



HP JetAdvantage Connect Discovery Server

Technical Reference

Administrator's Guide

Copyright and License

© Copyright 2016 HP Development Company, L.P.

Reproduction, adaptation, or translation without prior written permission is prohibited, except as allowed under the copyright laws.

The information contained herein is subject to change without notice.

The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

Product Number: HPJETADVCONNECT
c04994953

Edition: 2, 7/2016

Table of Contents

1	Introduction	0
1.1	Purpose	0
1.2	Intended Audience.....	0
1.3	Reference Documents.....	0
2	Overview	2
3	Architecture	4
3.1	System Prerequisites.....	4
3.2	Supported Mobile Operating Systems.....	5
4	HP JAC Discovery Server Setup	6
4.1	Setup Summary.....	6
4.2	Preparing for Setup.....	6
4.3	Setup the new JAC Discovery Server.....	8
4.4	Setup a “Search Domain” to point to the DNS server	9
4.5	Create the printer Zones in DNS on the JAC Discovery Server	9
4.6	Add JAC “Delegation” to the DNS server	9
4.7	Add DNS-SD records to the DNS server	10
4.8	Configure the JAC Discovery Server	11
5	HP JAC Discovery Setup Utility.....	12
5.1	General Use.....	12
5.2	User Input & Default Behavior.....	13
5.2.1	Configuration File Settings	14
5.2.2	Command Line Options.....	16
5.3	Maintaining printer entries.....	21
6	Validate Configuration	22
6.1	Validate using iOS mobile device or Mac OS X PC	22
6.2	Validate using DNS-SD Tools	22
7	Setup Example	23
7.1	Example: Printer organization and Zone setup.....	23
7.2	Example: Setup the JAC Discovery Server.....	23
7.3	Example: Setup a “Search Domain” to point to the DNS server	24

7.3.1	Set VPN Search Domains.....	25
7.4	Example: Create the printer Zones in DNS on the JAC Discovery Server.....	26
7.5	Example: Add JAC “Delegation” to the DNS server.....	34
7.6	Example: Add DNS-SD Records to the DNS Server.....	39
7.6.1	Add DNS-SD Records to the DNS Server using the Microsoft DNS Manager.....	39
7.6.2	Add DNS-SD Records to the DNS Server using PowerShell.....	44
7.7	Example: Configure the JAC Discovery Server	45
7.7.1	Entering Printers	45
7.7.2	Removing printer entries	52
7.7.3	Loading DNS data files on the JAC Discovery Server.....	54
8	Appendix A – HP JAC Discovery Server Setup - Quick Reference	63
9	Appendix B – Notes on using BIND DNS (<i>named</i>) on OS X Server	64
10	Appendix C – Notes on Multi-site Configurations.	65
11	Appendix D - Troubleshooting	70
11.1	Display the DNS servers and search domains that are set (Mac OS X client only)	70
11.2	Troubleshooting using <i>dns-sd</i> command (Mac OS X and Windows)	70
11.2.1	Display a list of domains available for browsing.....	70
11.2.2	Display a list of printers (print services) for a zone.....	71
11.3	Verify correctness of DNS records for a zone	72
11.4	Verify printers	73
11.4.1	Verify that the Printer is online.....	73
11.4.2	Verify that the printer supports IPP.....	73

Figures and Tables

Figure 1 - Basic Architecture including HP JAC Server Components.....	4
Table 1 - Discovery Setup Utility Usage Scenarios.....	11
Table 2 - Discovery Setup Utility Execution Options.....	12

1 Introduction

1.1 Purpose

The purpose of this document is to provide a complete technical description of the HP JetAdvantage Connect Discovery Server, as well as the set of instructions to perform the necessary server setup.

1.2 Intended Audience

The intended audience for this document is system or IT administrators who are or will be administering the server elements for HP JetAdvantage Connect functionality. Typically, this includes people who are responsible for administering DNS servers within a particular organization or enterprise operation, and those who are responsible for administering networked printers within the end-user environment.

1.3 Reference Documents

Domain Name System (DNS)

https://en.wikipedia.org/wiki/Domain_Name_System

DNS Service Discovery (DNS-SD)

<http://www.dns-sd.org/>

RFC 6763 – DNS Based Service Discovery

<https://tools.ietf.org/html/rfc6763>

Extension mechanisms for DNS (EDNS0 – RFC 2671)

https://en.wikipedia.org/wiki/Extension_mechanisms_for_DNS

HP Managed Print Administrator – HP Printer Administrator Resource Kit

<http://h20331.www2.hp.com/Hpsub/cache/576122-0-0-225-121.html>

Bonjour Printing Specification

<https://developer.apple.com/bonjour/printing-specification/bonjourprinting-1.2.pdf>

2 Overview

The HP JetAdvantage Connect Discovery Server (JAC Discovery Server or simply Discovery Server) is a server configuration that is intended to provide support for mobile printing within an enterprise environment. The Discovery Server enables DNS Service Discovery (DNS-SD) such that mobile devices can discover printers or print servers within the enterprise environment, which may not be discoverable on the local subnet where the mobile device is connected. With this Discovery Server in place, mobile devices can easily discover the printers and print servers, and print using native discovery and print methods.

The Discovery Server works in conjunction with the existing DNS server (or servers) within the enterprise environment. Throughout this document, the terms “DNS Server” and “main DNS Server” will indicate the actual DNS server or servers that are used by mobile devices to provide name resolution.

The Discovery Server is necessary for discovery support for the HP JetAdvantage Connect Print Server, which will provide Pull-Printing and Policy-Printing capability for mobile device users. The HP JetAdvantage Connect system will work in conjunction with existing HP server resources, such as HP MPL Servers and HPAC.

A basic architectural requirement for implementation of the Discovery Server is to set up a new server within the enterprise environment. The Discovery Server will run a DNS service, and will be configured to implement DNS-SD. This server will be configured to respond to specific requests for DNS-SD printing services, and will respond with a list of printers available within the enterprise environment. The Discovery Server will receive requests from mobile devices via the main DNS server. In order to facilitate this, the main DNS server will need to be configured to “Delegate” specific requests to the Discovery Server.

“Delegation” is a standard DNS feature, and in this implementation, the DNS delegate will be configured to only forward requests to the Discovery Server for particular Search Domains. Only those requests that come to the main DNS server for the specific Search Domain(s) set up for printer discovery will be delegated to the Discovery Server.

The basic sequence of events for the printing operation occurs as follows:

1. The user connects their mobile device to the corporate network (either directly to a local wireless access point, or via a VPN).
2. The corporate network infrastructure provides the mobile device with basic networking information, including IP Address, subnet mask, and one or more Search Domains.
Note: If a Search Domain cannot be provided by the network infrastructure, end-users may have to manually enter the appropriate Search Domain within their client software. The HP Android client will provide manual entry for the Search Domain. Currently, iOS does not provide any way to enter a Search Domain when connecting via a VPN.
3. The user chooses to print, which causes a DNS-SD request to be sent from the mobile device to the DNS server. This request asks “*What print services are available for this Search Domain?*”
4. The DNS server will forward this request, based upon the delegation, to the Discovery Server.
5. The Discovery Server responds to the request, providing a list of printers to the mobile device.
6. The user chooses a printer, and the mobile client sends the print job to the selected printer.

Requests for domains that are handled or forwarded by the main DNS server (such as google.com or amazon.com, etc.) will never be forwarded to the Discovery Server, since the delegate for that server is specified for a specific Search Domain. If some misconfiguration of DNS has occurred that causes unplanned requests to be routed to the Discovery Server, the requests will be ignored, as the Discovery Server will only be configured to process DNS-SD print service requests.

If DNS-SD is already configured on the enterprise DNS server(s) to support other print services, but does not use the Search Domain(s) set up for JAC, requests for these services will be handled by the enterprise DNS server(s), and will not be forwarded to the Discovery Server. This will allow other print services (or other DNS-SD service offerings) to operate independently of HP's JAC implementation.

3 Architecture

The following diagram shows a basic network architecture that includes the HP JAC server components.

