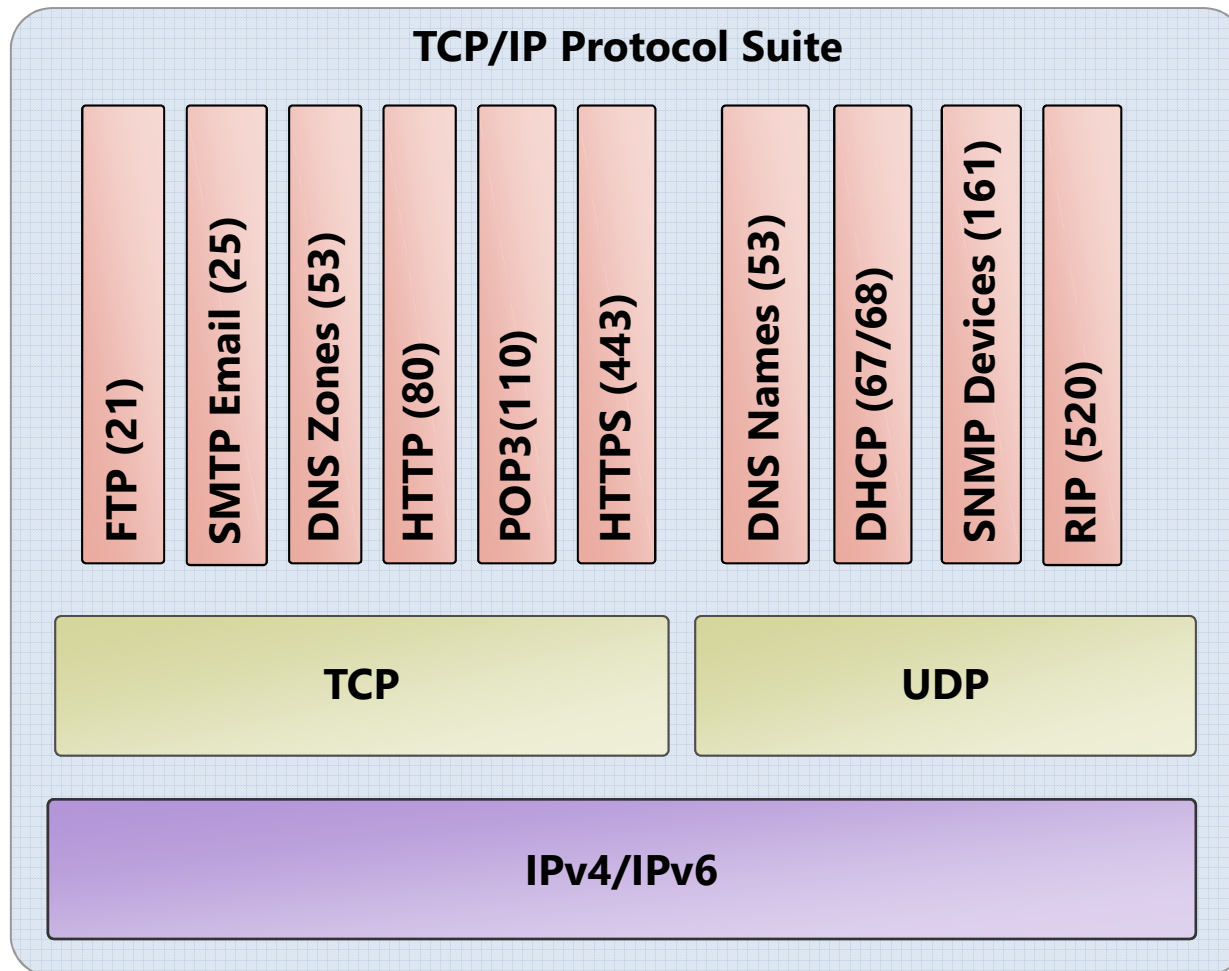
The TCP/IP Protocol Suite

- Each layer in the TCP/IP model includes specific protocols



Sockets and Ports

- A socket is a combination of protocol, port number, source and destination IP address



Lesson 2: IPv4 Addressing

- IPv4 Concepts and Terminology
- IPv4 Addresses
- Network and Host IDs
- IPv4 Address Classes
- Determining Subnet Addresses
- More Complex IPv4 Implementations
- Automatic IPv4 Configuration
- Demonstration: How to Configure IPv4
- IP Configuration Tools
- Demonstration: How to Verify IPv4 Configuration

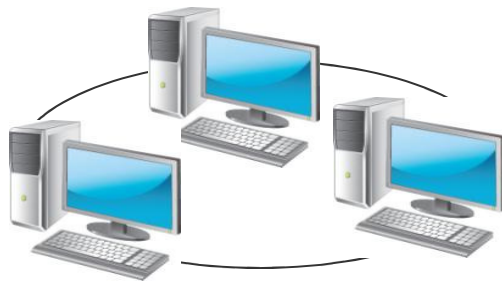
IPv4 Concepts and Terminology

- An IPv4 configuration identifies a computer to other computers on a network

Subnet 1

IP Addresses: 192.168.1.180,
102.168.1.181, 192.168.1.182

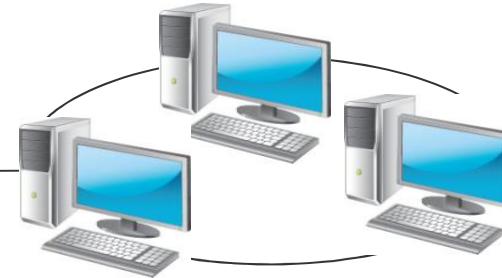
Subnet Mask: 255.255.255.0



Subnet 2

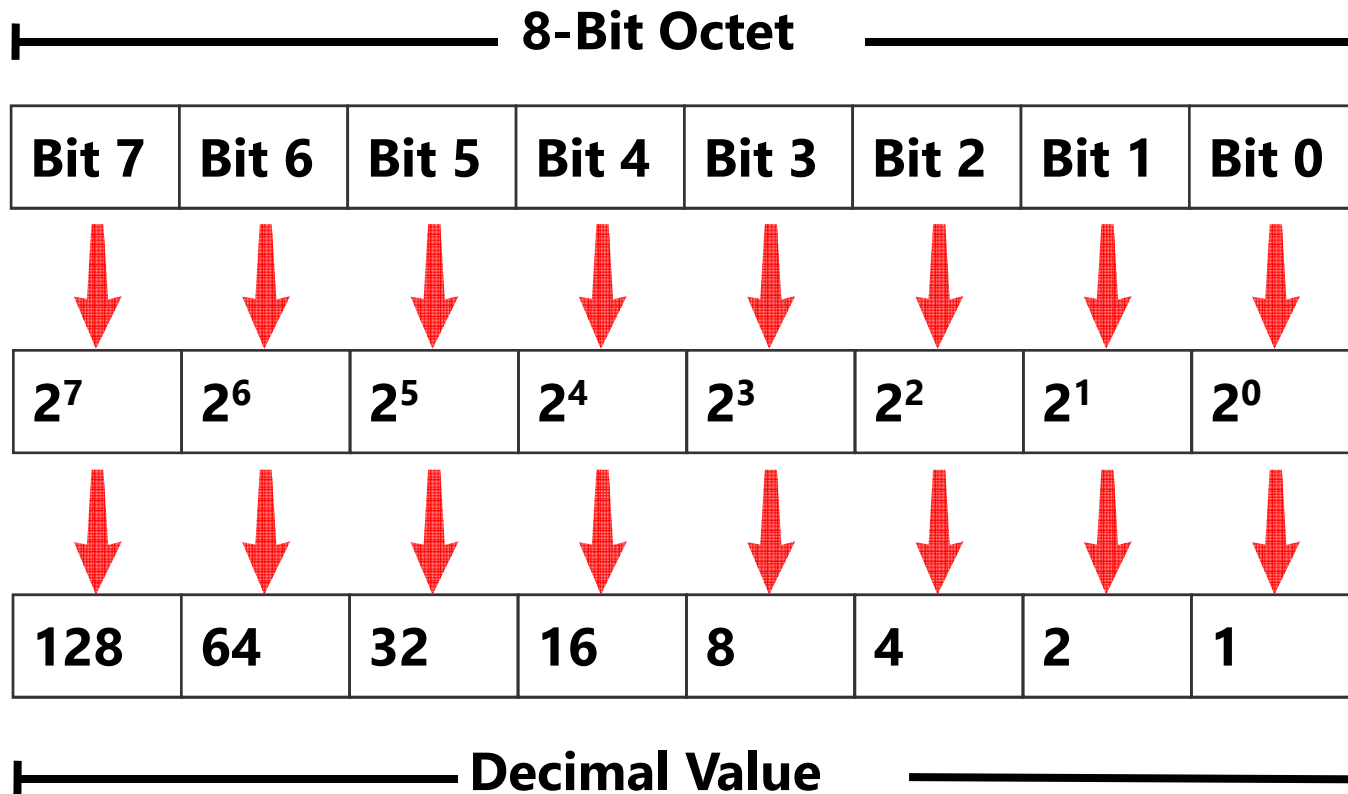
IP Addresses: 192.168.2.200,
102.168.2.201, 192.168.1.202

Subnet Mask: 255.255.255.0



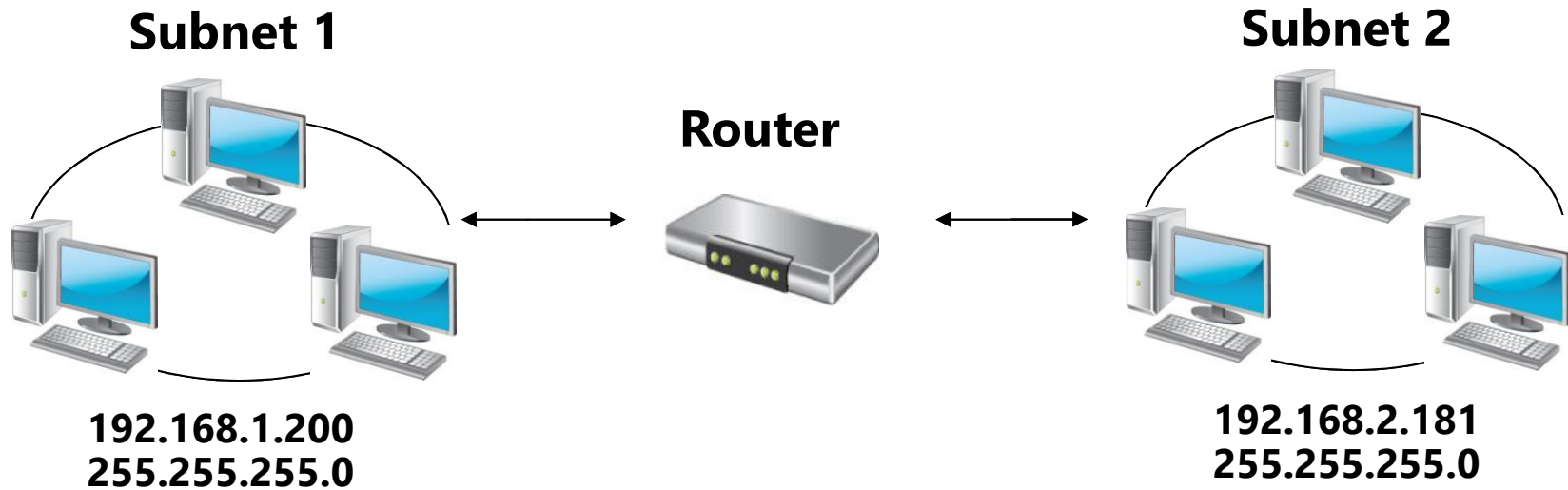
Default gateway defines
the preferred router

