

Application Note

Web Proxy Auto-Discovery Protocol (WPAD) Configuration

Revision 1.1 : 25/08/2011

Applicable to Ruckus Wireless ZoneDirector Controller SmartOS v9.2 and later

1. What is WPAD (Web Proxy Auto-Discovery)?

If your organization uses a [non-transparent] proxy server there can be a significant IT overhead in manually configuring browser proxy settings on all your computers, or supporting user self-configuration. This problem is exacerbated if the computer is either not owned by your organisation, or used in other locations where the proxy server is not available (i.e. at home, public hotspot, etc.) as the browsers proxy settings will need to be removed before use in these other locations.

Most mainstream "standards" compliant browsers are by default set to auto-detect proxy settings when they are installed using the "Web Proxy Auto-Discovery Protocol" (WPAD). They do this by performing a DNS lookup for a web-server called "wpad" in your organisations domain which hosts a proxy directive file named "wpad.dat". If the client device successfully receives an IP address for "wpad" DNS query when the browser is opened, it then attempts to download "wpad.dat" in the order of <http://wpad/wpad.dat> or <http://wpad.yourfullyqualified.domainname/wpad.dat> i.e. <http://wpad.corporate.local/wpad.dat>

An alternative method is using DHCP, but this is not as widely supported as the DNS method. Both methods are typically configured to try and automatically configure as many devices browsers as possible.

The "wpad.dat" file contains your proxy server configuration or "directives" which directs clients to go via your proxy server for specified sites or go directly to other sites i.e. typically intranet sites.

The following sections detail how to configure a network environment for WPAD and create a "wpad.dat" file that is hosted on a Microsoft Windows server or the Ruckus ZoneDirector Controller.

2. Configuring WPAD

Preparing the Windows Server for WPAD – DHCP “Option 252” creation

In order for some internet browsers to successfully locate the WPAD settings file, it is highly recommended that a DHCP Scope Option “252” is defined. In order to complete this step, you will need to have to know the DNS name of the server that is running IIS and will be hosting your “wpad.dat” file on your network.

- 1) Open the ‘Server Manager’ or DHCP snap-in for MMC, preferably on the server that is performing the DHCP role for your domain.
- 2) Expand ‘DHCP Server’ and the entry underneath with your server name.
- 3) Right-click ‘IPv4’ and select ‘Set Predefined Options’.
- 4) When the ‘Predefined Options and Values’ dialog appears, click ‘Add...’.
- 5) Enter “WPAD” for the ‘Name:’

Select “String” as the ‘Data type:’

Enter “252” as the ‘Code:’

Enter “WPAD Network File Location” as the ‘Description:’

Click ‘OK’.

- 6) Left-click in the ‘String:’ box of the ‘Predefined Options and Values’ dialog box and depending on where “wpad.dat” is hosted enter a string value similar to below then click ‘OK’:

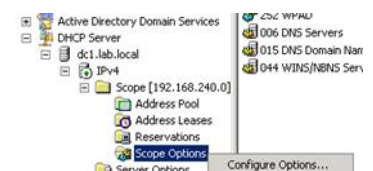
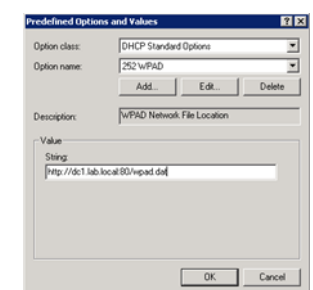
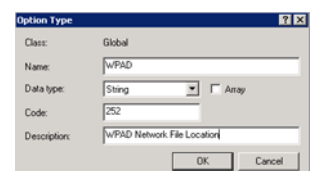
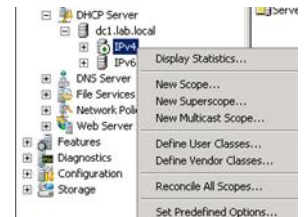
“http://<Host-Server-FQDN:80>/wpad.dat”

or

“http://<Host-server-IP:80>/wpad.dat”

Note: using a FQDN (i.e. http://wpad.corporate.local:80/wpad.dat) is preferred in case the IP address of the host server should change in the future. The FQDN should be entered in lower-case

- 7) Expand ‘IPv4’ and then expand ‘Scope [your IP subnet]’, right-click over ‘Scope Options’, and select ‘Configure Options...’
- 8) Scroll down and check the box next to the entry labeled ‘252 WPAD’.