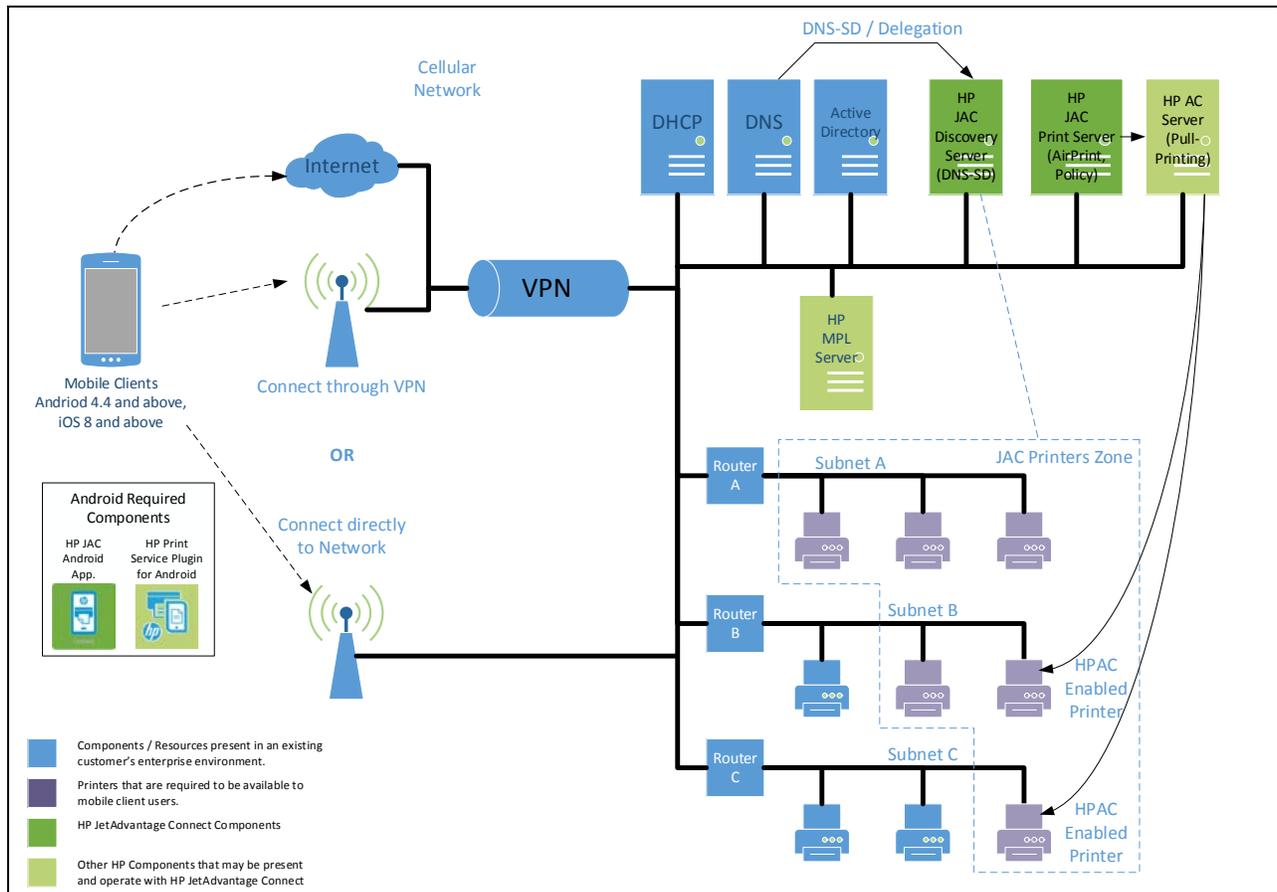


Figure 1 - Basic Architecture including HP JAC Server Components

3.1 System Prerequisites

The following items are considered prerequisite conditions that must be in place in order to setup the Discovery Server:

- Administrator access is required and administrators must have familiarity with the existing enterprise environment including DHCP, DNS, wireless network access, and any VPN that may be in use. This administrator must have appropriate privileges & permissions to make modifications to the settings/data for DHCP, DNS, and VPN.
- Acceptable to add additional servers to the customer’s network environment (either VM or bare-metal).
- Print Administrator familiar with customer’s existing printer fleet to be utilized for HP JAC.

- An environment that allows mobile devices to connect to the customer's network (either by connecting through a wireless access point, or through a VPN). This environment must provide the mobile device with access to DNS.
- The DNS Service being used must support EDNSO as fully described in rfc2671.

Recommended enterprise configuration items:

- Server OS: Windows 2012 R2
- DNS Service: Microsoft DNS
- VPN (if used): Cisco or Pulse – Configured to vend Search Domains to mobile devices.

3.2 Supported Mobile Operating Systems

- iOS 8 and newer.
- Android 4.4 and newer
 - Android devices will use in-OS print support with the HP Print Service Plugin and the HP Jet Advantage Connect Android application extension.
- Mac OS X 10.10 and newer.
Note: While not a “mobile” operation system, OS X is included here since it natively supports DNS-SD, and can be used as a troubleshooting and diagnostic platform.)

4 HP JAC Discovery Server Setup

The following section provides an explanation of the steps required to setup the Discovery Server. Later sections provide detailed examples of the setup steps.

If you are already familiar with DNS-SD and/or HP JAC, you may find it useful to go directly to [Appendix A – HP JAC Discovery Server Setup - Quick Reference](#)

4.1 Setup Summary

The Discovery Server is intended to work within established corporate IT environments, and will require minimal configuration of the main DHCP and DNS server infrastructures.

The following list outlines the high-level steps that will be required in order to integrate a Discovery Server:

1. Setup a new server to act as the Discovery Server.
2. Setup a “Search Domain” to point to the Discovery Server.
3. Add DNS-SD records to the DNS server, which point to JAC Printer zones.
4. Add a new “Delegation” to the DNS server to delegate all requests that reference the JAC printer zones to the Discovery Server.
5. Configure the Discovery Server to include records for all printers to be discoverable within the JAC system.

Each of these steps will be discussed in more detail below.

4.2 Preparing for Setup

Before starting out the setup process it will be good to do some prep work in organizing what printers will be included for mobile printing, and then designing the printer zones to be used within the JAC system.

Printers can be organized into different DNS “Zones”. Zones are simply an organizational methodology used by DNS. A zone may correspond to a particular physical site or building, or perhaps to a certain department or a group of users. The exact zone structure is up to the print administrator to decide. Regardless of how printers are organized, with the current implementation of iOS and Android client software, the user interface displayed on mobile devices will show a single list of available printers. Currently, there is no way for iOS or Android users to sort or filter using zones that are setup.

While not necessary, limiting the number of printer zones to a single zone will provide the simplest setup, by keeping to a minimum the number of records which need to be added to the main DNS server. If the number of printers being exposed by the Discovery Server is small (see below on the zone size limitations), or if the Discovery Server is only exposing one or more HP JetAdvantage Connect Print Servers, a single zone will be sufficient.

There is a technical limitation within DNS that will restrict the number of printers that can be returned using DNS-SD queries. This restriction limits the number of printers that can be organized into a zone to a maximum value. The following guideline has been established based upon empirical testing.

Guideline: Maximum number of printers per zone: 64

If the total number of printers exceeds this maximum value, you will be required to organize the printers into multiple zones.

A setup tool (called the HP JetAdvantage Connect Discovery Setup Utility or simply the Discovery Setup Utility) is used to configure the Discovery Server (in Step 5). Using this tool, it is possible to use one or more different methods to create DNS entries for the desired printers. Here is a list of the currently supported printer entry methods:

1. Bonjour discovered printers on the current subnet the tool is run on.
2. Printers managed via HP Managed Print Administrator
 - a. From MPL Server
 - b. Listed in MPL file
3. Manually added by IP address (or list of IP addresses).

Each of these methods can be performed such that the printers can be included into a specific DNS “zone”.

The preparatory steps to perform here include the following:

1. Determine which printers will be configured for use for JAC discovery.
2. Determine which entry method (or methods) will be used.
 - a. If an MPL server is to be used, obtain the address to that server.
 - b. If an MPL file is to be used, obtain that file.
 - c. If all printers on a given subnet are to be included, identify that subnet.
 - d. If individual printers are to be manually added, obtain the IP address for each printer.
 - i. Note: Printers can be added by IP address in bulk by providing a text file containing the list of IP addresses (one address per line).
3. Decide upon the name for JAC printer zone(s).

Recommended: `hpprinters.<domain name>`

Note: All printers must be connected to the network and powered on prior to starting Discovery Server configuration.

The configuration of the Discovery Server will need to be updated if/when the IP addresses or the printers change. It is highly recommended that Printer administrators use DHCP reservations for the printers, which insures that the printer’s will keep the same IP addresses. This will reduce this level of required maintenance of the Discovery Server.

4.3 Setup the new JAC Discovery Server

A new server must be added to the existing environment in order to host the Discovery Server functionality. This server may be a virtual machine, or a physical bare-metal server. This server must run some implementation of DNS, in order to implement DNS-SD.

The Setup of the Discovery Server will include:

1. Setup of the Operating System
2. Installing of the DNS service (if a non-native DNS service is to be used)
3. Add the server to the network environment, including DNS domain.

The recommended Server OS for the Discovery Server is Windows Server 2012 R2, and Microsoft DNS (available in Windows Server 2012 R2) is the recommended DNS implementation.

The JAC Discovery Setup Utility will need to run on the Discovery Server, and will generate DNS data files.

The Discovery Setup Utility supports the following Server Operating Systems:

- Windows Server 2012 R2 (Recommended)
- OS X 10.11 – Server 5.0
 - Mono (Cross-Platform .Net Framework) for OS X must be installed (<http://www.mono-project.com/>).
- Linux
 - Mono for Linux must be installed.

The Discovery Setup Utility generates DNS data files which are compatible with the following DNS implementations:

- Microsoft DNS (Recommended)
- BIND (named) on OS X
- BIND on Windows

4.4 Setup a “Search Domain” to point to the DNS server

When mobile devices connect to a company’s enterprise network infrastructure, it is necessary that the client is provided with a “Search Domain” that references the DNS server. This is necessary so that the client can initiate DNS-SD queries during the discovery process. The value of the necessary “Search Domain” is the fully qualified server name where the DNS service is running.

There are several ways that a “Search Domain” can be supplied, and some are dependent upon how mobile devices are connected to the network (directly vs. VPN), and which VPN is being used.

If mobile device users are to connect to the network directly through a local wireless access point, one or more of the following methods can be used to specify the appropriate “Search Domain”:

1. DHCP Scope Option 15.
2. DHCP Scope Option 119.
 - This option is appropriate only if iOS mobile devices are to be used. Android does not support DHCP Scope Option 119.

Please consult the documentation for your particular DHCP server for details on setting these options.

Example(s) of configuring Scope Options for DHCP servers are provided in a later section of this document.

If mobile device users are to connect to the network through a VPN, please consult the documentation for your particular VPN to determine if and how “Search Domains” can be configured, and follow the procedure indicated. Example(s) of configuring various VPNs are provided in a later section of this document.

4.5 Create the printer Zones in DNS on the JAC Discovery Server

The printer zones need to be initially created on the Discovery Server before further configuration can take place. Initially, these zones will be empty, but will be populated with printer DNS-SD records in a later setup step.

4.6 Add JAC “Delegation” to the DNS server

The main DNS server needs to be set up to delegate all DNS queries for the JAC printer zones to the Discovery Server. Delegation involves associating a specific name space (which corresponds to the name of the JAC printer zones) with a specific server name. This is done by creating a DNS NS record.