IPv4 Addresses



11000000.10101000.00000001.11001000
is **192.168.1.200**

Network and Host IDs



IP address (192.168.2.181)
Subnet mask (255.255.255.0)

11000000.10101000.00000010.10110101
11111111.11111111.11111111.00000000

Network address (192.168.2.0)
Host address (000.000.000.181)

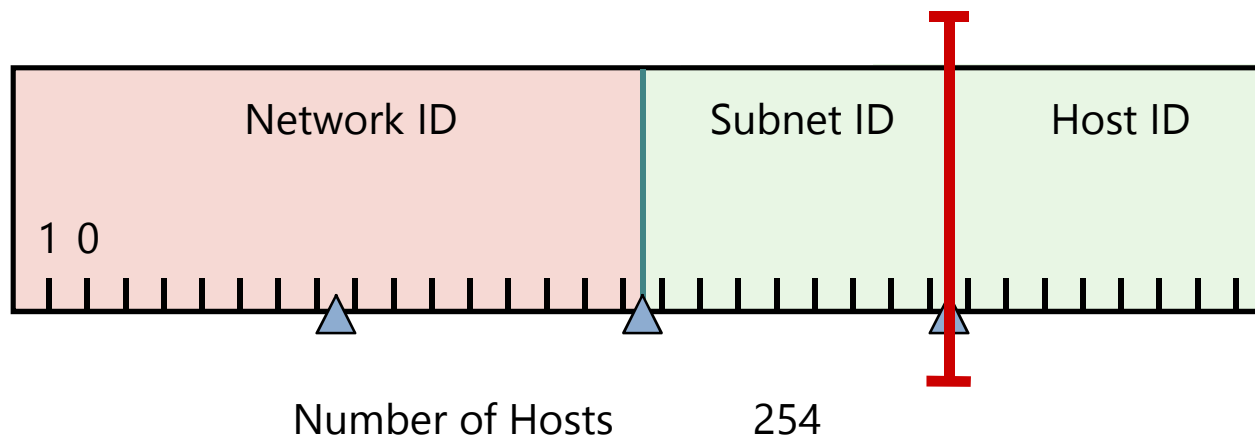
11000000.10101000.00000010.00000000
00000000.00000000.00000000.10110101

IPv4 Address Classes

- IANA controls IPv4 IP address
- Public and Private addresses
- Reserved addresses

Class B Address with Subnet

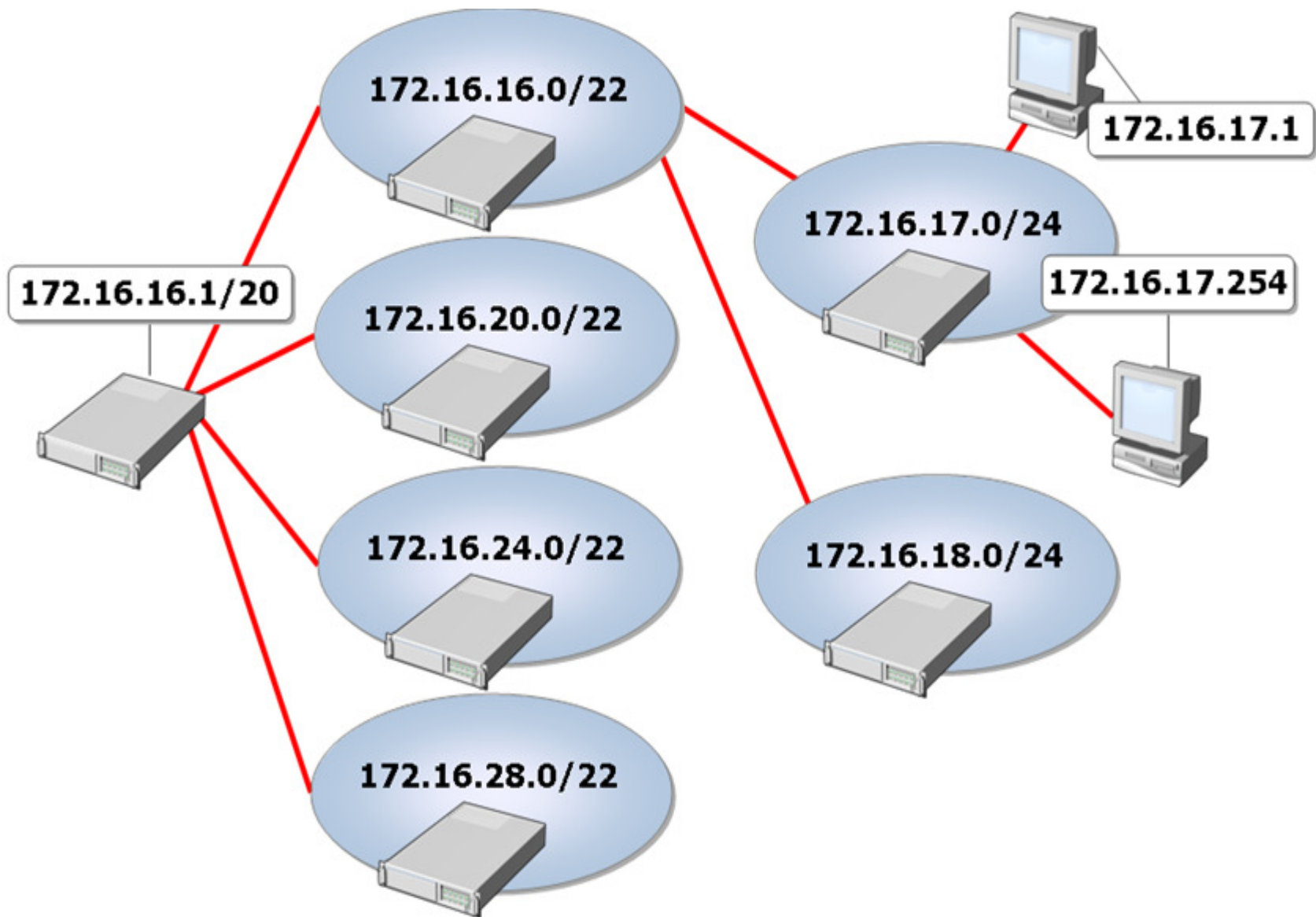
Number of Subnets 254



Determining Subnet Addresses

- By using subnets, you can:
 - Use a single network address across multiple locations
 - Reduce network congestion by segmenting traffic
 - Overcome limitations of current technologies
- Try to balance subnet growth with host growth

