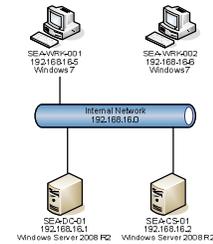


# Routing

Network Management Systems Dept.

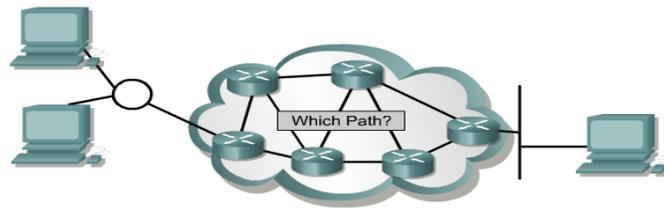
2<sup>nd</sup> Level.

Eng.Ebraheem Alkoli. (ibraheemkoli@gmail.com)



## Routing

هي عملية إختيار أفضل مسار للبيانات للبيانات في رحلتها من المرسل إلى المستقبل



# Routing Methods

a. Routing tables based on route

Destination	Route
Host B	R1, R2, host B

Routing table for host A

Destination	Route
Host B	R2, host B

Routing table for R1

Destination	Route
Host B	Host B

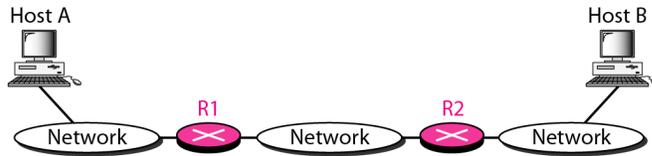
Routing table for R2

b. Routing tables based on next hop

Destination	Next hop
Host B	R1

Destination	Next hop
Host B	R2

Destination	Next hop
Host B	---



# Routing Methods

Routing table for host S based on host-specific method

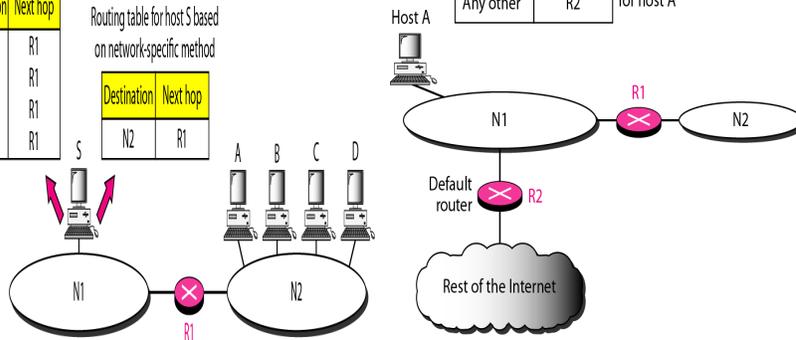
Destination	Next hop
A	R1
B	R1
C	R1
D	R1

Routing table for host S based on network-specific method

Destination	Next hop
N2	R1

Destination	Next hop
N2	R1
Any other	R2

Routing table for host A



## Routing Types

### Static

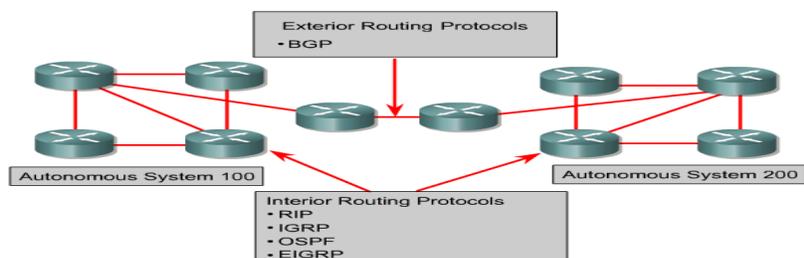
Uses a programmed route that a network administrator enters into the router

### Dynamic

Uses a route that a routing protocol adjusts automatically for topology or traffic changes

## Routing Protocols

- Protocols used by routers to build routing tables.
- Routing tables are used by routers to forward packets.
  - RIP
  - IGRP and EIGRP
  - OSPF
  - IS-IS
  - BGP



## Routing Protocols

**Open Shortest Path First (OSPF)** is a nonproprietary link-state routing protocol.

- It is a **link-state** routing protocol.
- **Open standard** routing protocol described in RFC 2328.
- Uses the **SPF algorithm** to calculate the lowest cost to a destination.
- **Routing updates are flooded** as topology changes occur.