Ruckus Wireless, Inc.

880 West Maude Avenue, Suite 101, Sunnyvale, CA 94085 USA

(650) 265-4200 Ph \ (408) 738-2065 Fx



- 9) Additionally, whilst in the DHCP 'Scope Options' box, it is worth checking and setting the following Options:

Mandatory:

006 (DNS Servers) – Sets client DNS server settings

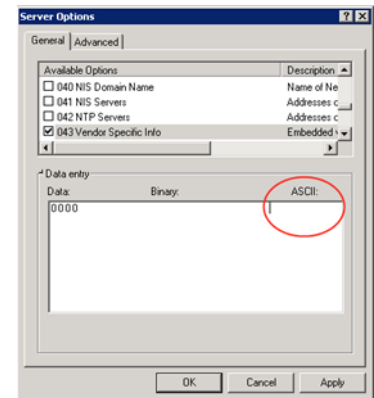
015 (DNS Domain Name) – Used to set client DNS suffix to match AD Domain Name (eg; corporate.local, corporate.com etc...).

If this option is not set; guest user's browsers may not successfully retrieve the WPAD file!

Optional:

042 (NTP Server) – Sets client clocks to same as the DC

If attempting to enter multiple server IP addresses into a single textbox, then additional addresses should be separated with commas.

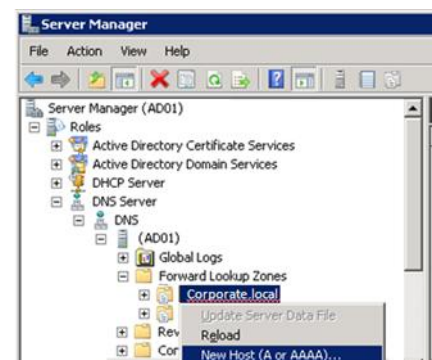


Note: If you have devices running Windows XP with SP3 and you wish to use only DHCP option 252 then you need to install HotFix <http://support.microsoft.com/kb/953761/en-us> on those devices.

Preparing the Windows Server for WPAD – DNS Host "A" record creation

In order for the wireless clients to "find" the proxy server settings, a manual DNS Host or "A" record needs to be created. When an internet browser opens on a client computer, it will send out a DNS request to resolve in order of either "wpad" or "wpad.yourfullyqualified.domainname" i.e. "wpad.corporate.local".

- 1) Open the 'Server Manager' or DNS snap-in for MMC, preferably on the server that is performing the DNS role for your domain.
- 2) Expand 'DNS' and the entry underneath with your server name.
- 3) Right-click the entry for your internal Active Directory Domain Name (in the example above the Active Directory domain name is Corporate.local) and select 'New Host (A or AAAA)'.



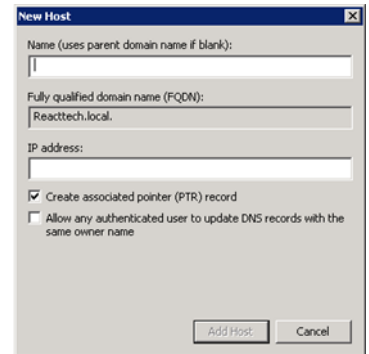
Ruckus Wireless, Inc.

880 West Maude Avenue, Suite 101, Sunnyvale, CA 94085 USA

(650) 265-4200 Ph \ (408) 738-2065 Fx



- 4) Enter "wpad" as the Name and enter the IP address of the IIS server or ZoneDirector Controller that will host the "wpad.dat" in the 'IP Address' box.
- 5) Windows 2008 DNS servers blacklist and block 'wpad' & 'ISATAP' entries by default, please open a 'Command Prompt' from the Windows 'Start' button and type:
`"dnscmd /config /enableglobalqueryblocklist 0"`



Note: This configuration needs to be performed on all DNS servers in your domain

Creating the "wpad.dat" file

The "wpad.dat" file is a text file containing script-like directives. The primary purpose of these directives is to tell the client browser which sites are accessed directly and which sites are accessed via the proxy server.