More Complex IPv4 Implementations



Automatic IPv4 Configuration

Static IP address

- Manual configuration
- Small number of computers

DHCP IP address

- Automatic configuration
- Plan for failover

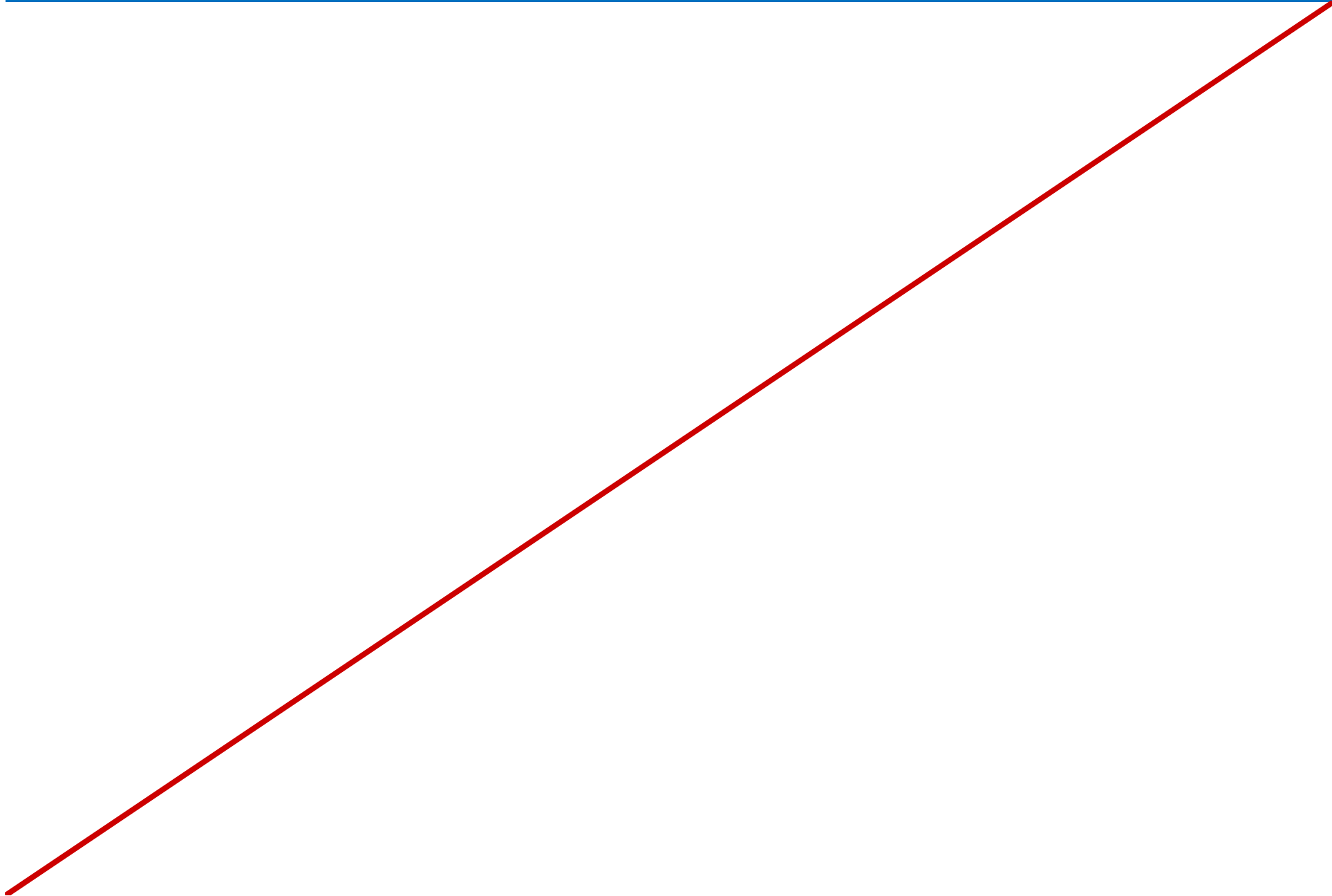
APIPA address

- Self configuration
- Is used if a DHCP server cannot be contacted

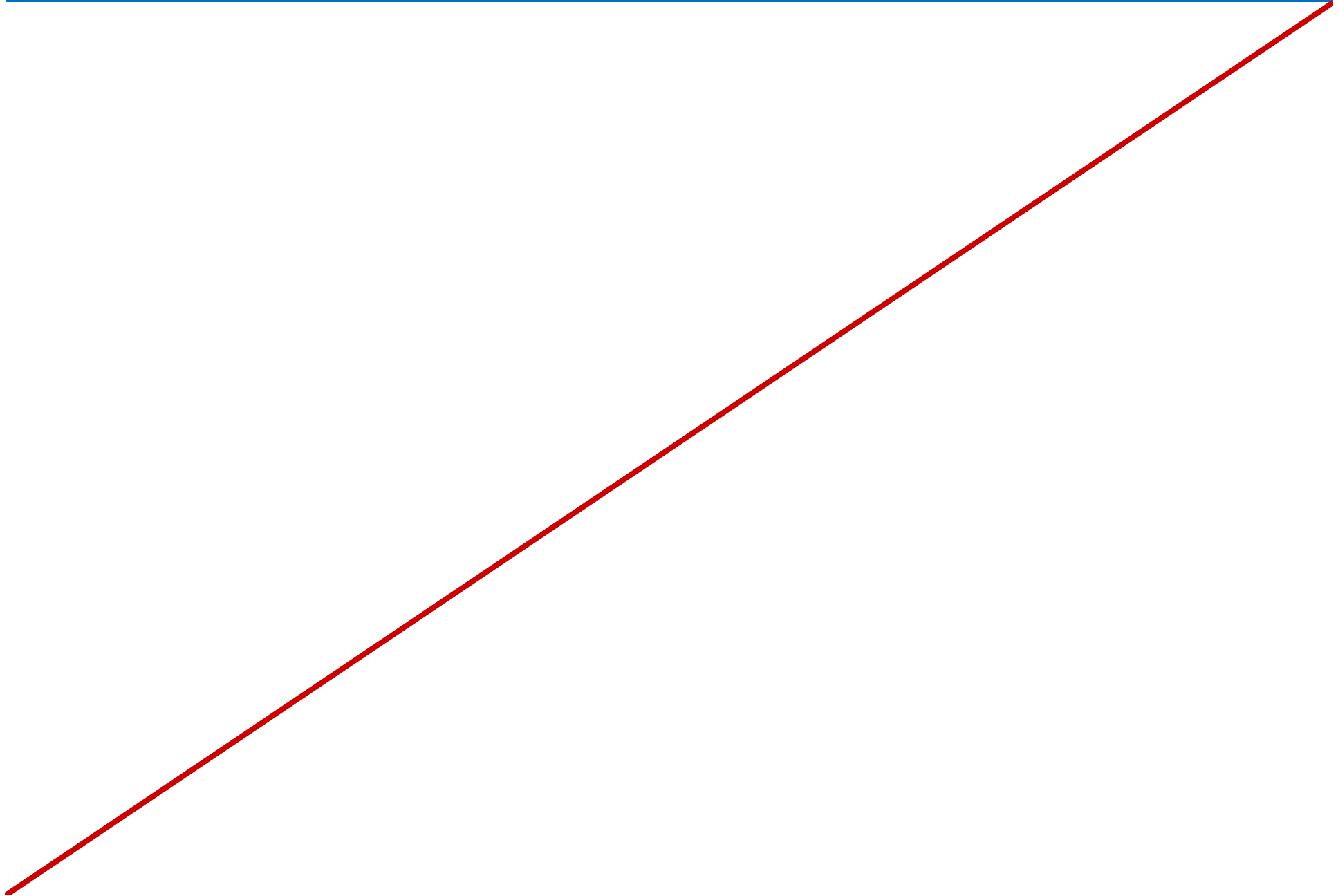
Demonstration: How to Configure IPv4

- In this demonstration, you will learn how to configure IPv4 settings manually and automatically

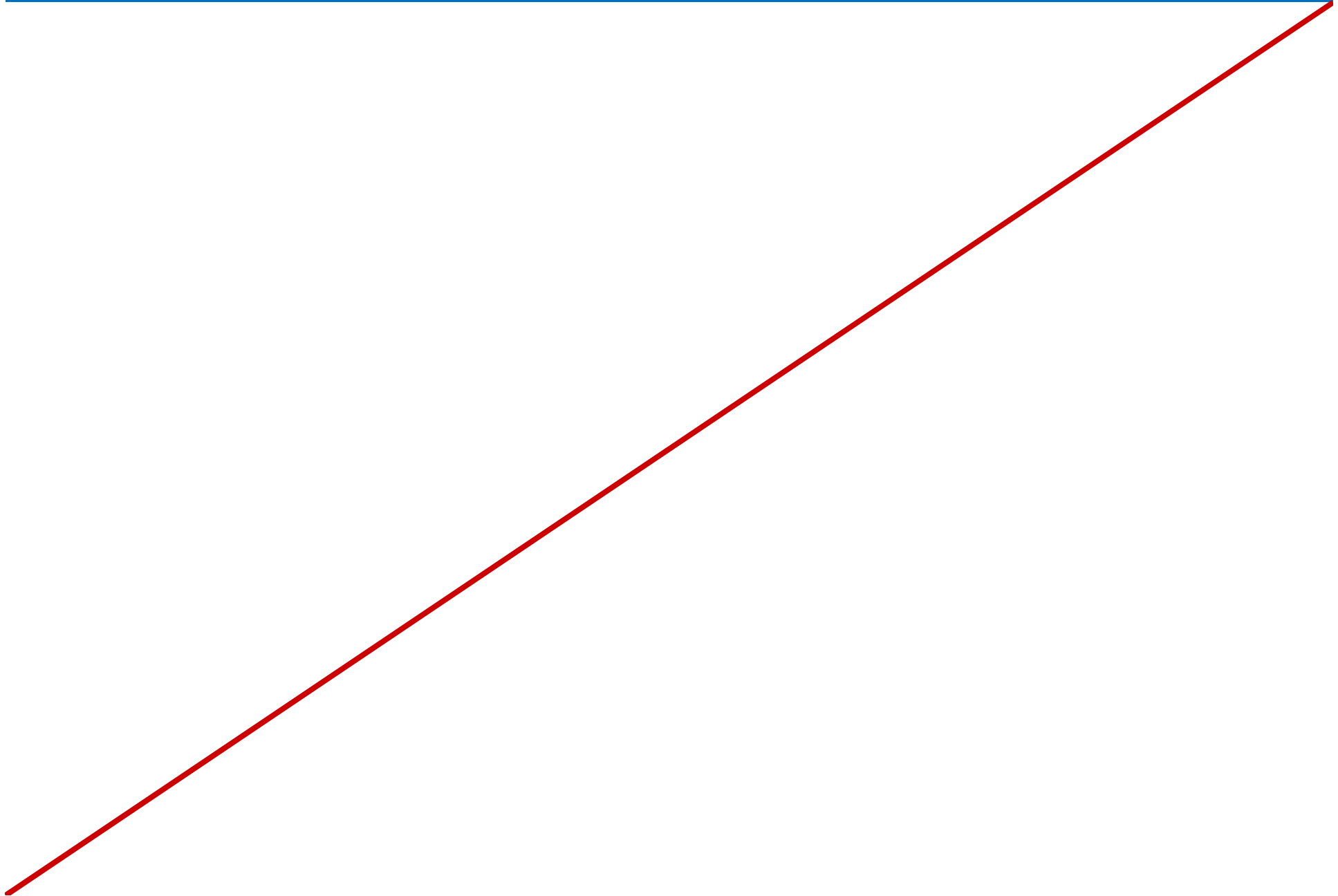
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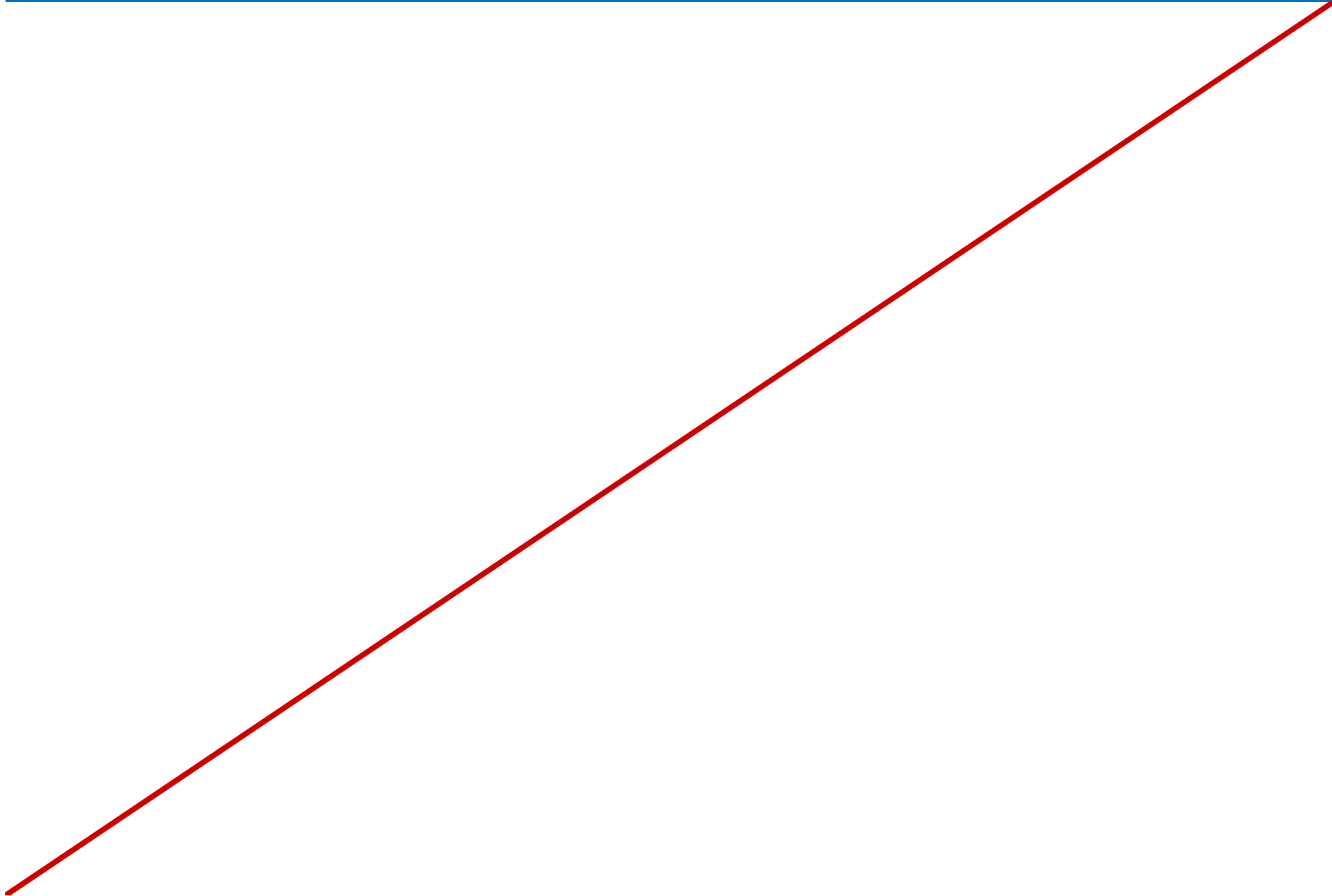
IP Configuration Tools