**Intermediate System to Intermediate System (IS-IS)**

- IS-IS is an Open System Interconnection (OSI) routing protocol originally specified by International Organization for Standardization (ISO) 10589.
- It is a **link-state** routing protocol.

**Border Gateway Protocol (BGP) is an exterior routing protocol.**

- It is a **distance vector** (or path vector) exterior routing protocol
- Used between **ISPs or ISPs and clients**.
- Used to **route Internet traffic** between autonomous systems.

7

## Routing Protocols

**Routing Information Protocol (RIP)** was originally specified in RFC 1058.

- It is a **distance vector** routing protocol.
- **Hop count** is used as the metric for path selection.
- If the hop count is **greater than 15, the packet is discarded**.
- Routing updates are broadcast **every 30 seconds**, by default.

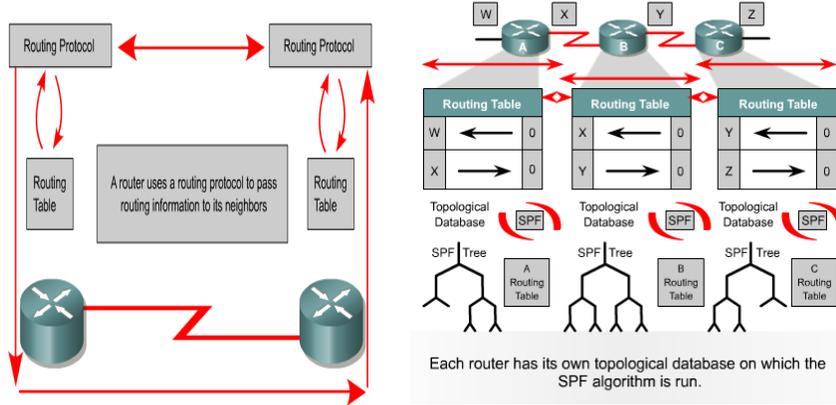
**Interior Gateway Routing Protocol (IGRP)** is a proprietary protocol developed by Cisco.

- It is a **distance vector** routing protocol.
- **Bandwidth, load, delay and reliability** are used to create a composite metric.
- Routing updates are broadcast **every 90 seconds**, by default.

**EIGRP** is a Cisco proprietary enhanced distance vector routing protocol.

- It is an **enhanced distance vector routing protocol**.
- Uses **unequal-cost and equal-cost** load balancing.
- Uses a combination of distance vector and link-state features.
- Uses **Diffused Update Algorithm (DUAL)** to calculate the shortest path.

## Routing Tables



## Windows 2008 Server with Routing and Remote Access service

- **Routing and Remote Access Services (RRAS)**
  - Role service used to configure and manage network routing in Windows Server 2008
  - Recommended for use in small networks that require simple routing directions
  - Not recommended for large and complex environments
- **Routers**
  - Responsible for forwarding packets between subnets, or networks with differing IP addressing schemes



Figure 9-1 Routing two subnets

## Routing Table in Windows Server 2008

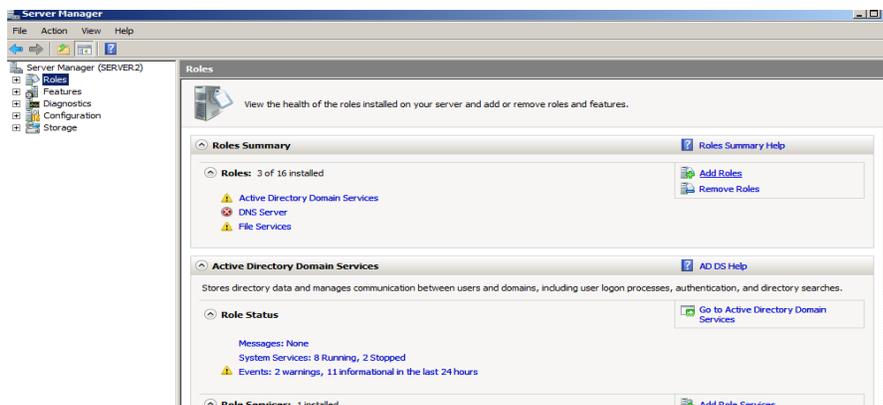
- Routing tables are composed of routes
- Routes
  - Direct data traffic to its destination based on the information it contains
- Routing tables
  - Can be managed in the RRAS console or from the command line using the route command