If multiple JAC printer zones are defined, then multiple Delegation records must be added to point to the Discovery Server.

Example(s) of Delegation records are provided in a later section of this document.

4.7 Add DNS-SD records to the DNS server

DNS-SD requires that specific PTR records be setup within DNS to enable *Domain Enumeration queries*.

The PTR records need to be setup to respond to the following query strings:

```
b._dns-sd._udp.<domain name>  
db._dns-sd._udp.<domain name>  
r._dns-sd._udp.<domain name>  
dr._dns-sd._udp.<domain name>  
lb._dns-sd._udp.<domain name>
```

The records need to point to the fully qualified name of the JAC printer zone. If multiple JAC printer zones are defined, then multiple sets of DNS-SD PTR records must be added to point to each of the defined printer zones.

4.8 Configure the JAC Discovery Server

Configuring the Discovery Server involves running the Discovery Setup Utility on the Discovery Server, and perhaps running it on other clients within the enterprise environment. The Discovery Setup Utility will create one or more DNS data files which contain all of the DNS records necessary for DNS-SD discovery of the desired printers. The DNS data files then need to be loaded into the DNS service running on the Discovery Server.

Depending upon the printer entry methods determined in the preparatory steps above, the Discovery Setup Utility will need to be run according to Table 1 below.

Table 1 - Discovery Setup Utility Usage Scenarios

	Printer entry	Input Needed	Utility run on:
1	MPL file from MPL Server	MPL Server address	Discovery Server
2	Local MPL File	MPL File name	Discovery Server
3	Individual printer	Printer IP address	Discovery Server
4	List of printers	Text file containing IP addresses	Discovery Server
5	Bonjour discovery (for printers on the local subnet where the Discovery Server is connected)	<none required>	Discovery Server
6	Bonjour discovery [on different subnet(s)]	<none required>	Client PC connected to the desired subnet. DNS data files must get transferred to Discovery Server

With each invocation of the Discovery Setup Utility, it is possible to specify a zone name. If a zone name is not provided, a default zone name will be used. If the same zone name is used as what was used on a previous invocation of the Discovery Setup Utility, the printers will be added to the existing set of printers for that zone. If a different zone name is used from what was used on any previous invocation of the Discovery Setup Utility, a new DNS zone data files will be created.

If the setup involves performing Bonjour (mDNS) discovery on subnets different from that which the Discovery Server is on (Row 6 in Table 1 above), consideration must be given as to what zone(s) the discovered printers are going to reside. It is possible that the printers on each subnet may be entered in their own zone, or they could all be entered into a single zone, or any other zone organization desired.

If it is desired that Bonjour discovered printers (on different subnets) are to be added to the same zone as printers entered through other means, it is recommended that the Bonjour discovery entry steps be performed before the other printer entry steps, so that the DNS data files can be more easily combined.

Details concerning the operation of the Discovery Setup Utility for each of the above mentioned printer entry methods will be discussed in later sections of this document.

5 HP JAC Discovery Setup Utility

5.1 General Use

The HP JAC Discovery Setup Utility (Discovery Setup Utility) is a command line based tool, and is intended to be run with administrator privileges. The Discovery Setup Utility runs natively on Windows Server 2012 R2, or any Windows system with .Net v4.5 installed. The HP Setup Utility can be run on Mac OS X using the Mono framework.

The Discovery Setup Utility is packaged in a ZIP file, and must be extracted to a directory on the machine where the utility is going to be run. You should place the Discovery Setup Utility in a well-known location, as it may be necessary to re-run the utility for maintenance purposes.

Note: The recommended extraction tool for ZIP files is 7-Zip (<http://www.7-zip.org/>). The reason for recommending 7-Zip is that it has been observed that the native Windows functionality for extracting zip files occasionally causes corruption of the contents of the zip file.

The Discovery Setup Utility has the following name:

`HP.jacdiscsetup.exe`

The Discovery Setup Utility generates DNS data files that must be imported into the DNS service that is running on the Discovery Server.

When running the Discovery Setup Utility, it is required to provide an option on the command line. The descriptions of the supported options are listed in the table below.

Table 2 - Discovery Setup Utility Execution Options

Option	Description
run	Add printers by running all enabled discovery methods.
addprinters	Adds specific printers (from a list or individually).
removeprinters	Remove specific printers (from a list or individually).
help	Display more information on a specific command.
version	Display version information.

5.2 User Input & Default Behavior

User input can be provided for each of the options either by editing certain settings in a configuration file, or by providing additional parameters on the command line.

If no command line options are provided, and if no changes are made to the default configuration file, the Discovery Setup Utility will perform the following steps:

1. The default DNS zone name will be:
`hpprinters.<domain of computer the utility is run on>`
2. DNS-SD records will be created for the zone.
3. Bonjour (mDNS) discovery will be used to discover printers on the local network. SRV, PTR, TXT, and A/AAAA records will be created for each printer discovered. The utility will perform IPP queries with the printers to obtain required data to fill out the TXT records.
4. The output files from the utility will be placed in the directory:
`<Utility directory>\output\`

This directory will contain the DNS data files, and other files used by the Discovery Setup Utility.

The DNS output file will be named as follows:

When run on Windows:

`<zone name>.dns`

When run on Linux/Mac OS X:

`<zone name>.txt`

5.2.1 Configuration File Settings

The name of the configuration file for the Discovery Setup Utility is:

```
HP.jacdiscsetup.exe.config
```

This configuration file is in XML format, and contains multiple configuration items which may be edited to fit the run-time needs of setting up the JAC environment. These configuration items are utilized when overriding command line options are not provided.

Details concerning the available configuration settings are listed below.

5.2.1.1 *Setting: BonjourDiscovery*

Description: Boolean value to enable printer entry from Bonjour (mDNS) discovery.

Default value: True

XML Example: `<add key="BonjourDiscovery" value="true" />`

5.2.1.2 *MplDiscovery*

Description: Boolean value to enable printer entry from an MPL server / file.

Default value: True

XML Example: `<add key="MplDiscovery" value="true" />`

Note: Additional MPL configuration items are required for MplDiscovery to be successful. See below.

5.2.1.3 *MplFilePath*

Description: String value with the fully qualified file path to a local MPL File on the computer where the utility is being run.

Default value: Commented out.

XML Example: `<add key="MplFilePath" value="c:\JAC\MPLFiles\Zone03MPL.xml" />`

Note: This item must be uncommented for MPL Discovery to use this value. The value must point to a valid MPL XML file.

5.2.1.4 *MplServerUrl*

Description: String value containing fully qualified file path to a local MPL File on the computer where the utility is being run.

Default value: Commented out.

XML Example:

```
<add key="MplServerUrl" value="http://mplserver.hp.com/hmpa/hmpml/?mplId=3"/>
```

Note: This item must be uncommented for MPL Discovery to use this value. The value must reference a valid MPL server, and point to a valid MPL XML file on that server.

5.2.1.5 *DnsFilePath*

Description: String value containing the path to a directory where the DNS Data Files will be written to or read from.

Default value: `<App directory>\output\`

XML Example: `<add key="DnsFilePath" value="c:\JAC\DiscoveryServer\DnsDataFiles" />`

Note: The default output directory is called "output" and is relative to the directory on the computer where the utility is being run. The DNS Data files (named *.dns) will need to be loaded into the DNS service running on the Discovery Server.

5.2.1.6 *PrinterDataFilePath*

Description: String value containing the path to a directory where JAC Printer Data Files will be written to and read from (on subsequent runs of the utility).

Default value: <App directory>\output\

XML Example:

```
<add key="PrinterDataFilePath" value="c:\JAC\DiscoveryServer\PrinterDataFiles" />
```

Note: The default output directory is called "output" and is relative to the directory on the computer where the utility is being run. The Discovery Setup Utility uses files in this directory to manage the printer inventory that is being presented via DNS-SD. Care should be taken to not modify the files in this directory, and to use this directory consistently on each execution of the Discovery Setup Utility. The files in this directory should only be deleted if it is necessary to completely refresh the list of printers to be presented by the Discovery Server.

5.2.1.7 *DnsZoneName*

Description: String value containing fully qualified zone name where the added printers are to be included. This name corresponds directly to a specific DNS Data file created for the zone.

Default value: hpprinters.<domain of computer where the utility is being run>

XML Example:

```
<add key="DnsZoneName" value="hpprinters.hpitest.com" />
```

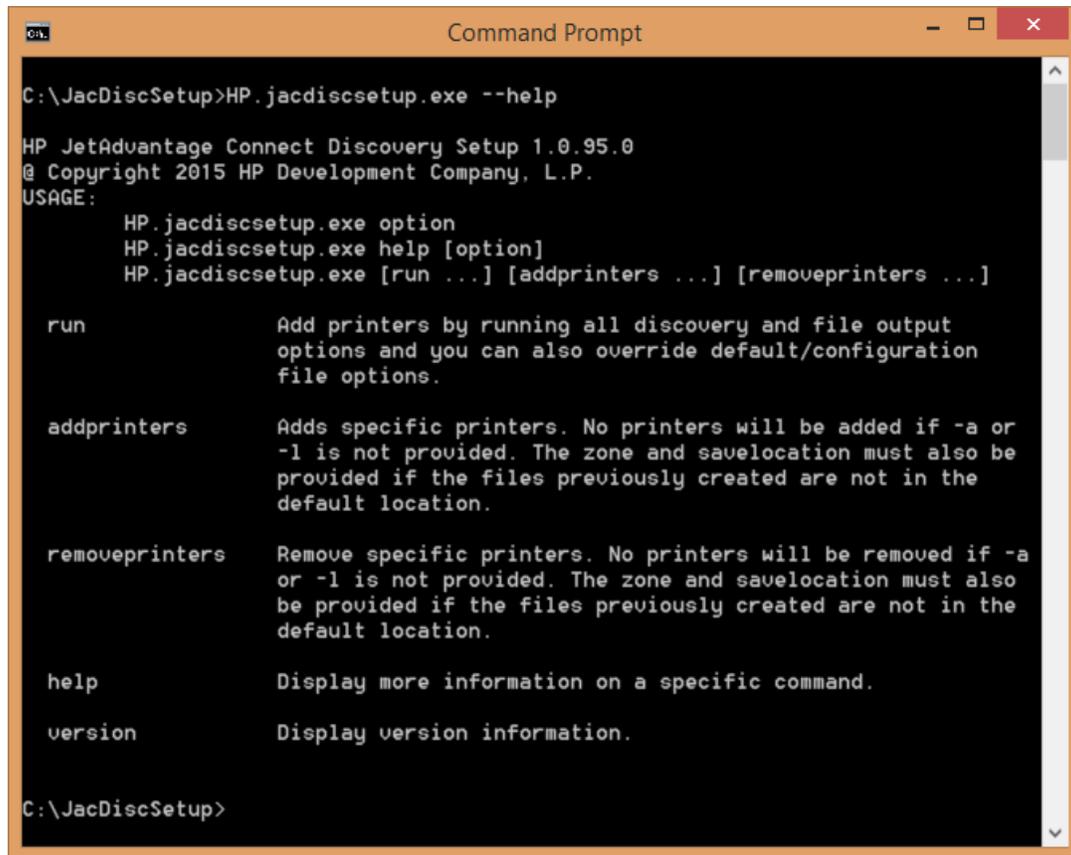
The following configuration settings are provided for future use, and should not be modified:

5.2.1.8 *DnsOutput*

Default value: <add key="DnsOutput" value="true" />

5.2.2 Command Line Options

The command line help text (which includes a listing of the main options) is shown below.



```
C:\JacDiscSetup>HP.jacdiscsetup.exe --help
HP JetAdvantage Connect Discovery Setup 1.0.95.0
@ Copyright 2015 HP Development Company, L.P.
USAGE:
  HP.jacdiscsetup.exe option
  HP.jacdiscsetup.exe help [option]
  HP.jacdiscsetup.exe [run ...] [addprinters ...] [removeprinters ...]

run          Add printers by running all discovery and file output
             options and you can also override default/configuration
             file options.

addprinters  Adds specific printers. No printers will be added if -a or
             -l is not provided. The zone and savelocation must also be
             provided if the files previously created are not in the
             default location.

removeprinters Remove specific printers. No printers will be removed if -a
             or -l is not provided. The zone and savelocation must also
             be provided if the files previously created are not in the
             default location.

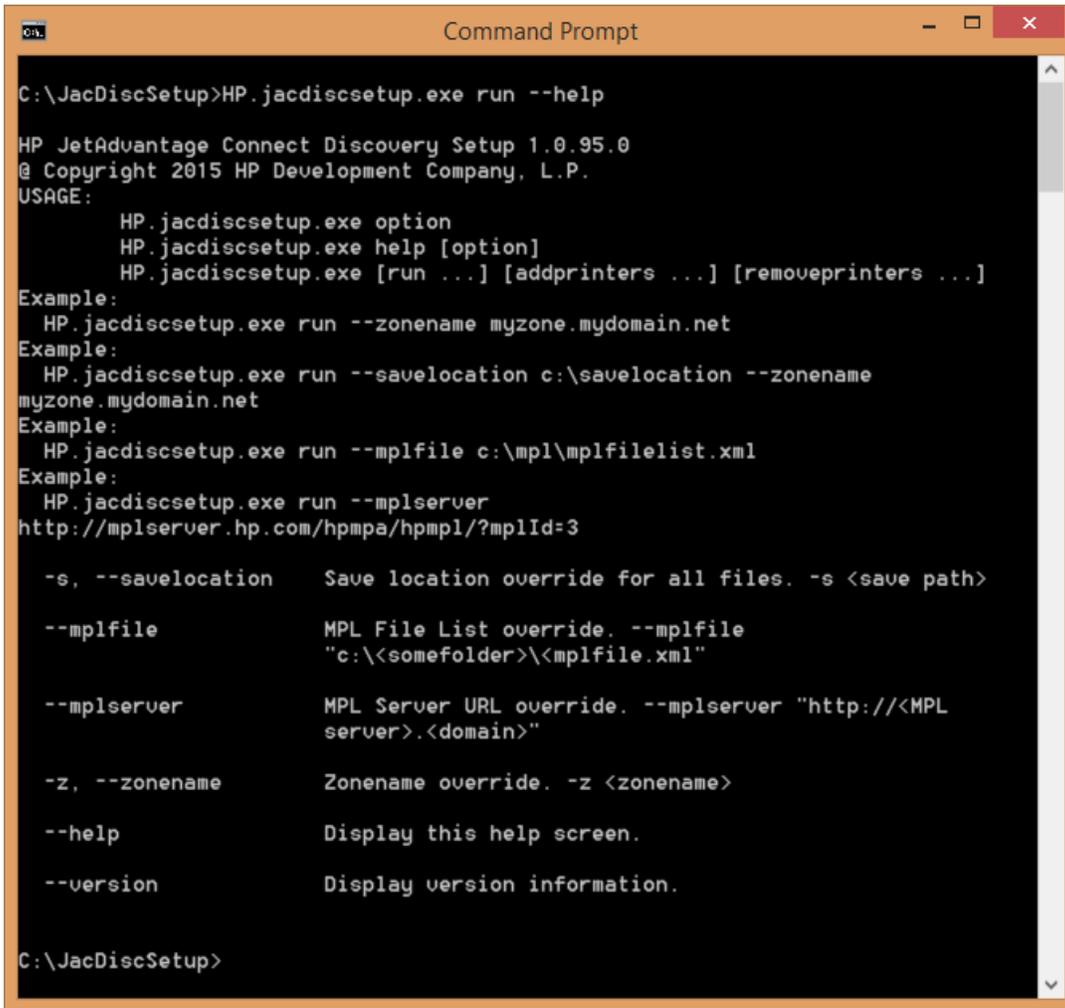
help         Display more information on a specific command.

version      Display version information.

C:\JacDiscSetup>
```

Command line help text for each of the main options is also provided.

Command line help text for the “run” option is shown below.



```
C:\JacDiscSetup>HP.jacdiscsetup.exe run --help

HP JetAdvantage Connect Discovery Setup 1.0.95.0
@ Copyright 2015 HP Development Company, L.P.
USAGE:
    HP.jacdiscsetup.exe option
    HP.jacdiscsetup.exe help [option]
    HP.jacdiscsetup.exe [run ...] [addprinters ...] [removeprinters ...]
Example:
    HP.jacdiscsetup.exe run --zonename myzone.mydomain.net
Example:
    HP.jacdiscsetup.exe run --savelocation c:\savelocation --zonename
myzone.mydomain.net
Example:
    HP.jacdiscsetup.exe run --mplfile c:\mpl\mplfilelist.xml
Example:
    HP.jacdiscsetup.exe run --mplserver
http://mplserver.hp.com/hmpa/hmpml/?mplId=3

-s, --savelocation    Save location override for all files. -s <save path>

--mplfile             MPL File List override. --mplfile
                    "c:\<somefolder>\<mplfile.xml"

--mplserver           MPL Server URL override. --mplserver "http://<MPL
server>.<domain>"

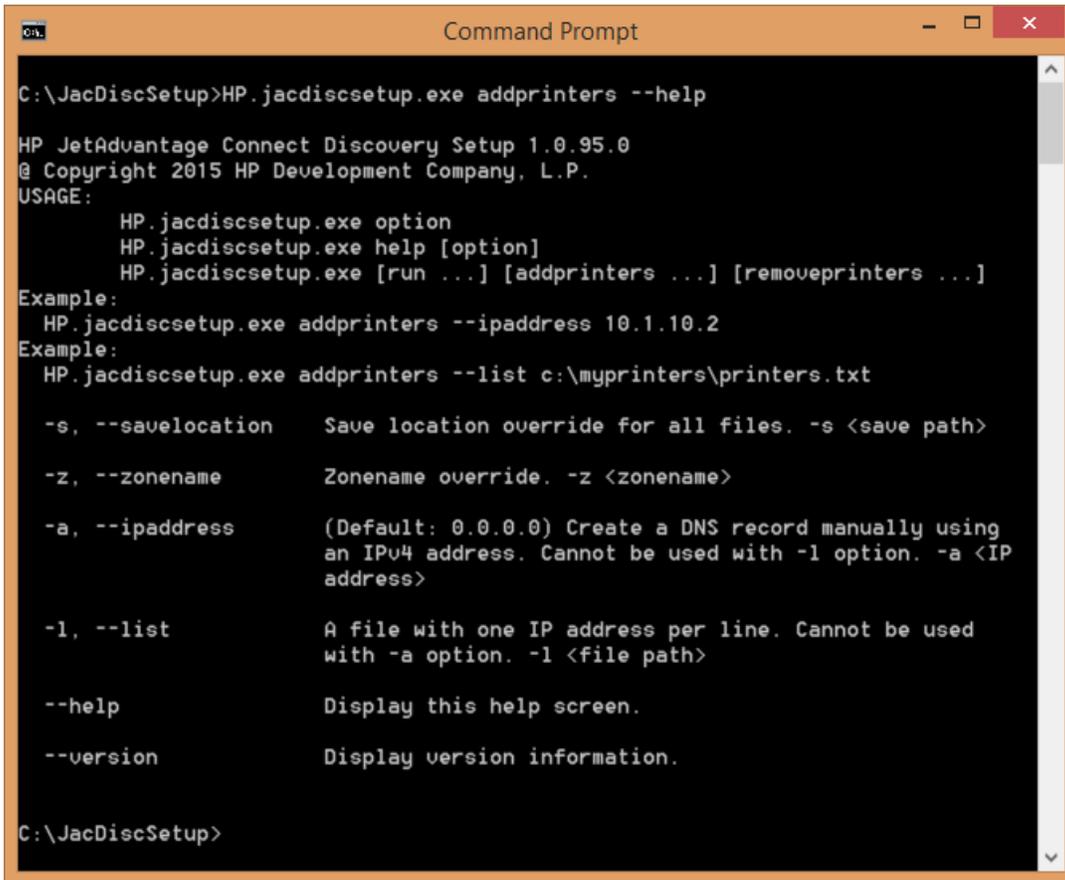
-z, --zonename        Zonename override. -z <zonename>

--help               Display this help screen.

--version             Display version information.

C:\JacDiscSetup>
```

Command line help text for the “addprinters” option is shown below.