- Windows includes a number of utilities that help you to verify your IP configuration:
 - IPConfig
 - Ping
 - Tracert
 - Pathping
- These utilities are being phased out in favor of Windows PowerShell
 - Get-NetIPConfiguration
 - Get-NetIPAddress
 - Test-Connection

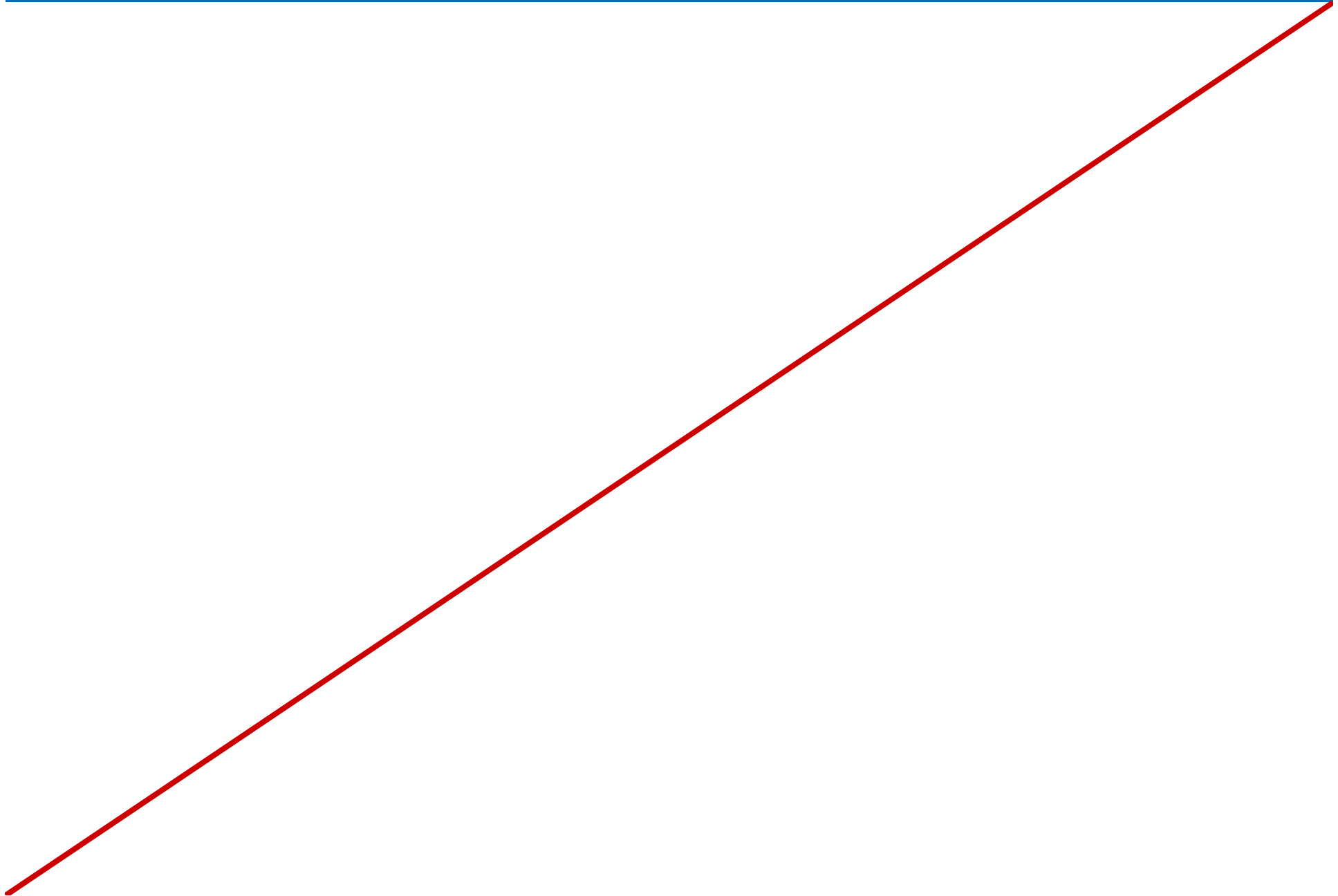
Demonstration: How to Verify IPv4 Configuration

- In this demonstration, you will see how to use IPConfig to verify the computer's IPv4 configuration

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Lesson 3: IPv6 Addressing

- Benefits of Using IPv6
- The IPv6 Address Space
- Transitioning to IPv6
- IPv6 Automatic Configuration

Benefits of Using IPv6

- IPv6 features and functionality address many IPv4 limitations
 - Larger address space
 - More efficient routing
 - Simpler host configuration
 - Built-in security
 - Better prioritized delivery support
 - Redesigned headers

The IPv6 Address Space

- 128-bit address in binary:

```
00100000000000010000110110111000000000000000000010111100111011  
00000010101010100000000011111111111111110001010001001110001011010
```

- 128-bit address divided into 16-bit boundaries:

```
0010000000000001 0000110110111000 0000000000000000  
0010111100111011 0000001010101010 0000000011111111  
1111111000101000 1001110001011010
```

- Each 16-bit block converted to HEX (base 16):

```
2001:0DB8:0000:2F3B:02AA:00FF:FE28:9C5A
```

- Further simplify by removing leading zeros:

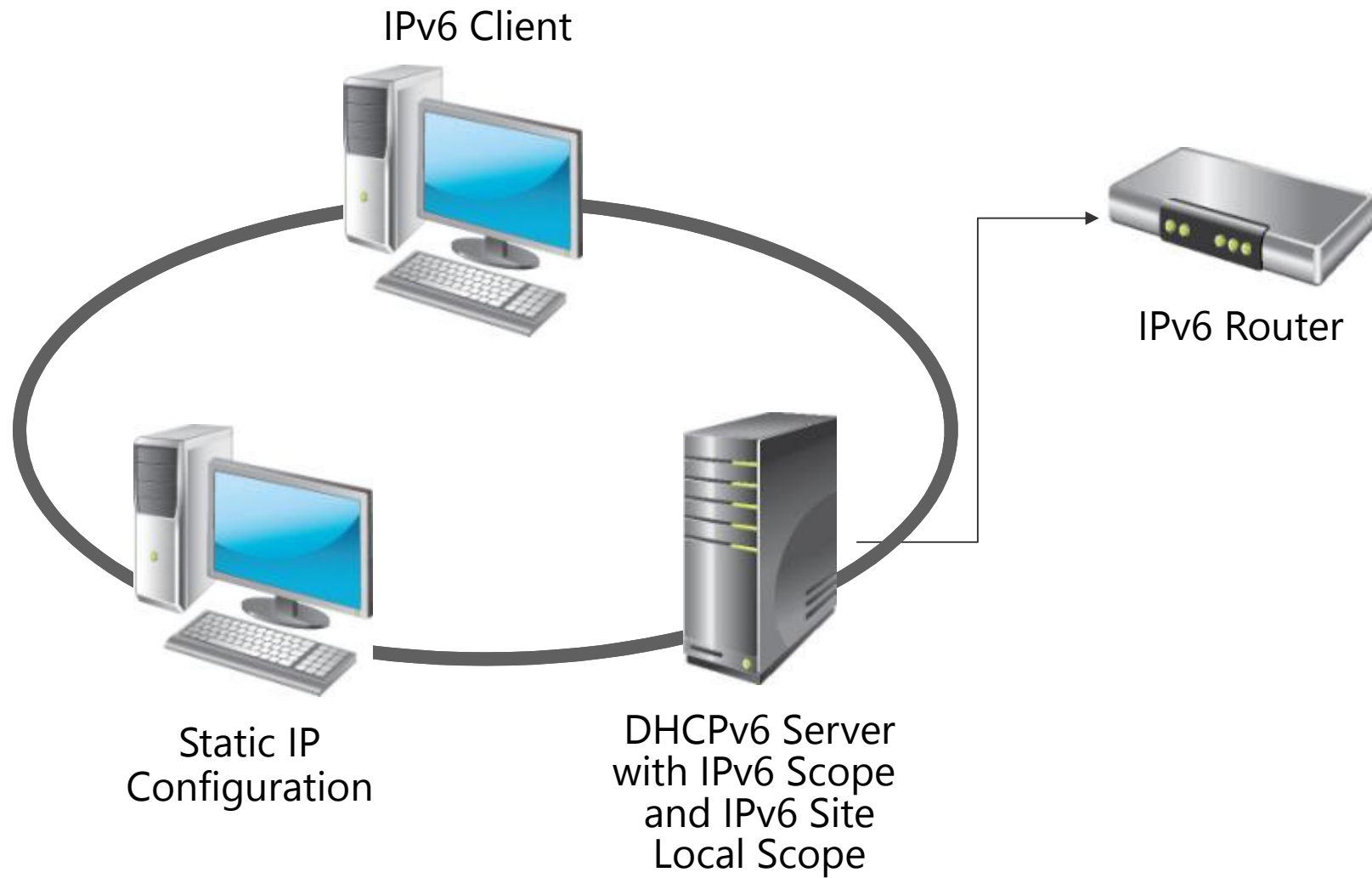
```
2001:DB8:0:2F3B:2AA:FF:FE28:9C5A
```

Transitioning to IPv6

Methods for providing transition from IPv4 to IPv6:

- Upgrade applications to Windows Sockets
- Upgrade DNS infrastructure
- Upgrade hosts to IPv6/IPv4 nodes
- Upgrade routing infrastructure
- Implement tunneling
- Convert IPv6/IPv4 nodes to IPv6 only


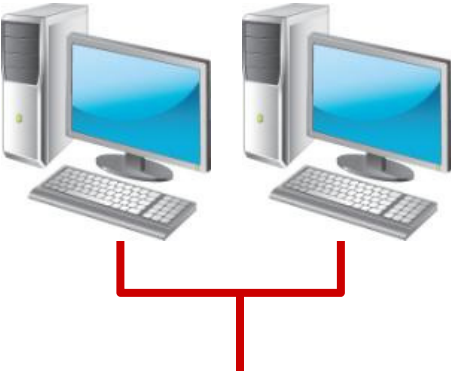
IPv6 Automatic Configuration



Lesson 4: Name Resolution

- Configuring a Computer Name
- What Is Link Local Multicast Name Resolution?
- The NetBIOS Name Resolution Process
- DNS Infrastructure Components
- How Internet DNS Names Are Resolved
- How a Client Resolves a Name
- The GlobalNames Zone
- Demonstration: How to Troubleshoot Name Resolution