**Table 9-1** Route command options

Command	Description	Example
Print	Prints the current routing table.	Route print
Add	Adds a route to a routing table for a RRAS server. -p can be used with the command to add a persistent route so that it will be available after a reboot.	Route -p add 192.168.200.0 mask 255.255.255.0 192.168.200.1
Change	Modifies an existing route in a routing table.	Route change 192.168.200.0 mask 255.255.255.0 192.168.200.254
Delete	Deletes an existing route from a routing table.	Route delete 192.168.200.0

## Configure routing in Windows Server 2008

- **Server Manager** قم بفتح شاشة
- **Start > Administrative Tools > Server Manager**



# Routing Configuration

**Before You Begin**

This wizard helps you install roles on this server. You determine which roles to install based on the tasks you want this server to perform, such as sharing documents or hosting a Web site.

Before you continue, verify that:

- The Administrator account has a strong password
- Network settings, such as static IP addresses, are configured
- The latest security updates from Windows Update are installed

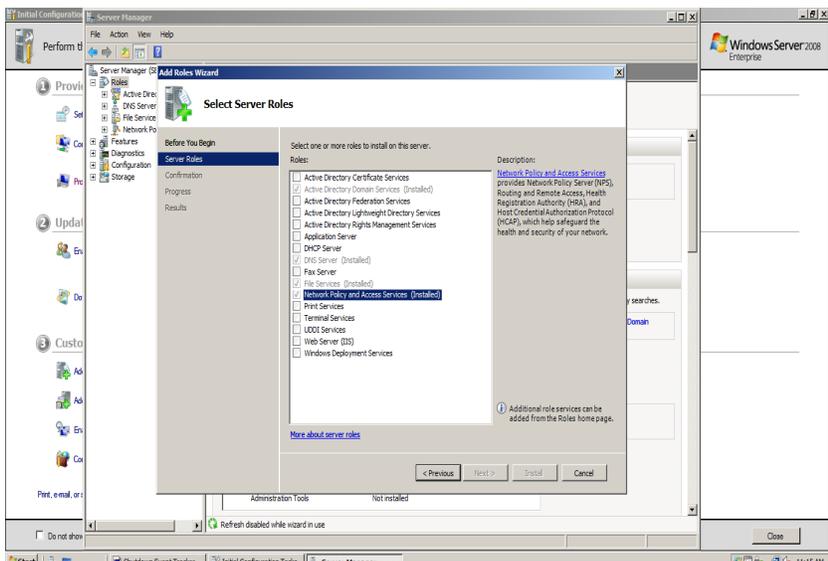
If you have to complete any of the preceding steps, cancel the wizard, complete the steps, and then run the wizard again.

To continue, click Next.

Skip this page by default



# Routing Configuration



The screenshot shows the 'Add Roles Wizard' in Windows Server 2008 Enterprise. The 'Select Server Roles' dialog box is open, listing various roles. The 'Network Policy and Access Services' role is selected and highlighted in blue. Other roles listed include Active Directory Certificate Services, Active Directory Federation Services, Active Directory Lightweight Directory Services, Active Directory Rights Management Services, Application Server, DHCP Server, DNS Server (uninstalled), Fax Server, File Services (uninstalled), Print Services, Terminal Services, UDDI Services, Web Server (IIS), and Windows Deployment Services. The description for 'Network Policy and Access Services' is visible on the right. The background shows the 'Initial Configuration' window with a sidebar of server management options like Provisioning, Updates, and Customization.

# Routing Configuration

## Network Policy and Access Services

**Before You Begin**

- Server Roles
- Network Policy and Access Services**
- Role Services
- Confirmation
- Progress
- Results

**Introduction to Network Policy and Access Services**

Network Policy and Access Services allows you to provide local and remote network access and to define and enforce policies for network access authentication, authorization, and client health using Network Policy Server (NPS), Routing and Remote Access Service, Health Registration Authority (HRA), and Host Credential Authorization Protocol (HCAP).

**Things to Note**

- You can deploy NPS as a Remote Authentication Dial-In User Service (RADIUS) server and proxy and as a Network Access Protection (NAP) policy server. After installing NPS using this wizard, you can configure NPS from the NPAS home page using the NPS console.
- NAP helps you ensure that computers connecting to the network are compliant with organization network and client health policies. After installing NPS using this wizard, you can configure NAP from the NPAS home page using the NPS console.