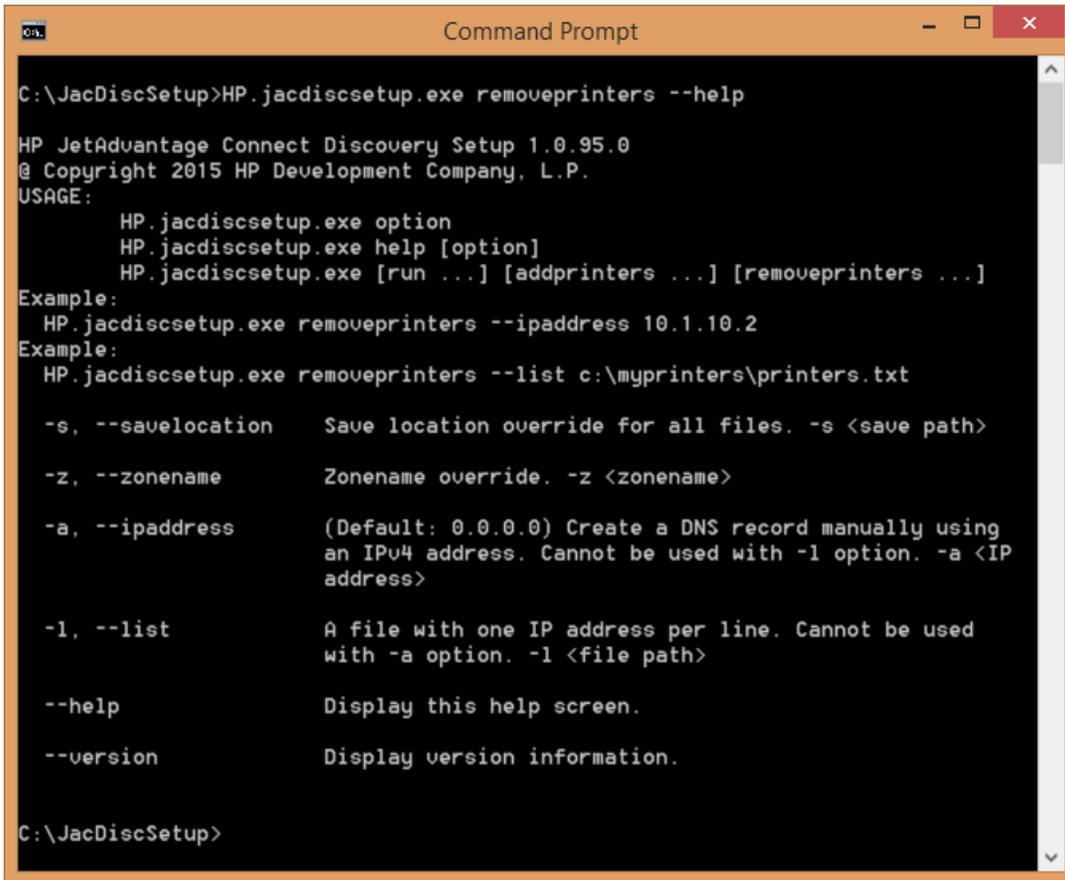
```
C:\JacDiscSetup>HP.jacdiscsetup.exe addprinters --help

HP JetAdvantage Connect Discovery Setup 1.0.95.0
@ Copyright 2015 HP Development Company, L.P.
USAGE:
    HP.jacdiscsetup.exe option
    HP.jacdiscsetup.exe help [option]
    HP.jacdiscsetup.exe [run ...] [addprinters ...] [removeprinters ...]
Example:
    HP.jacdiscsetup.exe addprinters --ipaddress 10.1.10.2
Example:
    HP.jacdiscsetup.exe addprinters --list c:\myprinters\printers.txt

-s, --save location      Save location override for all files. -s <save path>
-z, --zone name         Zonename override. -z <zonename>
-a, --ip address       (Default: 0.0.0.0) Create a DNS record manually using
                        an IPv4 address. Cannot be used with -l option. -a <IP
                        address>
-l, --list              A file with one IP address per line. Cannot be used
                        with -a option. -l <file path>
--help                 Display this help screen.
--version              Display version information.

C:\JacDiscSetup>
```

Command line help text for the “removeprinters” option is shown below.



```
C:\JacDiscSetup>HP.jacdiscsetup.exe removeprinters --help

HP JetAdvantage Connect Discovery Setup 1.0.95.0
@ Copyright 2015 HP Development Company, L.P.
USAGE:
    HP.jacdiscsetup.exe option
    HP.jacdiscsetup.exe help [option]
    HP.jacdiscsetup.exe [run ...] [addprinters ...] [removeprinters ...]
Example:
    HP.jacdiscsetup.exe removeprinters --ipaddress 10.1.10.2
Example:
    HP.jacdiscsetup.exe removeprinters --list c:\myprinters\printers.txt

-s, --save location      Save location override for all files. -s <save path>
-z, --zone name         Zonename override. -z <zonename>
-a, --ip address       (Default: 0.0.0.0) Create a DNS record manually using
                        an IPv4 address. Cannot be used with -l option. -a <IP
                        address>
-l, --list              A file with one IP address per line. Cannot be used
                        with -a option. -l <file path>
--help                 Display this help screen.
--version              Display version information.

C:\JacDiscSetup>
```

Detailed descriptions of the all the command line parameters are listed below.

5.2.2.1 *Save Location (-s, --savelocation)*

Providing this parameter overrides both the `DnsFilePath` and the `PrinterDataFilePath` configuration file entries, or their respective default values.

This parameter is valid for the `run`, `addprinters`, and `removeprinters` options. When performing updates to existing DNS data files, this option must be included if the save location is different from the default. See Section 5.3 below.

5.2.2.2 *Zone name (-z, --zonename)*

Providing this parameter overrides the `DnsZoneName` configuration file entry, or its default value (if the configuration entry is not present).

This parameter is valid for the `run`, `addprinters`, and `removeprinters` options.

5.2.2.3 *MPL File (--mplfile)*

This parameter is valid only for the `run` option, and will only take effect if the `MplDiscovery` configuration file entry is set to `true`.

Providing this parameter overrides the `MplFilePath` configuration file entry, or its default value (if the configuration entry is not present).

5.2.2.4 *MPL Server (--mplserver)*

This parameter is valid only for the `run` option, and will only take effect if the `MplDiscovery` configuration file entry is set to `true`.

Providing this parameter overrides the `MplServerUrl` configuration file entry, or its default value (if the configuration entry is not present).

5.2.2.5 *Printer IP Address (-a, --ipaddress)*

This parameter is valid only for the `addprinters`, and `removeprinters` options.

Providing this option causes DNS records to be added to the specified (or default) zone for the printer located at the specified IP address. If the printer is offline, or if the IP address is invalid, no DNS records are added. This option may not be used with the “Printer List” option.

5.2.2.6 *Printer List (-l, --list)*

This parameter is valid only for the `addprinters`, and `removeprinters` options.

Providing this option causes DNS records to be added to the specified (or default) zone for the printers listed in specified input text file. The input text file is to include one or more IP addresses, with each IP address on a separate line in the file. If a printer is offline, or if an IP address is invalid, no DNS records are added for that printer. This option may not be used with the “Printer IP Address” option.

5.2.2.7 *Help (--help)*

Shows the available command line parameters for a given option.

This parameter is valid for the `run`, `addprinters`, and `removeprinters` options.

5.2.2.8 *Version (--version)*

Shows the current version of the setup utility.

This parameter is valid for the `run`, `addprinters`, and `removeprinters` options.

5.3 Maintaining printer entries

The Discovery Setup Utility will need to be re-run when adding/removing printers, such that the printer records on the DNS-SD server accurately reflect the printers that are available and that are to be presented by the Discovery Server. It is important when re-running the Discovery Setup Utility that you run it from the same directory where it was previously run, or to run it with the same “`savelocation`” parameter value. This is critical since the Discovery Setup Utility uses data files to manage the list of printers which are located in specific directories.

If it is necessary to totally refresh the list of printers presented by the Discovery Server, you must first clear the printer data by deleting the data files that the Discovery Setup Utility uses. By default, these files will be located in the “`output`” directory relative to the location of where the utility was run. The path to this location will be different if the `PrinterDataFilePath` configuration item was changed in the configuration file, or if the “`savelocation`” parameter was provided on the command line.

To clear the list of printers, delete the following files from the Discovery Setup Utility’s `PrinterDataFilePath` location:

- `*.dns`
- `*.json`

6 Validate Configuration

After all of the server setup steps have been completed, you can validate that the printers are now able to be discovered by clients that support DNS-SD.

If the steps below fail and you are unable to validate that the server configuration is correct, refer to [Appendix E- Troubleshooting](#) section of this document.

6.1 Validate using iOS mobile device or Mac OS X PC

Since iOS and Mac OS X natively support DNS-SD, it is possible to use either platform to validate that the server configuration is operational.

1. Connect an iOS device to the customer network. This can be performed by either connecting directly to the customer's Wifi network, or connecting through a VPN.
2. Select a file/document to print.
3. Choose "Select a printer".
4. Verify that all of the appropriate printers are available to be selected.