Configuring a Computer Name

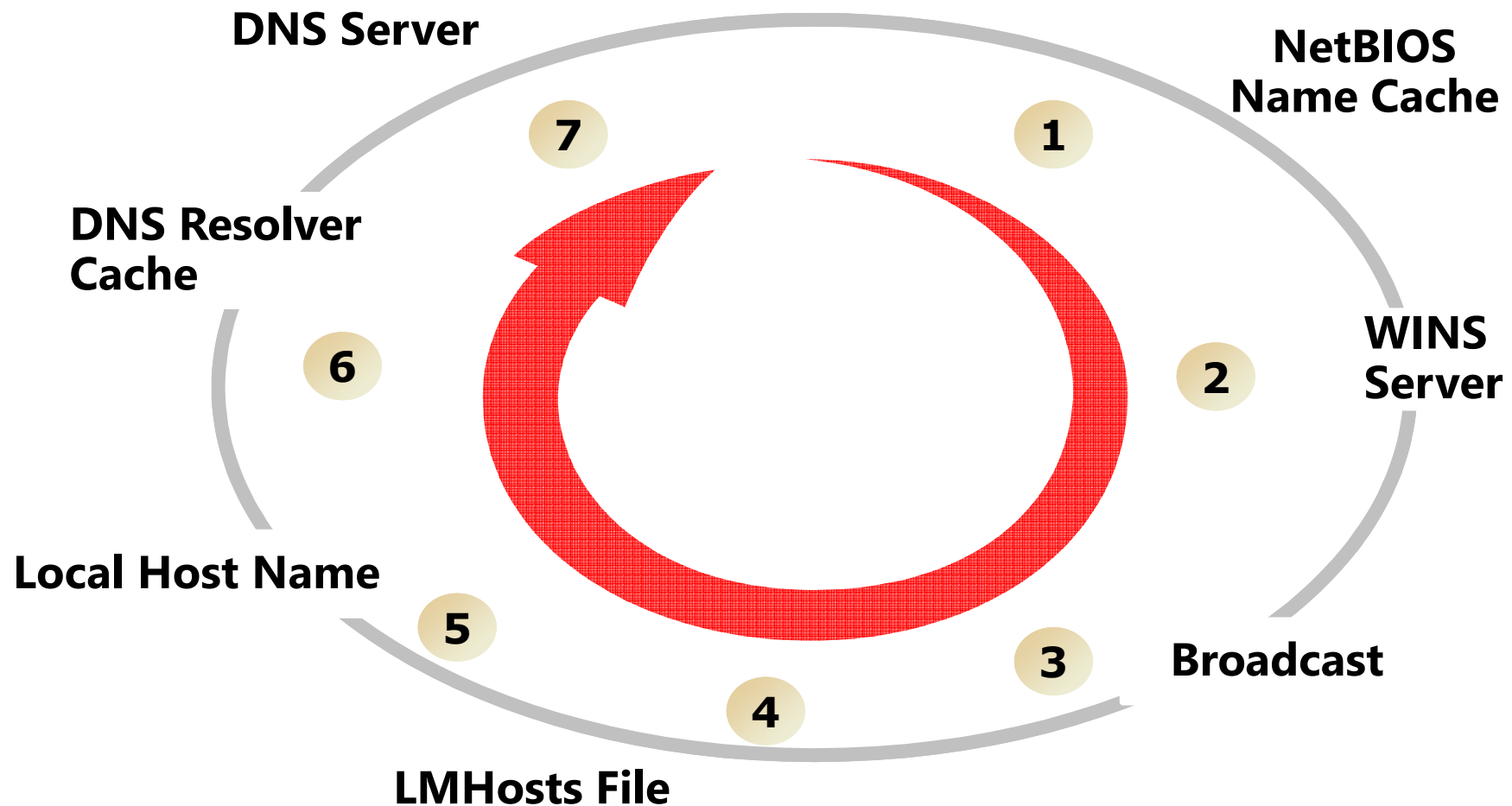
Name	Description
 <p data-bbox="359 808 695 849">NetBIOS Name</p>	<ul data-bbox="829 412 1839 951" style="list-style-type: none">• Single identifier; no secondary or tertiary identifiers are allowed• Identifies a single computer• Associated with home networks, workgroups, older servers or services, or where DNS is not present• 15 characters used for the name, 16th character identifies a service
 <p data-bbox="401 1377 653 1417">Host Name</p>	<ul data-bbox="829 998 1745 1417" style="list-style-type: none">• Associated with corporate or complex networks and DNS• Can contain alphabetic and numeric characters, periods, and hyphens• Part of an FQDN• Up to 255 characters in length

What Is Link Local Multicast Name Resolution?

- Name resolution methodology that provides the following:
 - Resolves computer names to IPv6 addresses in local subnet
 - No servers , file, or database maintenance required to implement
- LLMNR implementation requires:
 - Network Discovery to be enabled on client computers to be able to respond to LLMNR requests
 - Windows Vista, Windows 8, Windows Server 2008, and Windows Server 2012 operating systems only

The NetBIOS Name Resolution Process

- When the NetBIOS name resolution process fails, DNS name resolution methods are used



DNS Infrastructure Components

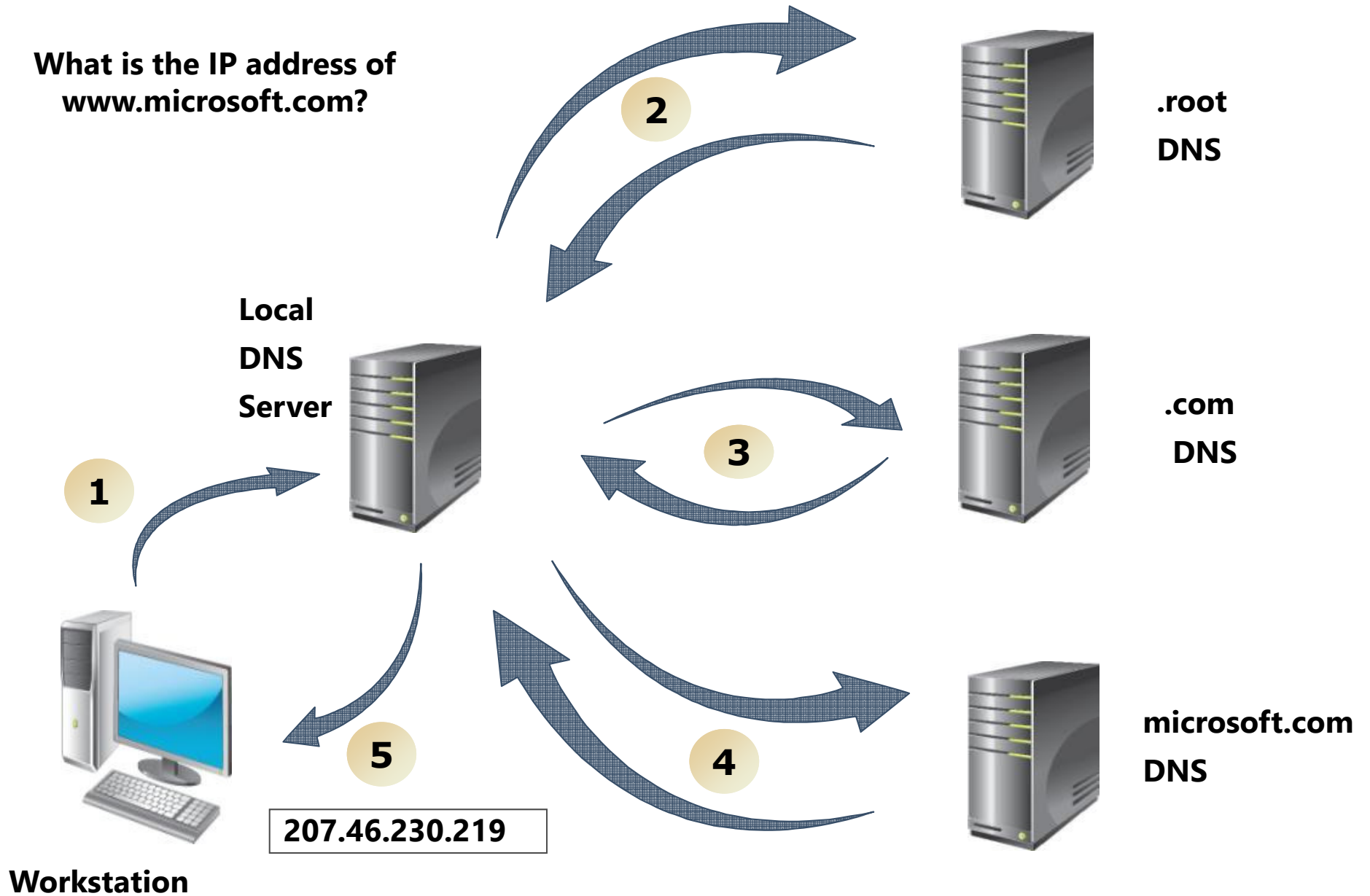
- DNS namespace is a hierarchical naming structure that provides multiple identifiers for each network node that can be identified relative to the root domain.

computer01.unitedstates.microsoft.com

- DNS infrastructure components include:
 - DNS server
 - DNS zone
 - DNS resolvers
 - Resource records

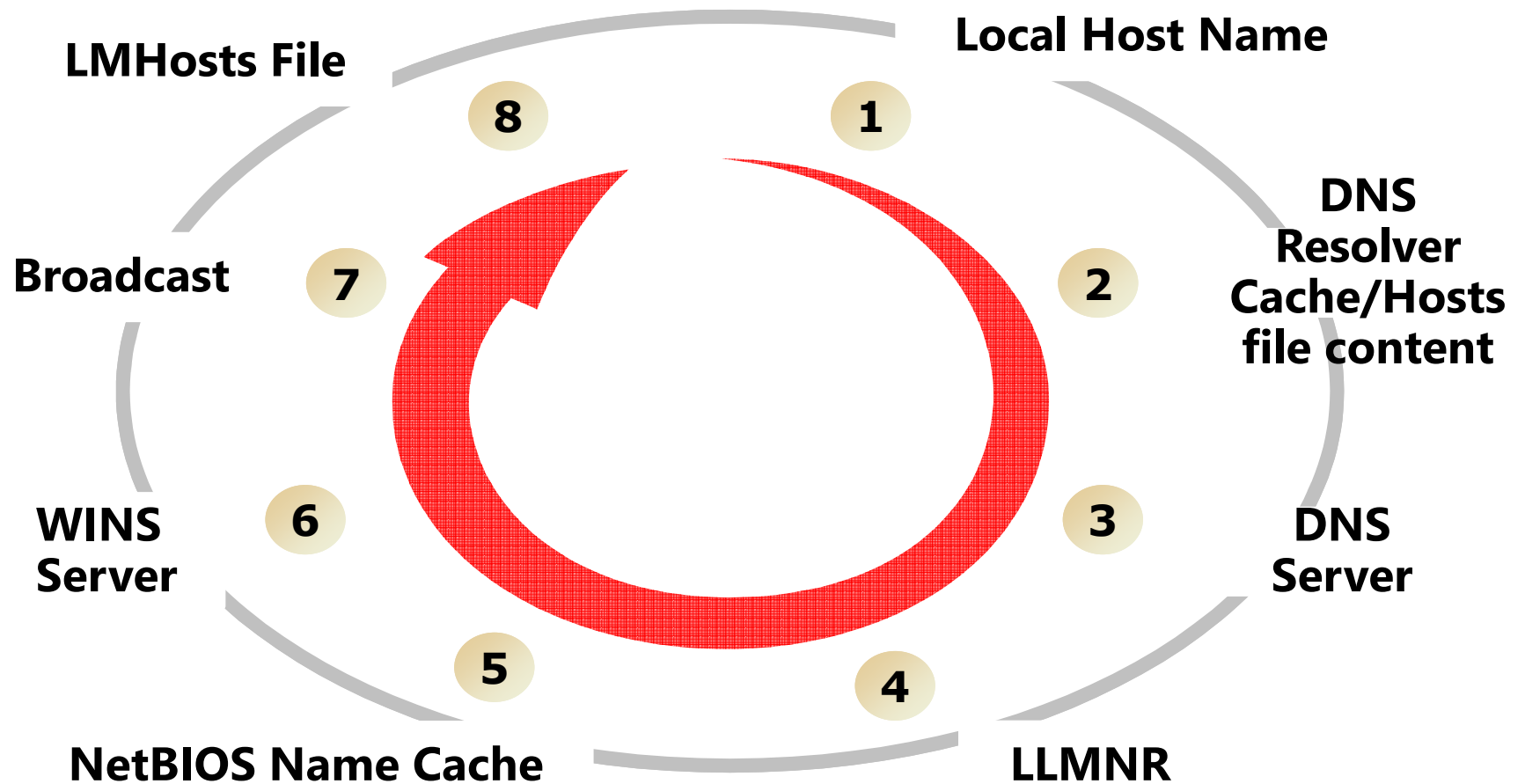
How Internet DNS Names Are Resolved

What is the IP address of
`www.microsoft.com`?