The "wpad.dat" file may be hosted on a customer's web server or the Ruckus ZoneDirector controller and the following sections detail both scenarios.

An example "wpad.dat" file structure along with some common directives is provided on the following page. This is not intended to be a full tutorial on wpad.dat creation - it is the responsibility of the partner or customer to ensure appropriate directives and syntax are used.

Ruckus Wireless, Inc.

880 West Maude Avenue, Suite 101, Sunnyvale, CA 94085 USA

(650) 265-4200 Ph \ (408) 738-2065 Fx



Sample "wpad.dat" file:

Create a text file named "wpad.dat" in an application such as "notepad" with the directives relevant to your environment.

The text below can be used as a template (// indicates comment line) – more examples are available by searching the Internet.

```
function FindProxyForURL(url, host)
{
// Connect to the ZD IP:192.168.0.13 without using the proxy server
// This entry must be included if using its Guest Access WLAN or Captive Web Portal
// Replace 192.168.0.13 with the IP address of your ZD controller.
    if (isInNet(host, "192.168.0.13", "255.255.255.255"))        return "DIRECT";

// Connect to "localhost" without using the proxy server
    if (isInNet(host, "127.0.0.1", "255.255.255.255"))          return "DIRECT";

// Connect to the specific host web server IP (i.e. intranet server) without using the proxy server
    if (isInNet(host, "10.10.10.117", "255.255.255.255"))        return "DIRECT";

// Connect to any servers in the domain "ruckuswireless.com" without using the proxy server
    if (shExpMatch(url, "*.xe.com/*"))                          return "DIRECT";

// Use the proxy 10.10.2.253:3128 if source is from 10.0.0.0/8
    if (isInNet(myIpAddress(), "10.0.0.0", "255.0.0.0")) return "PROXY 10.10.2.253:3128";

// If the protocol is ftp use the proxy server 10.10.2.253:3128
    if (shExpMatch(url, "ftp:*"))                                return "PROXY 10.10.2.253:3128";

// For all other connections use the proxy server "192.168.0.5" on port "8080".
    return "PROXY 192.168.0.5:8080";
}
```

Ruckus Wireless, Inc.

880 West Maude Avenue, Suite 101, Sunnyvale, CA 94085 USA

(650) 265-4200 Ph \ (408) 738-2065 Fx



Storing the “wpad.dat” file on a Microsoft Windows IIS Web Server

- 1) On the server that is performing the IIS web server role open Windows Explorer and navigate to the folder that stores the files for IIS root website; for a default installation this path is: “C:\Inetpub\wwwroot”
- 2) Copy and paste your “wpad.dat” file into this directory

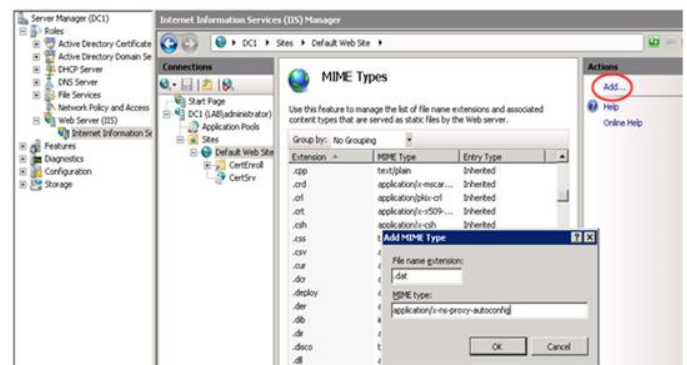
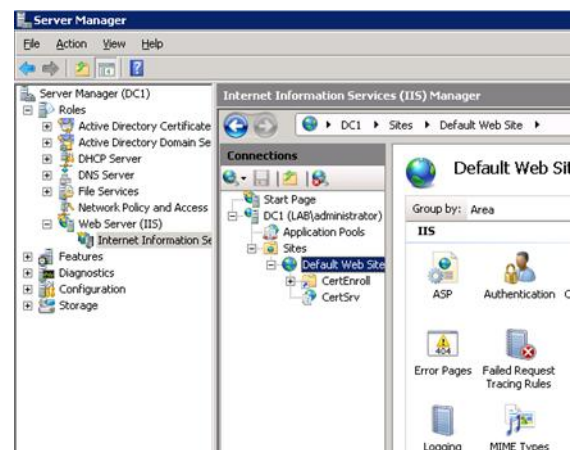
Note: Refer to Appendix B for an overview of installing Windows IIS Web Server 2008.