**Additional Information**

- [Overview of Network Policy and Access Services](#)
- [NAP enforcement methods](#)
- [Network Access Protection \(NAP\) in NPS](#)
- [Network Policy Server](#)

**Navigation:** < Previous, Next >, Install, Cancel

# Routing Configuration

## Select Role Services

**Before You Begin**

- Features
- Diagnostics
- Configuration
- Storage

**Server Roles**

- Network Policy and Access Services
- Role Services**
- Confirmation
- Progress
- Results

Select the role services to install for Network Policy and Access Services:

Role services:

- Network Policy Server
- Routing and Remote Access Services**
- Remote Access Service
- Routing
- Health Registration Authority
- Host Credential Authorization Protocol

Description:

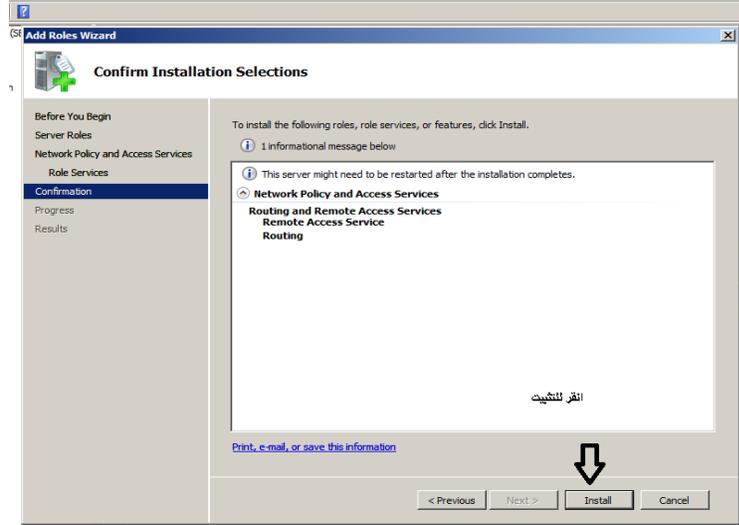
[Routing and Remote Access Services](#) provides remote users access to resources on your private network over virtual private network (VPN) or dial-up connections. Servers configured with the Routing and Remote Access service can provide LAN and WAN routing services used to connect network segments within a small office or to connect two private networks over the Internet.

**Routing and Remote Access Services** حدد ثم انقر التالي

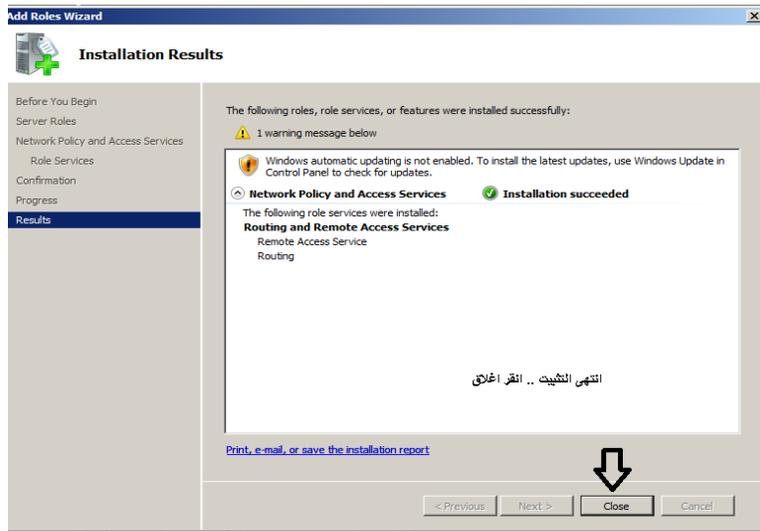
[More about role services](#)