How a Client Resolves a Name

- Windows resolves host names through a customizable resolution process



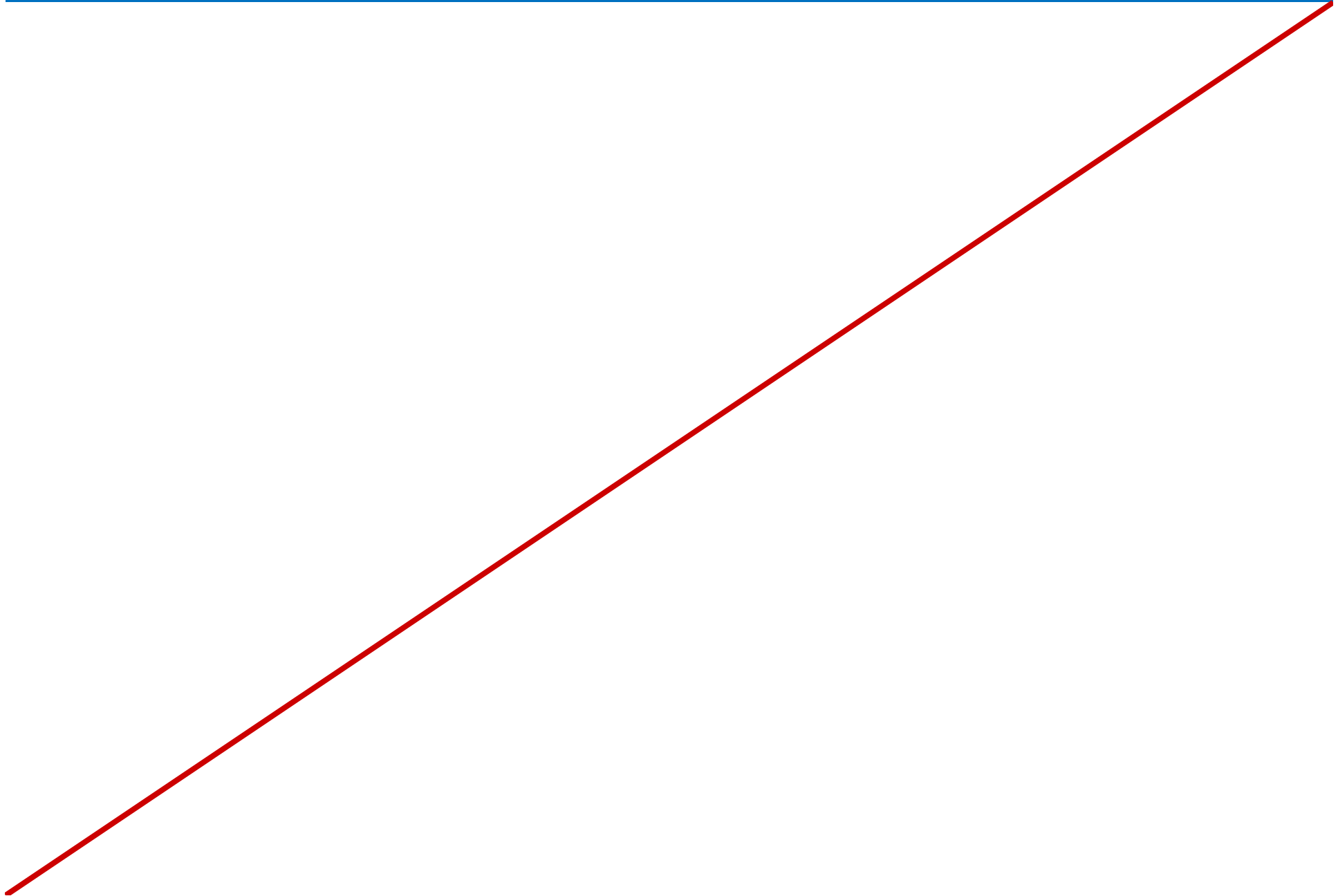
The GlobalNames Zone

- The GNZ provides single-label name resolution for large enterprise networks that do not deploy WINS
- Considerations:
 - Supports only static global records
 - Helps to transition from WINS
 - Manually created and populated with records
- Instead of using the GNZ, you can choose to configure DNS and WINS integration

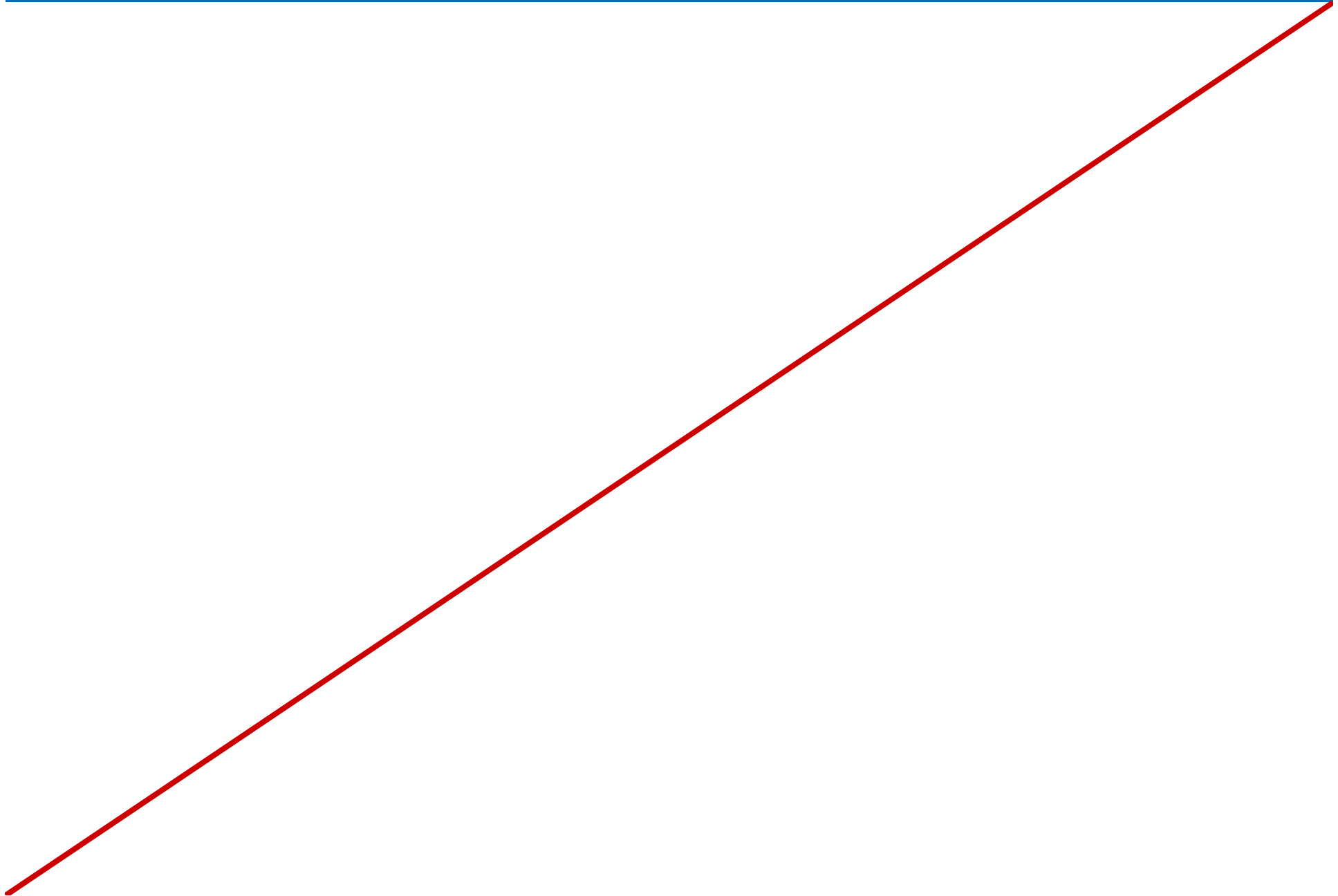
Demonstration: How to Troubleshoot Name Resolution

- In this demonstration, you will see how to troubleshoot name resolution with Nslookup.exe