Configuring IIS Server for the correct MIME Type

By default, Windows IIS Server does not have a MIME type configured for “.dat” file extensions. Therefore this needs to be configured so that when a client browser requests your “wpad.dat” file, it is correctly classified as an “application/x-ns-proxy-autoconfig” type. The MIME type effectively tells the browser how to handle and process the “wpad.dat” file and may need to be configured on other external web server as well (the ZoneDirector is pre-configured for this MIME type).

- 1) Open ‘Server Manager’ on the IIS server.
- 2) Expand ‘Roles’ and then ‘Web Server (IIS)’.
- 3) Left-click ‘Internet Information Server’.
- 4) Expand the entry with your server name (“DC1” in this example) from the ‘Connections’ pane and expand ‘Sites’.
- 5) Left-click ‘Default Web Site’ (you may have renamed this if you are using an IIS server already deployed on your network).
- 6) Look for the icon towards the right-hand side of the screen that is labelled ‘MIME Types’ and double left-click over it.
- 7) Look towards the top-right of the ‘Server Manager’ window and click ‘Add...’
- 8) Enter “.dat” in the ‘File name Extension:’ box. Enter “application/x-ns-proxy-autoconfig” in the ‘MIME Type:’ box and then click ‘OK’.

Note: Refer to Appendix B for an overview of installing Windows IIS Web Server 2008.



Ruckus Wireless, Inc.

880 West Maude Avenue, Suite 101, Sunnyvale, CA 94085 USA

(650) 265-4200 Ph \ (408) 738-2065 Fx

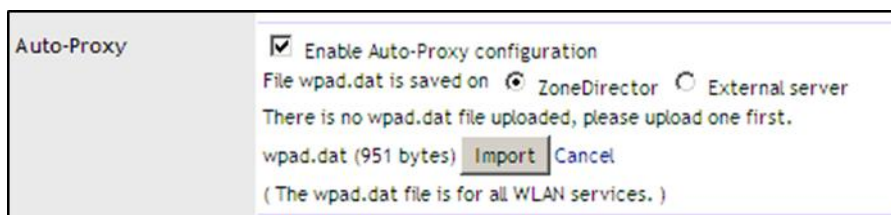


Enabling WPAD on the Ruckus ZoneDirector Controller

- 1) Connect to the ZD Controller's Admin Web Interface.
- 2) Open the Configuration context for the WLAN you wish to enable Auto-Proxy on and then click the "Advanced Options" link. Near the bottom of the Advanced Options page you will see a Tick Box to "Enable Auto-Proxy configuration" – click this tick-box to enable.
- 3) You will then be presented with 2 radio button options to either store the "wpad.dat" file on the ZD Controller itself (step 4); else reference it stored on an external web server (step 5).