**Navigation:** < Previous, Next >, Install, Cancel

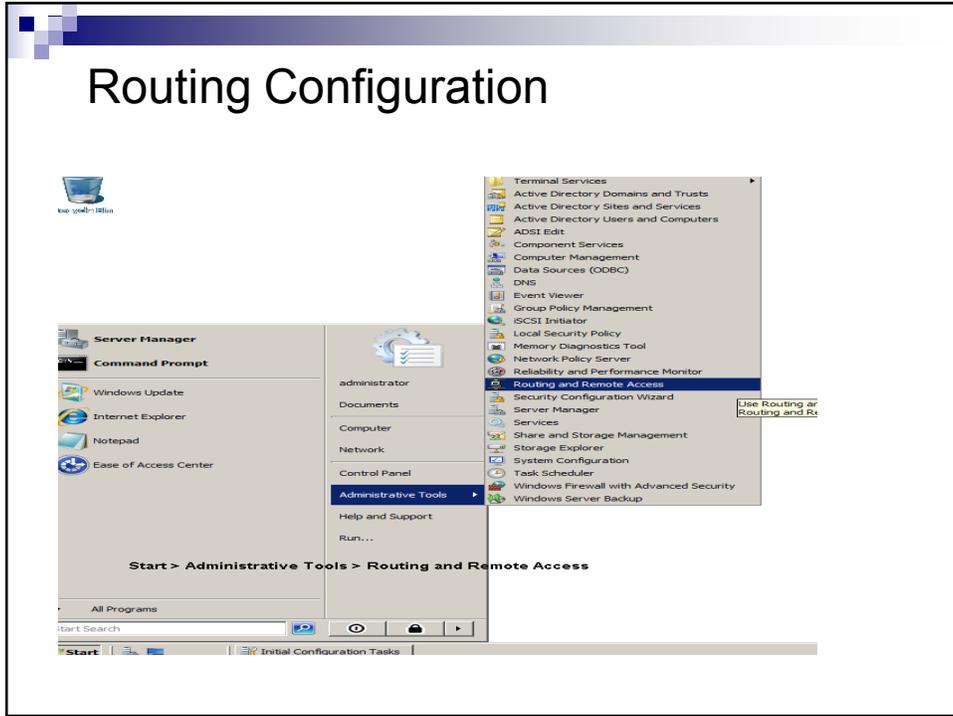
# Routing Configuration



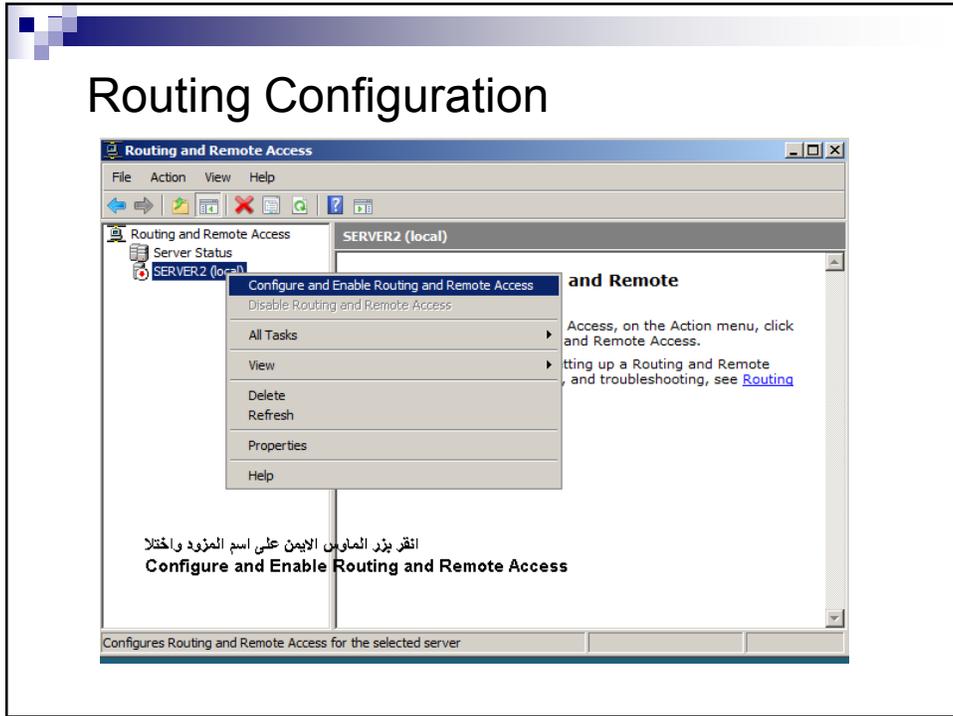
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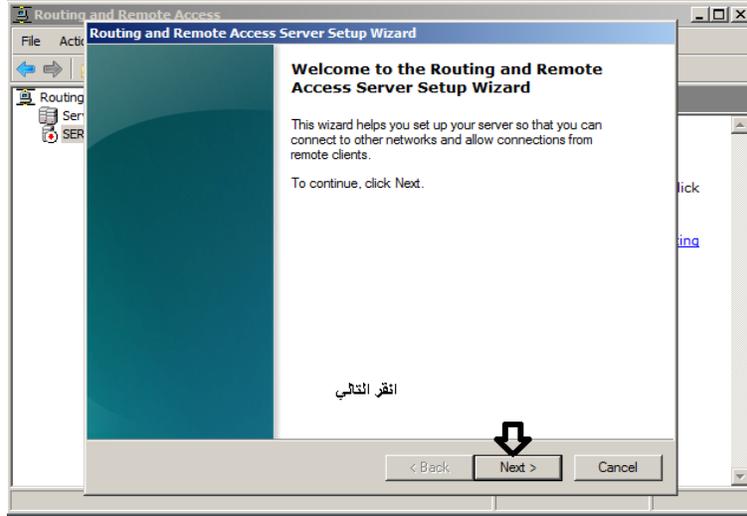
# Routing Configuration