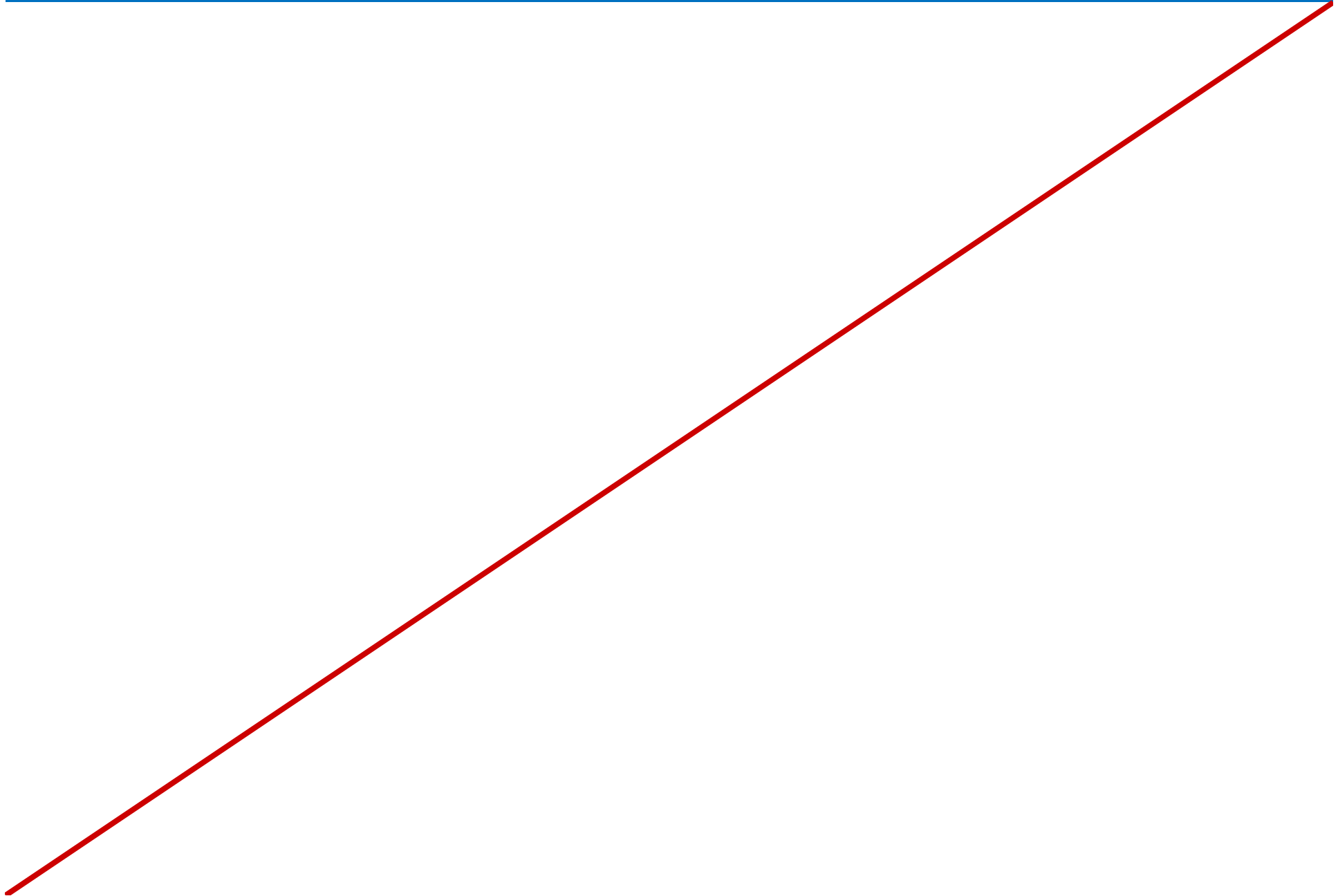
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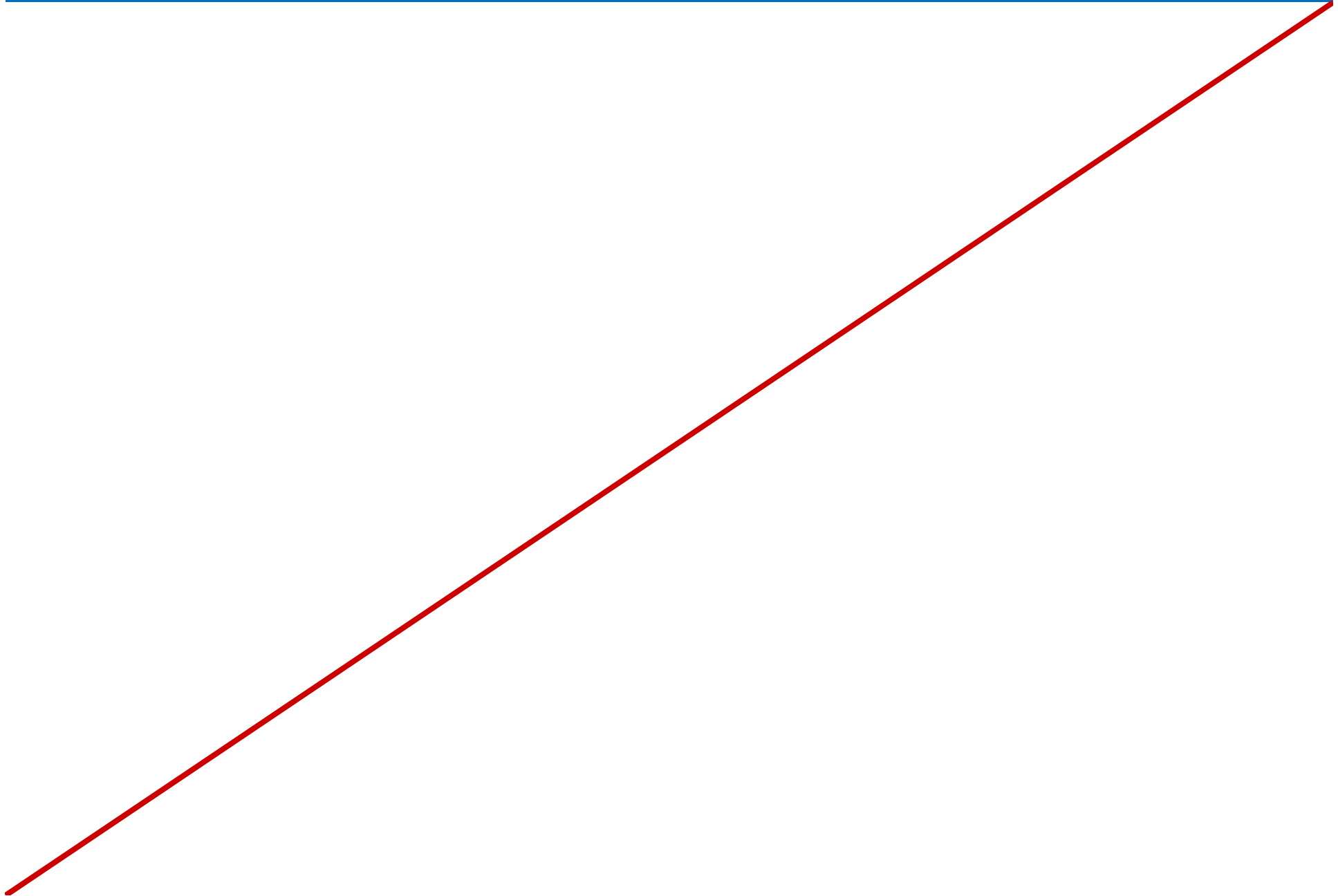
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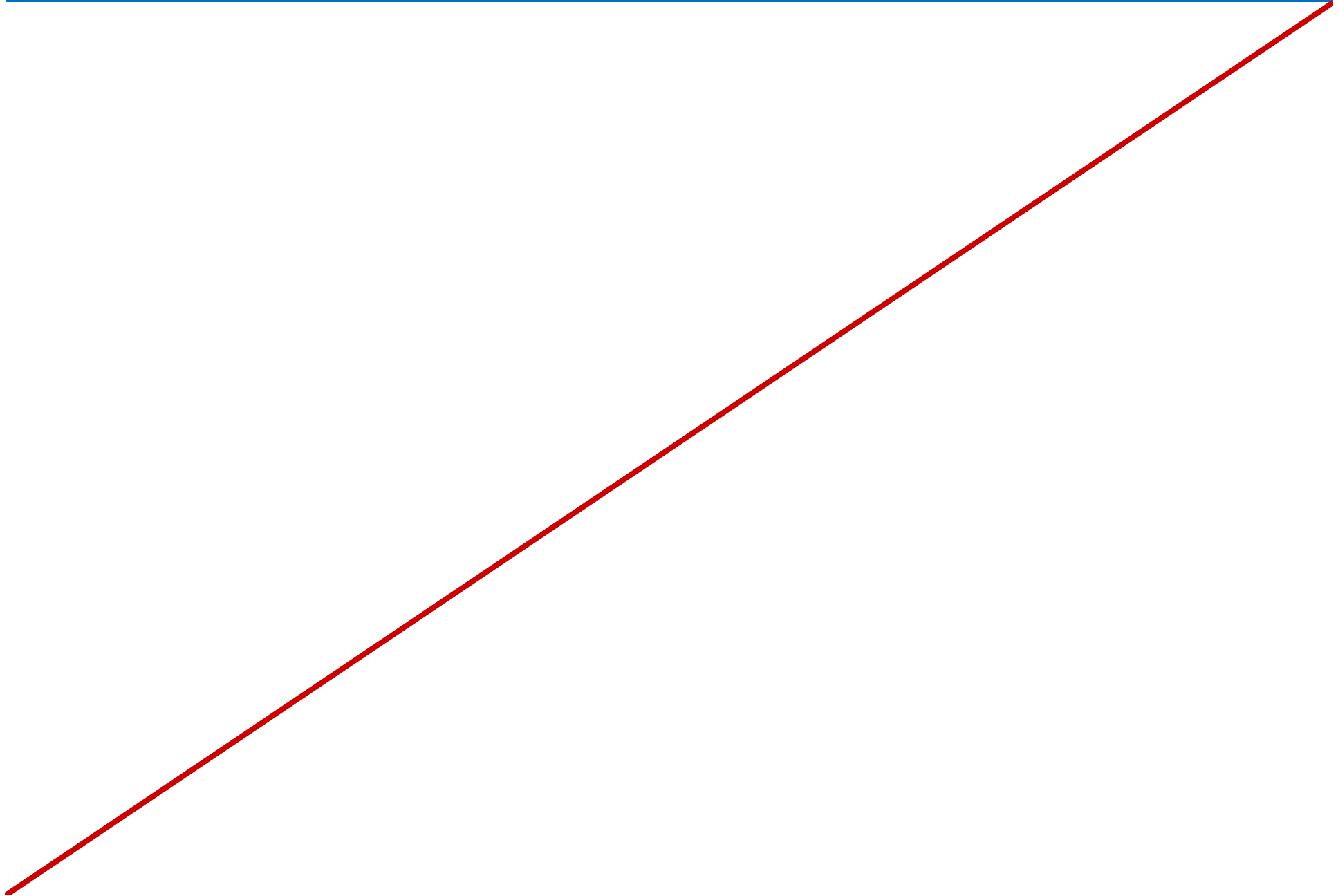
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Lab: Implementing TCP/IP

- Exercise 1: Determining an Appropriate IPv4 Addressing Scheme
- Exercise 2: Configuring IPv4 with Windows Server 2012
- Exercise 3: Verifying the IPv4 Configuration
- Exercise 4: Configuring and Testing Name Resolution
- Exercise 5: Viewing the IPv6 Configuration