Note: WPAD lookup references a single instance of "wpad.dat" so it is not possible to have different WLAN point to different "wpad.dat" files. If you wish to use different proxy servers for different URL then refer to the sample "wpad.dat" file in section "Creating the wpad.dat file"

- 4) If storing the "wpad.dat" file on the ZD Controller click the "ZoneDirector" radio button then perform the following 3 sub-steps; else if storing it on an external web server go to step 5:
 - a) Click "Choose File" to browse for your "wpad.dat" file
 - b) Click the "Import" button to upload it to the ZD controller as per screen shot below:



Auto-Proxy

☒ Enable Auto-Proxy configuration

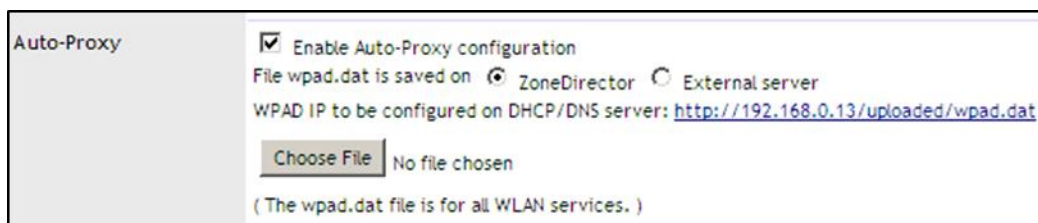
File wpad.dat is saved on ☒ ZoneDirector ☐ External server

There is no wpad.dat file uploaded, please upload one first.

wpad.dat (951 bytes)

(The wpad.dat file is for all WLAN services.)

- c) After your "wpad.dat" file is uploaded you need to make sure that your DNS and/or DHCP are configured to use the ZD's IP address as shown in the returned - see example screen shot below where the ZD IP is 192.168.0.13:



Auto-Proxy

☒ Enable Auto-Proxy configuration

File wpad.dat is saved on ☒ ZoneDirector ☐ External server

WPAD IP to be configured on DHCP/DNS server: <http://192.168.0.13/uploaded/wpad.dat>

No file chosen

(The wpad.dat file is for all WLAN services.)

Ruckus Wireless, Inc.

880 West Maude Avenue, Suite 101, Sunnyvale, CA 94085 USA

(650) 265-4200 Ph \ (408) 738-2065 Fx



- 5) If storing the "wpad.dat" file on an external web server then click the "External server" radio button and enter the external web servers IP address hosting your "wpad.dat" file as per the example in the following screen shot:

Auto-Proxy	☒ Enable Auto-Proxy configuration
	File wpad.dat is saved on ☐ ZoneDirector ☒ External server
	WPAD IP configured on DHCP/DNS server: 192.168.0.14
	(The WPAD IP is for all WLAN services.)

Configuring Access Control List (ACL) Policies on the ZD Controller

If you configure WPAD on a Guest Access WLAN or a standard WLAN with Client Isolation enabled you will need to modify the Access Control List (ACL) policies under Configure->Guest Access->Restricted Subnet Access to permit access to your non-transparent proxy server under the following condition:

- The proxy server is on the same IP subnet as the ZD controller, or any other private subnet that is blocked by the default ACLs (192.168.0.0/16, 10.0.0.0/8, 172.16.0.0/12)
- An example of permitting access to the proxy server on the same subnet as the ZD Controller is given in the screen shot below.
- The proxy server IP address is 192.168.0.5 which is on the same subnet as the ZD Controller and therefore access on any WLAN with Client Isolation enabled is blocked
- An "Allow" ACL has been added as rule number 1 which explicitly permits access to the proxy server for authorised WLAN clients.
- Also note that this rule specifies IP protocol type 6 and Port number 8080 to restrict access to only TCP traffic destined for IP address of 192.168.0.5 on port 8080.

Restricted Subnet Access							
Guest users are automatically blocked from the subnets to which ZoneDirector and its managed APs are connected. Note that guest access rules are prioritized in the order that they are listed (1 has highest priority).							
☐	Order	Description	Type	Destination Address	Application	Protocol	Destination Port Action
☐	1	Permit-Proxy Allow		192.168.0.5/32	Any	TCP (6)	8080 Edit Clone
☐	2		Deny	192.168.0.13/24	Any	Any	Edit Clone
☐	3		Deny	10.0.0.0/8	Any	Any	Edit Clone
☐	4		Deny	172.16.0.0/12	Any	Any	Edit Clone
☐	5		Deny	192.168.0.0/16	Any	Any	Edit Clone
Create New Advanced Options Delete							

Ruckus Wireless, Inc.