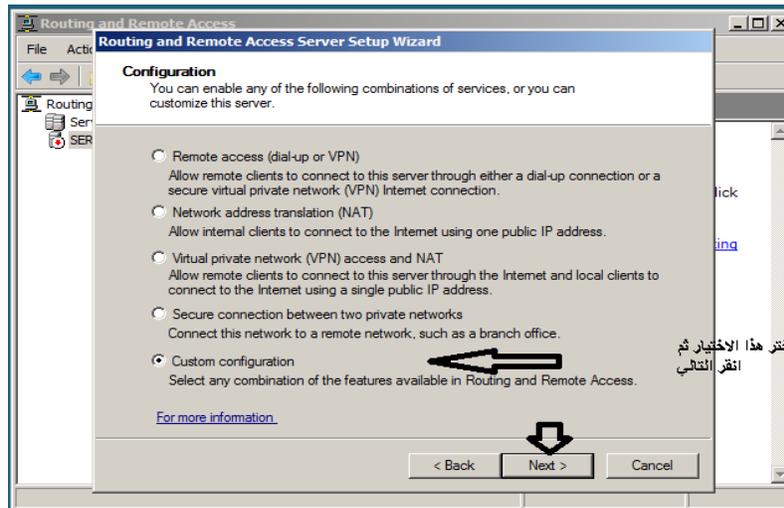
# Routing Configuration



## Routing Configuration



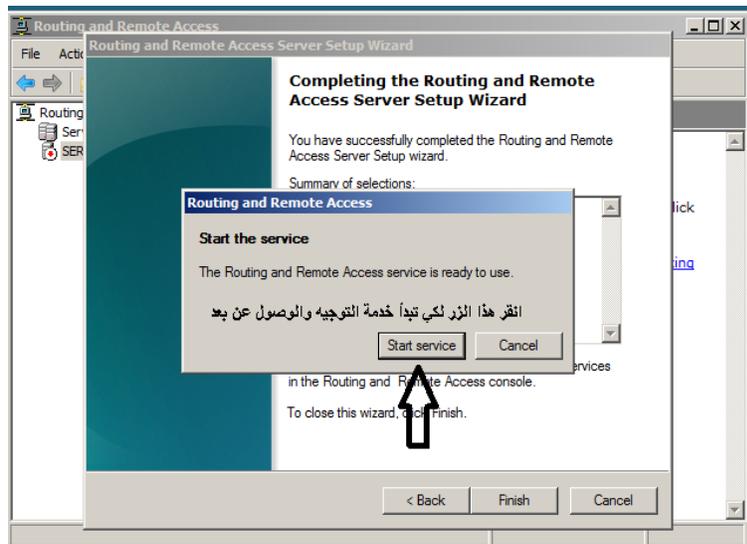
## Routing Configuration



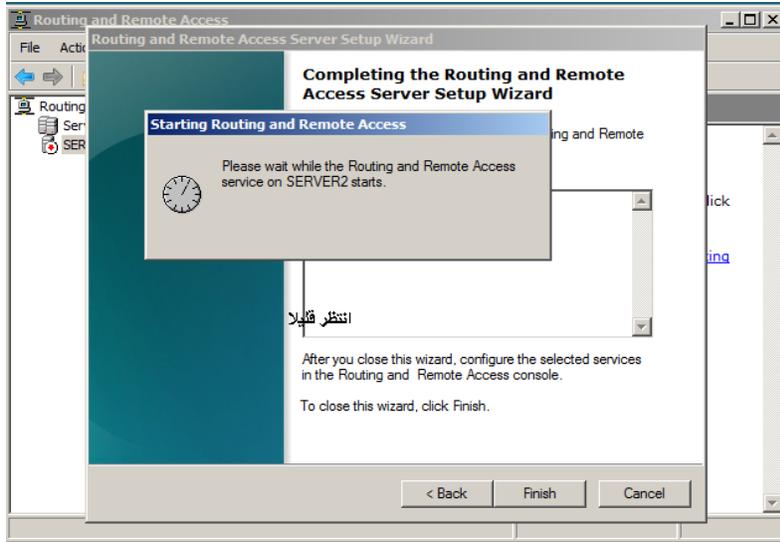