A similar process can be followed using a Mac OS X PC.

6.2 Validate using DNS-SD Tools

There is a command line tool called `dns-sd`, which is available for both Windows and Mac OS X systems. This tool can be used to validate that printers are able to be discovered. Details concerning this tool are discussed in [Appendix E - Troubleshooting using dns-sd command \(Mac OS X and Windows\)](#).

Specifically see section [11.2.2: Display a list of printers \(print services\) for a zone](#)

7 Setup Example

The following example will show the steps involved in setting up and configuring a specific instance of the Discovery Server. This example will utilize Microsoft Windows Server 2012 R2 and the associated management tools provided within the OS. Where appropriate, screen shots are provided.

This example will walk through the process of setting up the Discovery Server within an established environment. The domain used for this example is named:

```
ems2.hpitest.com
```

7.1 Example: Printer organization and Zone setup.

For this example, the following value will be used for the JAC Printers zone:

```
hpprinters.ems2.hpitest.com
```

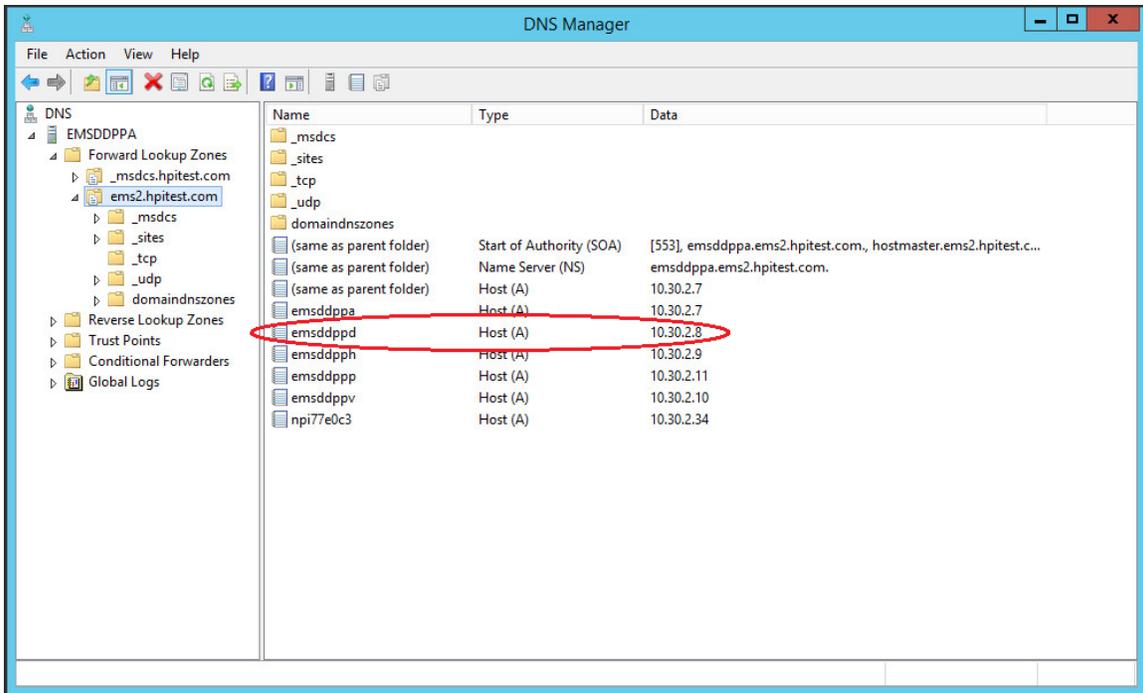
(Note that domain/zone names are case insensitive on Windows Server 2012 R2.)

7.2 Example: Setup the JAC Discovery Server

This example assumes that a new server VM (to host the Discovery Server functionality) has been added to an existing environment as follows:

Server Name:	emsddppd
Server IP address:	10.30.2.8
Server OS:	Windows Server 2012 R2
Domain Name:	ems2.hpitest.com
DNS Service on Server:	Microsoft DNS

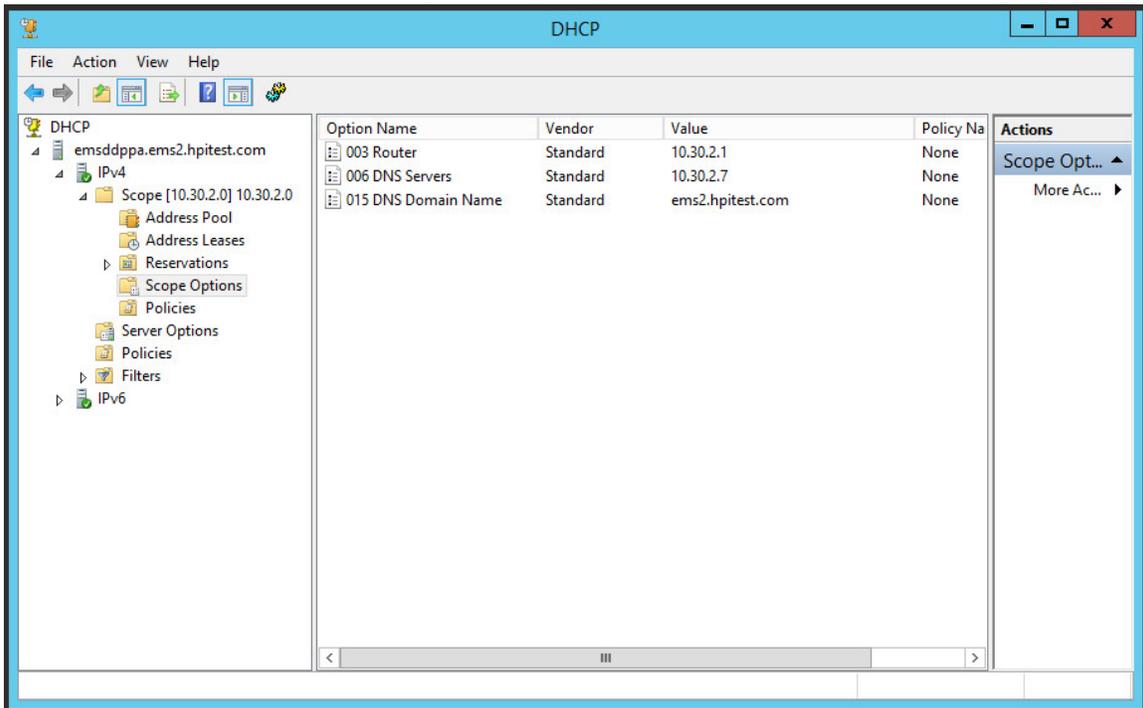
The following screenshot shows the Discovery Server added to the DNS server:



7.3 Example: Setup a “Search Domain” to point to the DNS server

Since, for the purposes of this example, Windows Server is being used, setting DHCP Scope Option 15 is the appropriate way to set the “Search Domain”.

The following screen shot shows the domain name set in the Scope Option 15 setting.



7.3.1 Set VPN Search Domains

If mobile devices are to connect to the enterprise network via a VPN, it is mandatory that the VPN in use be configured to vended out the necessary search domain. The specific configuration necessary for each VPN will be dependent upon the VPN in use, and possibly on the enterprise environment.

7.3.1.1 Supported (Tested and Verified) VPNs

The following VPNs have been tested, and settings have been established that allow for vending of search domains. These VPNs are regarded as supported.

- Cisco
- Pulse

For more information of the configuration steps necessary for each of the above VPNs, refer the following whitepapers:

- [Configure the search domain settings for Cisco VPN using the Discovery Server](#)
- [Configure the search domain settings for Pulse VPN using the Discovery Server](#)

7.3.1.2 Unsupported VPNs

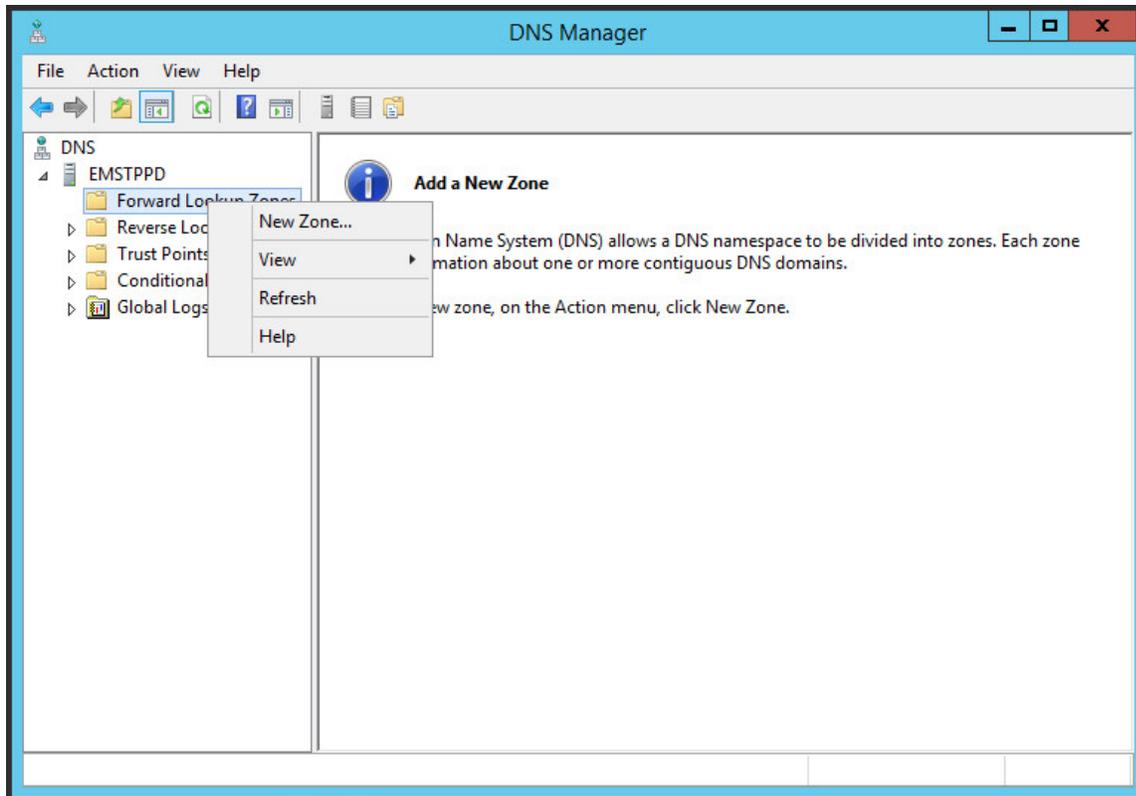
The following VPNs have been tested and have been found to not allow configuration that will provide a Search Domain to mobile clients (iOS and Android). These VPNs are viewed as unsupported.