880 West Maude Avenue, Suite 101, Sunnyvale, CA 94085 USA

(650) 265-4200 Ph \ (408) 738-2065 Fx



Notes:

- 1) *You do not need to add an explicit "Allow" ACL on the ZD Controller to permit unauthenticated captive portal clients download the "wpad.dat" file hosted on either the ZD Controller or external web server. An internal rule is automatically added allowing unauthenticated WLAN client traffic to TCP port 80 of the respective host server IP address when Auto-Proxy is configured on the WLAN. This rule only allows access to the file "wpad.dat" and not all content at that location.*
- 2) *If you are using a standard WLAN without Client Isolation, but with L3/L4 ACLs configured under the context "Access Control" then ensure access is permitted to your proxy server using an explicit "Allow" ACL. As per comment in Note 1, you do not need to add an explicit "Allow" ACL on the ZD Controller to permit unauthenticated captive portal clients download the "wpad.dat" file hosted on either the ZD Controller or external web server.*
- 3) *If you have a firewall deployed in your network ensure that you have permit rule(s) to allow access to your proxy server and to the ZD or external web server hosting your "wpad.dat" file.*

Ruckus Wireless, Inc.

880 West Maude Avenue, Suite 101, Sunnyvale, CA 94085 USA

(650) 265-4200 Ph \ (408) 738-2065 Fx



3. Appendix A

Testing WPAD and Browser Compatibility / Troubleshooting

In order to test the WPAD configuration on a wireless computer:

1. Under Options->Proxy Settings ensure the Internet browser is set to "Automatically detect" settings (see below if unsure how to do this) and that manual proxy settings are not configured.
2. Close the browser and connect to the target WLAN.
3. Open the browser and attempt to access both internal and external websites to test different "wpad.dat" directives.

You do not need to disable the "Automatically detect" setting in the clients browser when they move to another location because if the browser fail's to find where "wpad.dat" is hosted, or cannot download it then it will not use proxy settings.

Unfortunately not all software manufacturers follow the "standards" so WPAD may not work on all devices that have browser software...

Enabling Auto-Proxy detection on Internet Explorer (Windows)

- 1) Open Internet Explorer.
- 2) Select 'Tools' from the application menu, click 'Internet Options'.
- 3) Click the 'Connections' tab and click the 'LAN settings' button.
- 4) Check 'Automatically detect settings', click 'OK'.

Enabling Auto-Proxy detection on Firefox (Windows)

- 1) Open Firefox.
- 2) Select 'Tools' from the application menu, click 'Options'.
- 3) Click the 'Advanced' section and click 'Settings' under 'Connection'.
- 4) Select 'Auto-detect proxy settings for this network', click 'OK'.

Enabling Auto-Proxy detection on Opera (Windows)

Opera does not currently support the WPAD protocol.

Ruckus Wireless, Inc.

880 West Maude Avenue, Suite 101, Sunnyvale, CA 94085 USA

(650) 265-4200 Ph \ (408) 738-2065 Fx



Enabling Auto-Proxy detection on Safari (Windows)

Safari utilizes the Windows proxy settings as used in Internet Explorer. Please follow the instructions for Internet Explorer.

Enabling Auto-Proxy detection on Google Chrome (Windows)

Like Safari, Chrome utilizes the Windows proxy settings as used in Internet Explorer. Please follow the instructions for Internet Explorer.

Enabling Auto-Proxy detection on Apple iPhone, iPad, iTouch

Go to Settings -> Wi-Fi -> connect to the appropriate WLAN -> click the WLAN options button -> at the bottom of the page set "HTTP Proxy" to "Auto" and enter the URL in the format:

- For ZD hosted "wpad.dat" <http://<ZD-IP or FQDN>/wpad.dat>
- For external server hosted "wpad.dat" <http://<web-server-IP or FQDN>/wpad.dat>

Enabling Auto-Proxy detection on Android based devices

As of time of writing this App Note, Android devices do not natively support network proxy configuration or auto detection via WPAD. Manual proxy configuration may be entered using a 3rd party Android App such as "ProxySetting" but this has not been tested.