# Routing Configuration



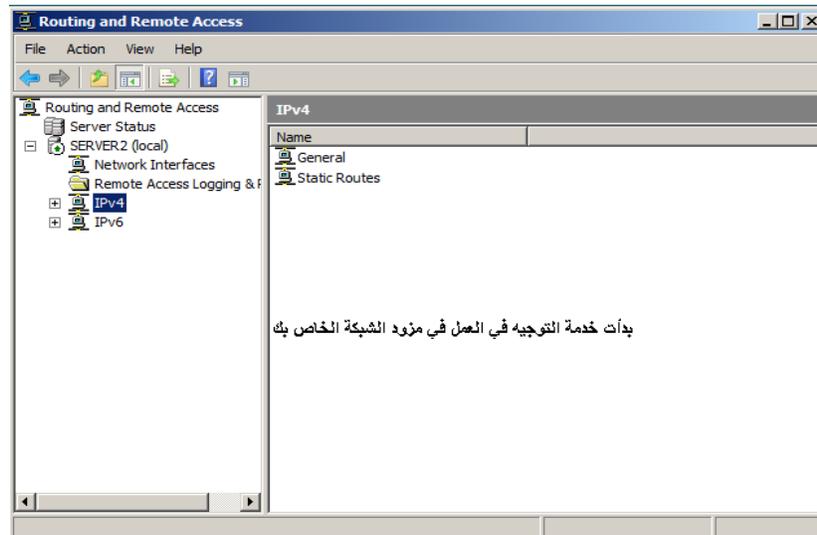
# Routing Configuration



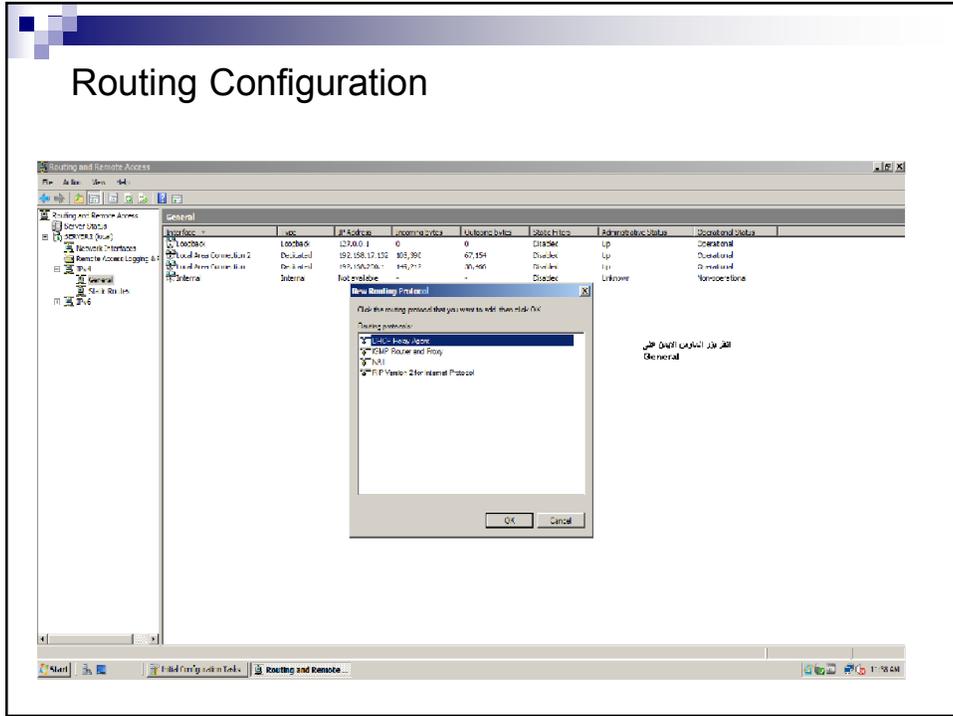
## Routing Configuration



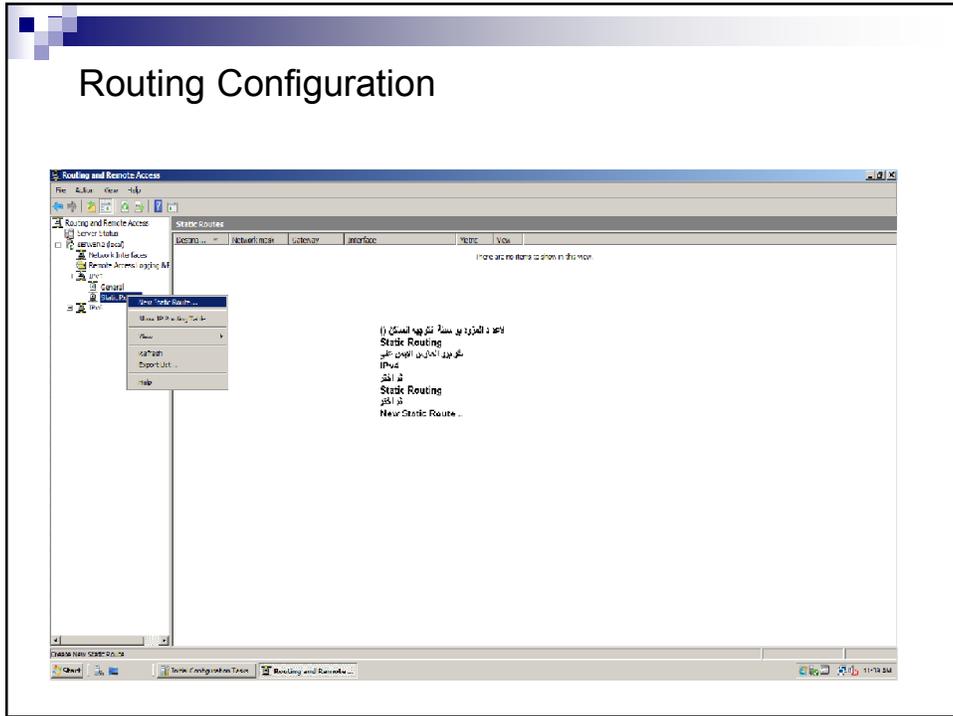