- Microsoft VPN

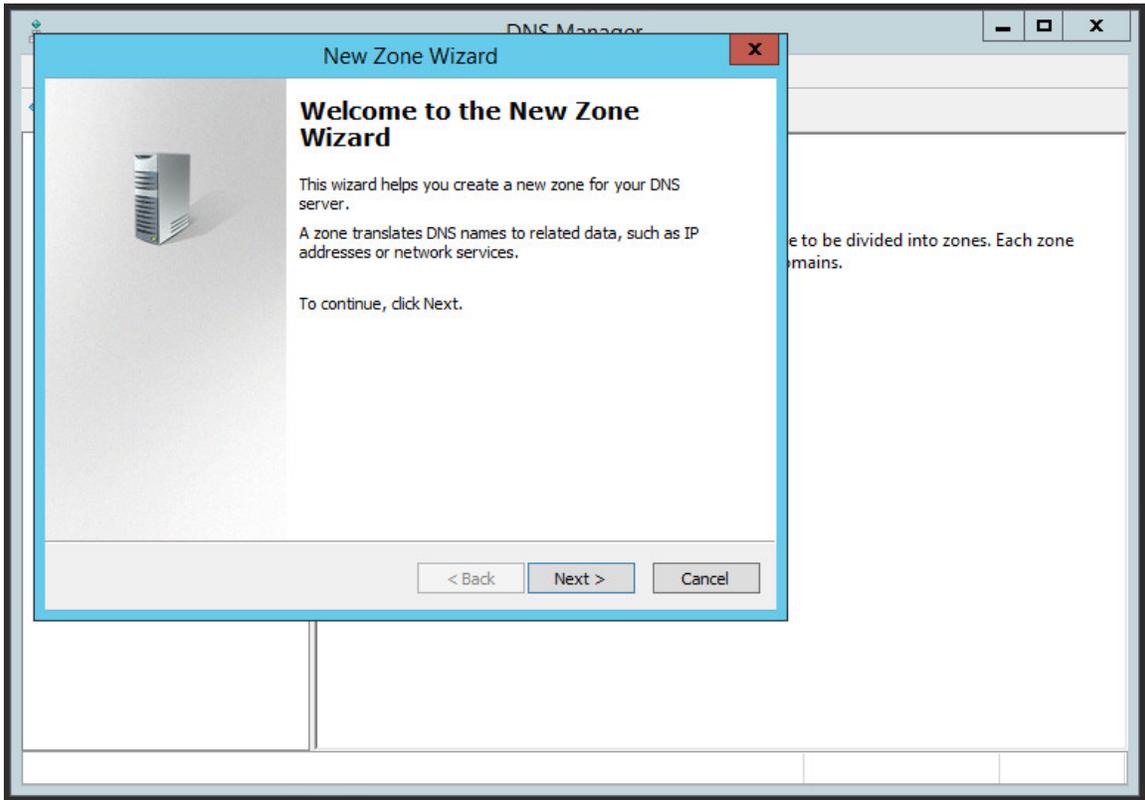
7.4 Example: Create the printer Zones in DNS on the JAC Discovery Server

The following example shows how to create the initial printer zones on the Discovery Server.

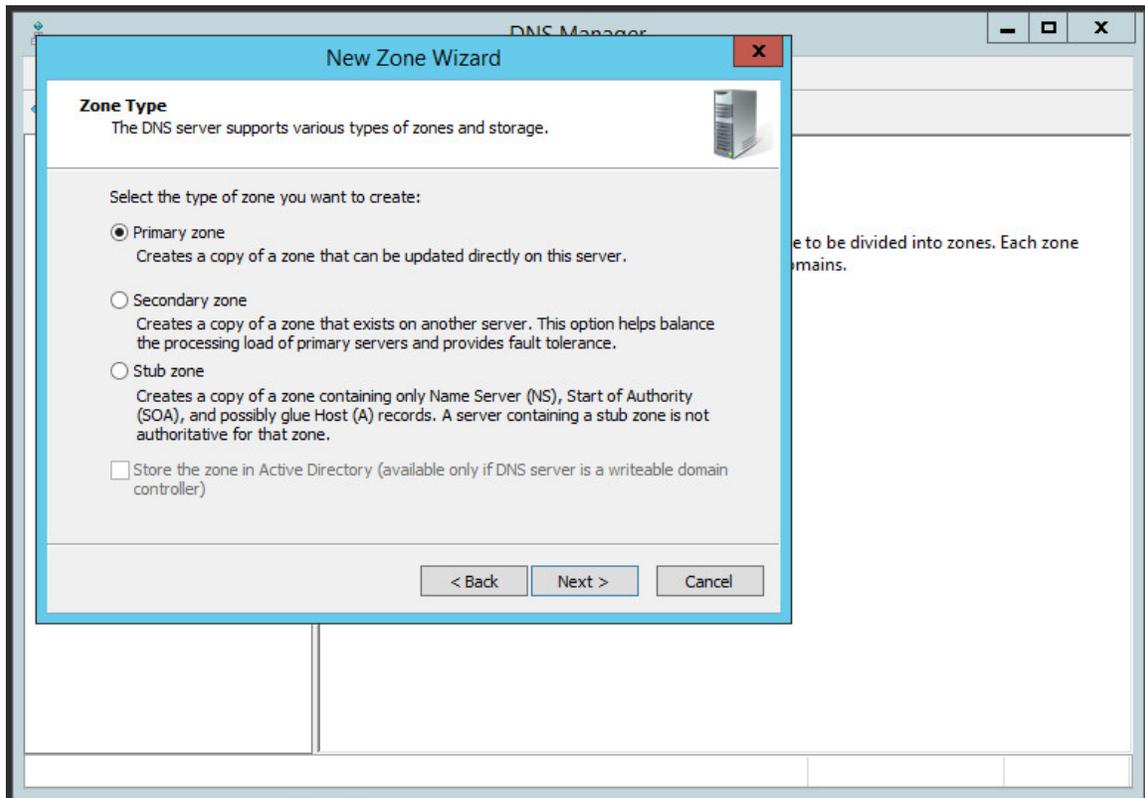
1. On the Discovery Server, run the DNS Manager.
2. Create new zones as follows:
 - a. This example illustrates creating a new “hpprinters” zone in the “ems6.hpitest.com”.
 - b. Right-click on “Forward Lookup Zone” and select “New Zone...”



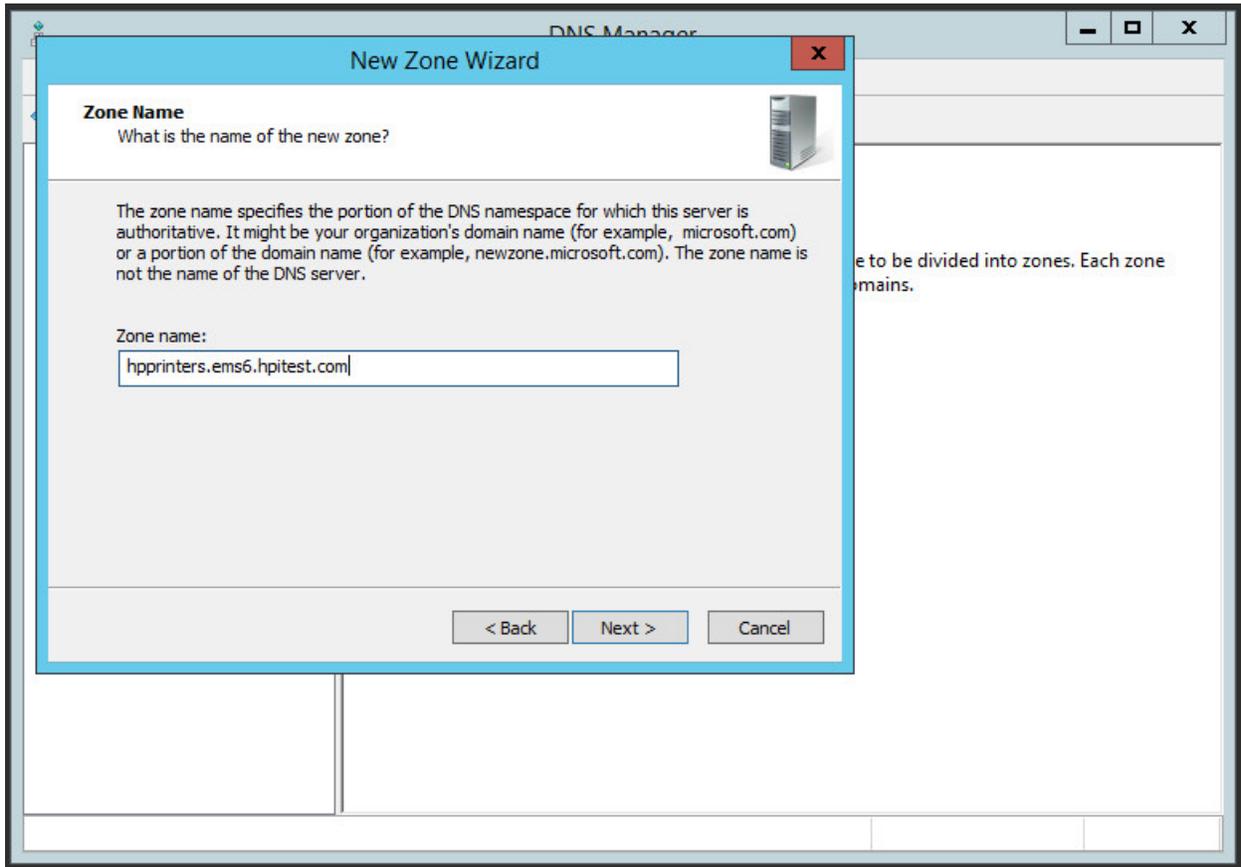
c. Click "Next".