Ruckus Wireless, Inc.

880 West Maude Avenue, Suite 101, Sunnyvale, CA 94085 USA

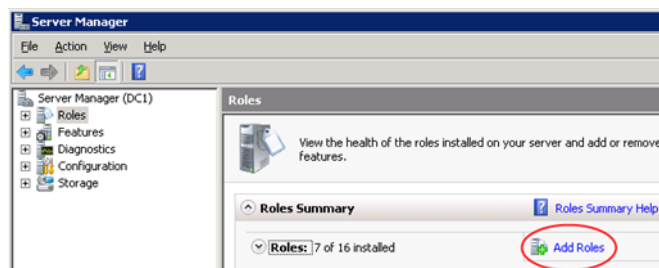
(650) 265-4200 Ph \ (408) 738-2065 Fx



4. Appendix B

Installing Internet Information Services (IIS)

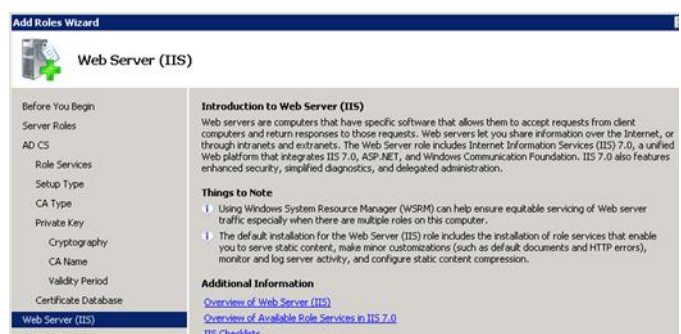
- 1) Log in to the Windows Server [Windows Server 2008 shown in this example] you have designated to receive the IIS Web Server role.
- 2) Open 'Server Manager' – the default shortcut is located immediately to the right of the 'Windows' start button on the taskbar. Whether deploying all roles to a single server or across multiple servers - most of the configuration tasks in this section of the document are performed within the 'Server Manager' application.
- 3) Left-click 'Roles' in the left-hand 'Server Manager' pane, then locate 'Add Roles' as circled in the screen shot below:



- 4) Locate 'Web Server IIS' in the servers' roles and add it to progress to the dialog box shown in the screen shot to the right:



- 5) Click 'Next' after viewing the 'Introduction to Web Server (IIS)'.



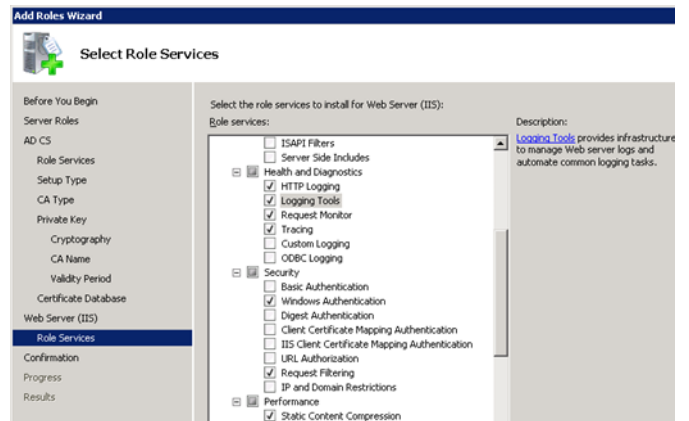
Ruckus Wireless, Inc.

880 West Maude Avenue, Suite 101, Sunnyvale, CA 94085 USA

(650) 265-4200 Ph \ (408) 738-2065 Fx



- 6) Click 'Next' to accept the default installation settings unless you wish to add any functionality to support another web application that you wish to run on this server. The default settings allow basic web page serving.



- 7) You will be prompted to confirm your selections before Windows completes the IIS installation.

Ruckus Wireless, Inc.

880 West Maude Avenue, Suite 101, Sunnyvale, CA 94085 USA

(650) 265-4200 Ph \ (408) 738-2065 Fx