## Routing Configuration



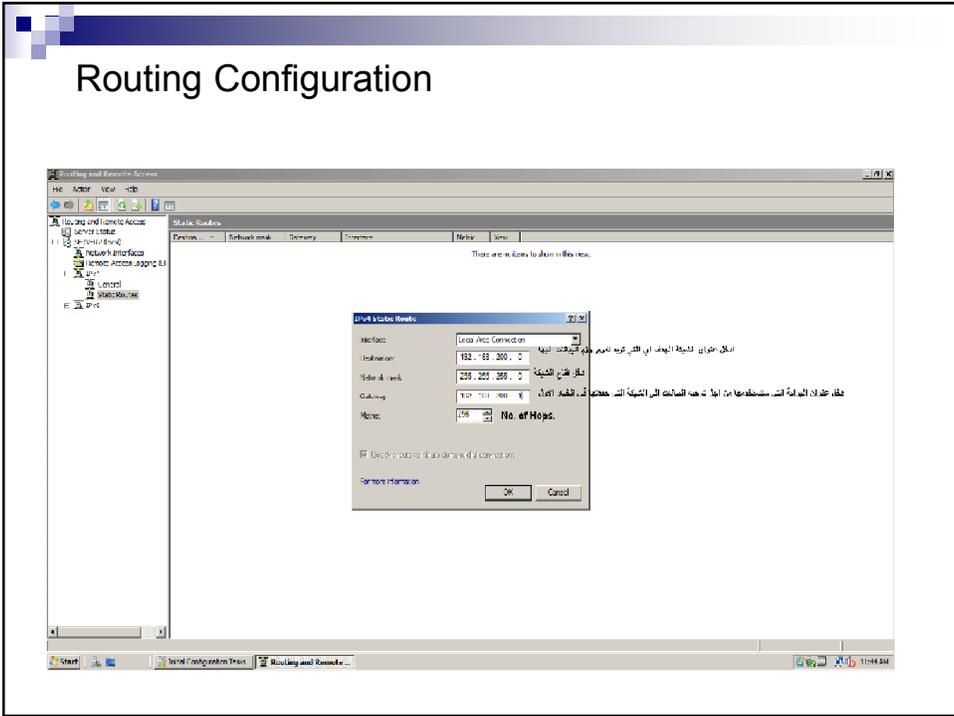
# Routing Configuration



# Routing Configuration



## Routing Configuration



## Any Questions ?