Logon Information

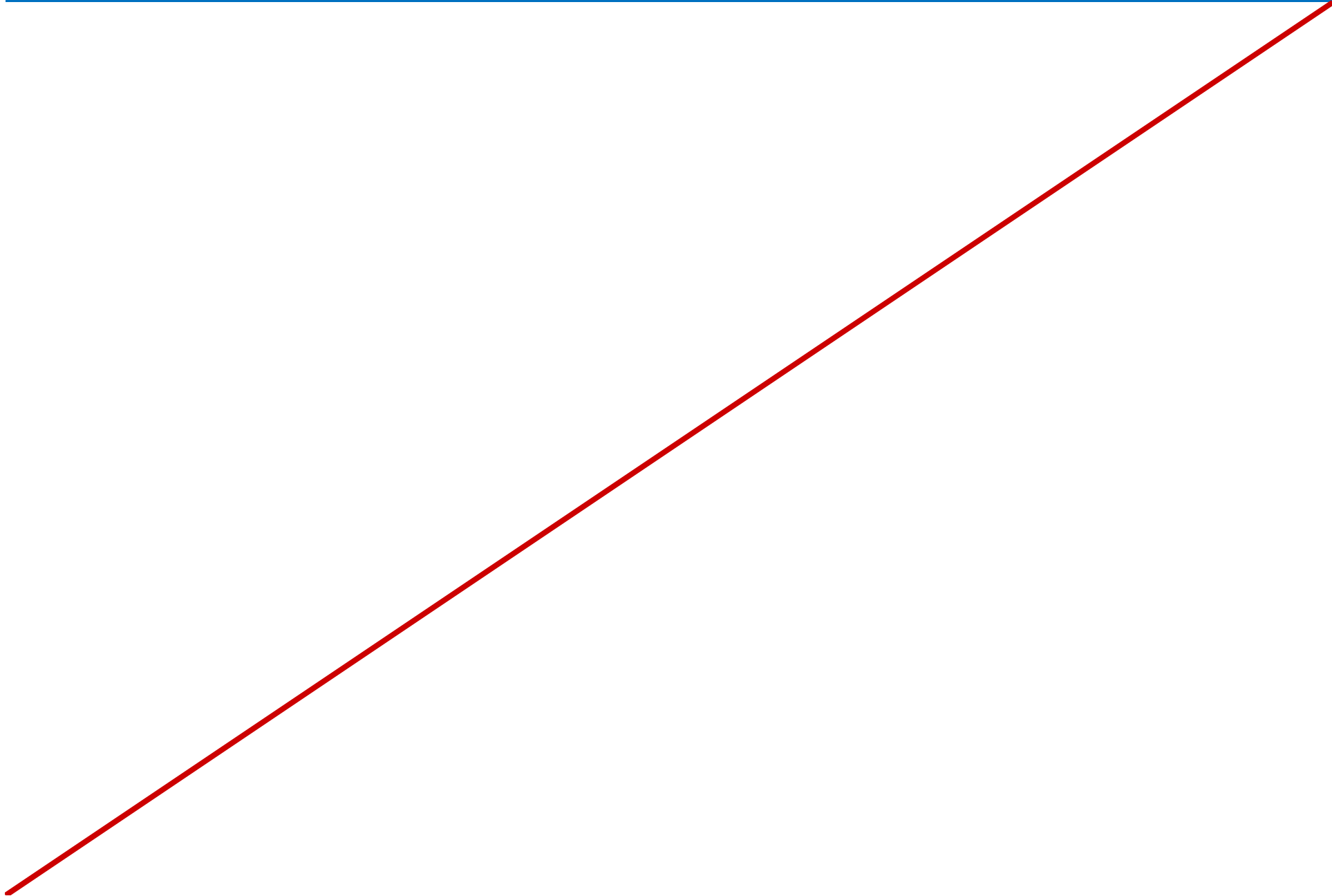
Virtual Machines: 10967A-LON-DC1, 10967A-LON-SVR1,
10967A-LON-CL1

User Name: ADATUM\Administrator

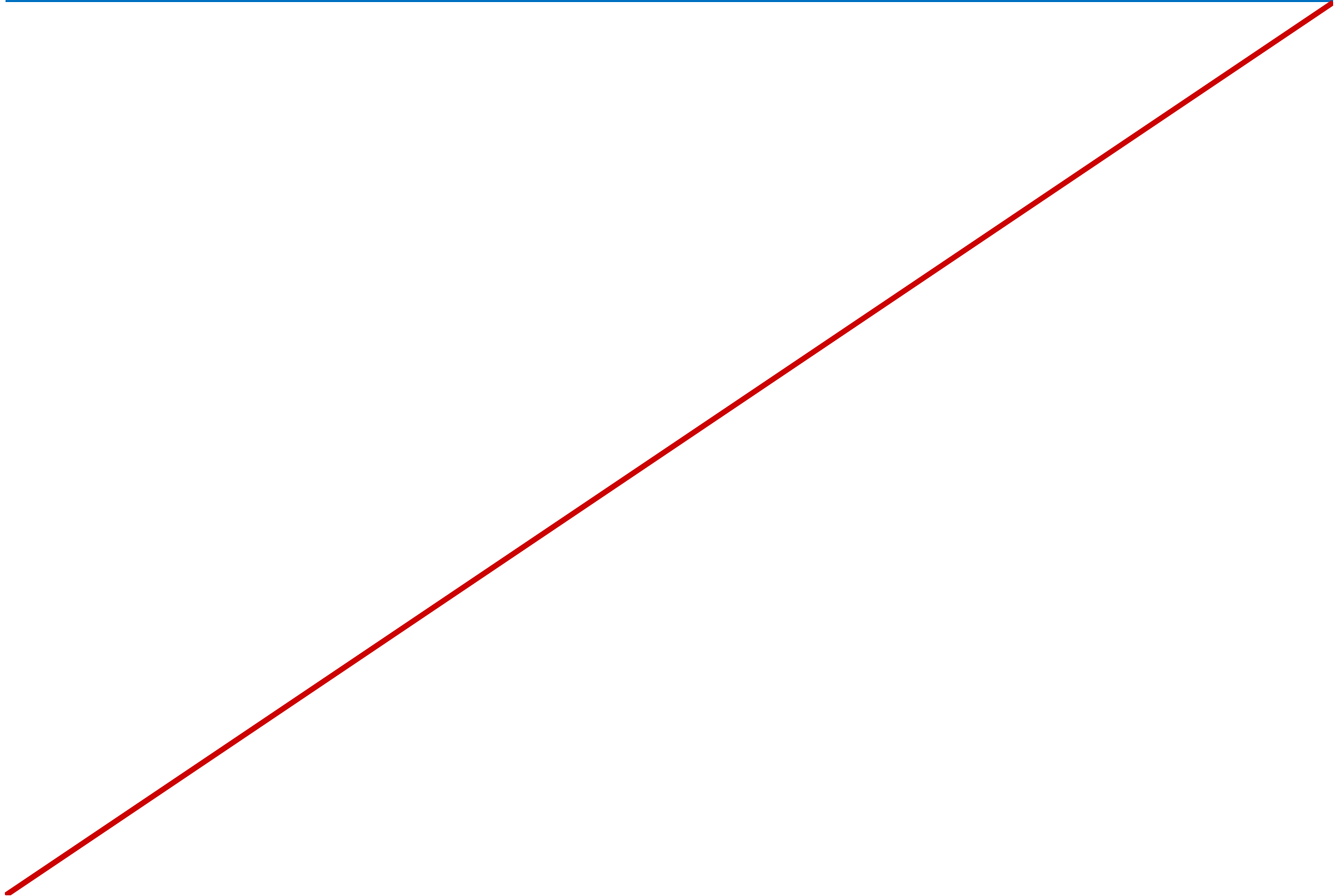
Password: Pa\$\$w0rd

Estimated Time: 90 minutes

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Lab Scenario

The A. Datum Corporation has created a new Research and Development team. As a result, computers are being deployed to new R & D offices.

You are tasked with assigning several client computers appropriate IP configurations, but first you must choose a suitable IP addressing scheme for the new branches.

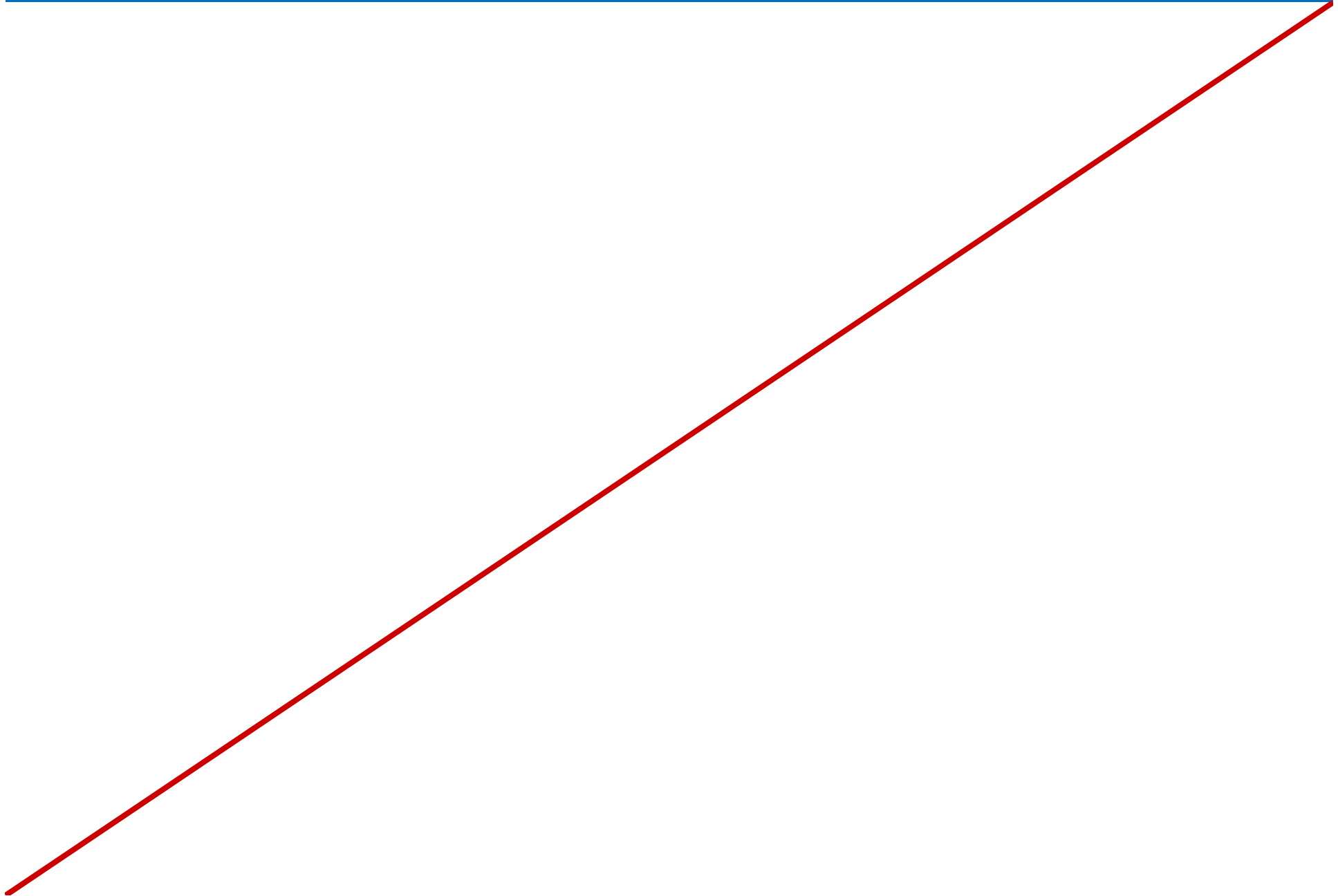
Lab Review

- In the lab, you were tasked with providing an addressing scheme that would accommodate 100 hosts per subnet. Ed provided the first subnet ID of 172.16.16.0/20. How many hosts could be accommodated within this subnet?
- The subnet might grow. If you had to accommodate 100 addresses, what would you recommend as the subnet mask?
- What would the first subnet address be?

Module Review and Takeaways

- Review Questions
- Tools

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