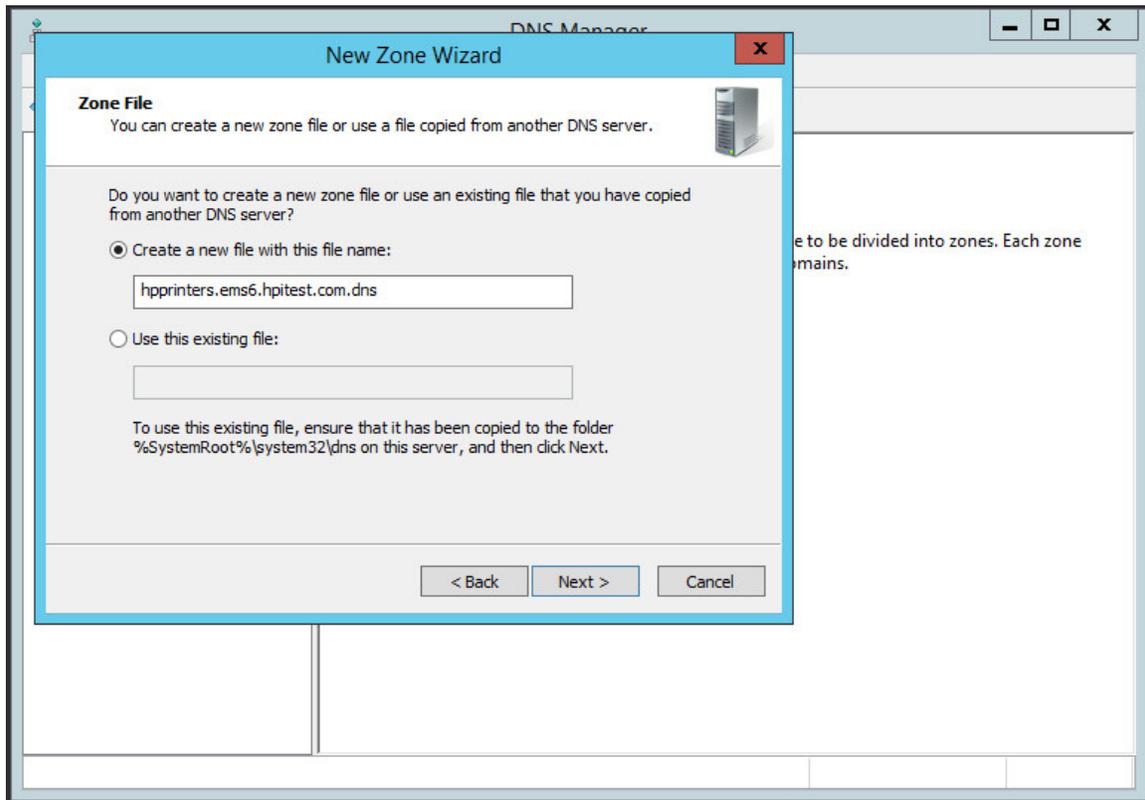
d. Select “Primary zone”, and click “Next”.



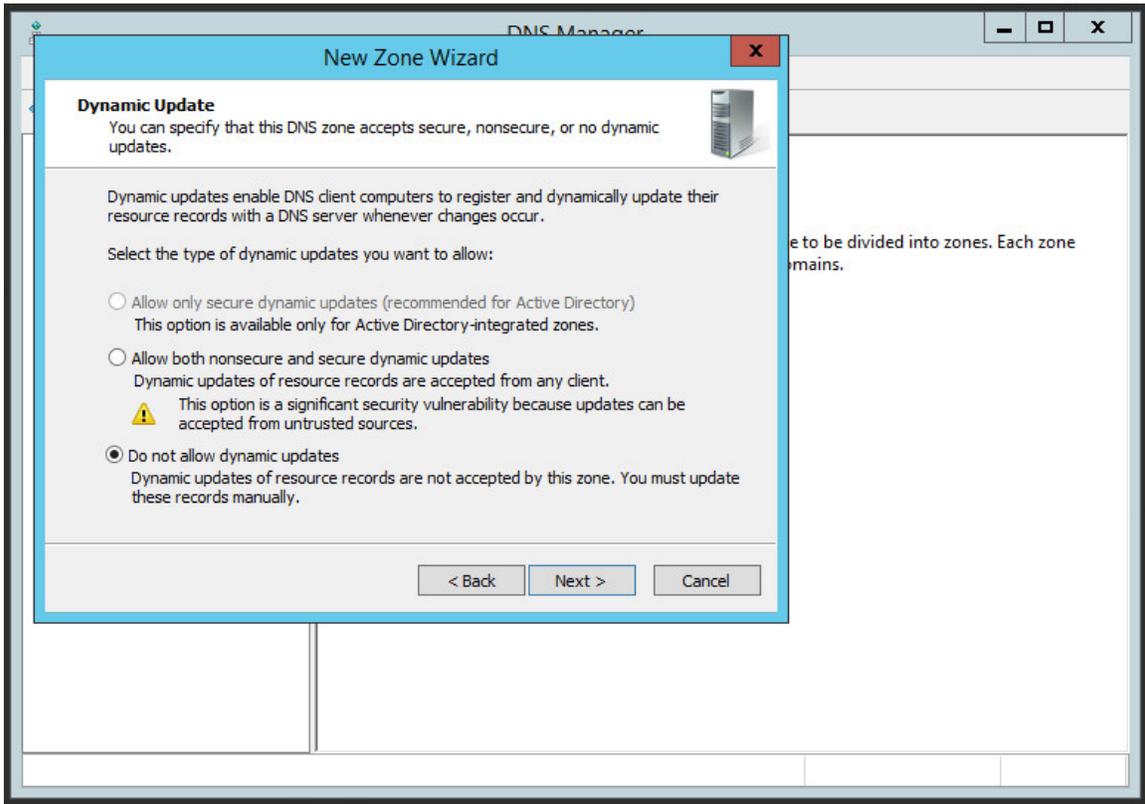
- e. Enter the full name of the zone (including the domain), and click “Next”.



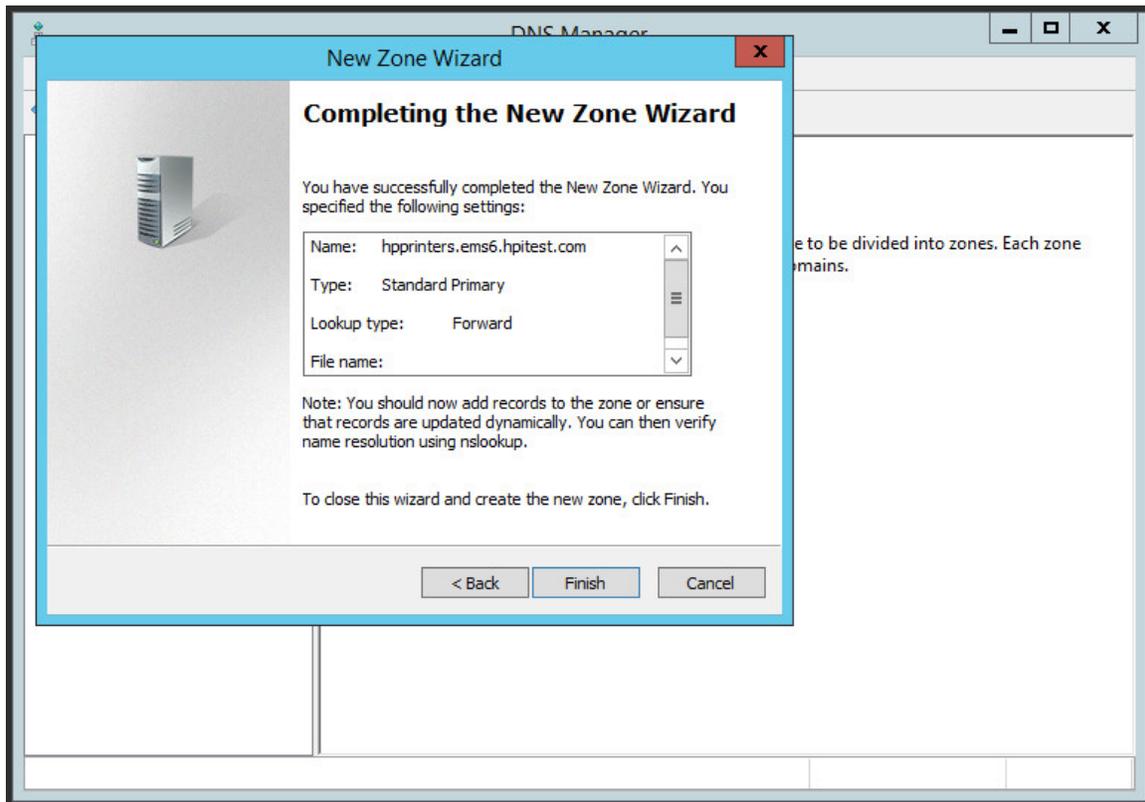
- f. Select "Create a new file with this name:", then verify the file name and click "Next".



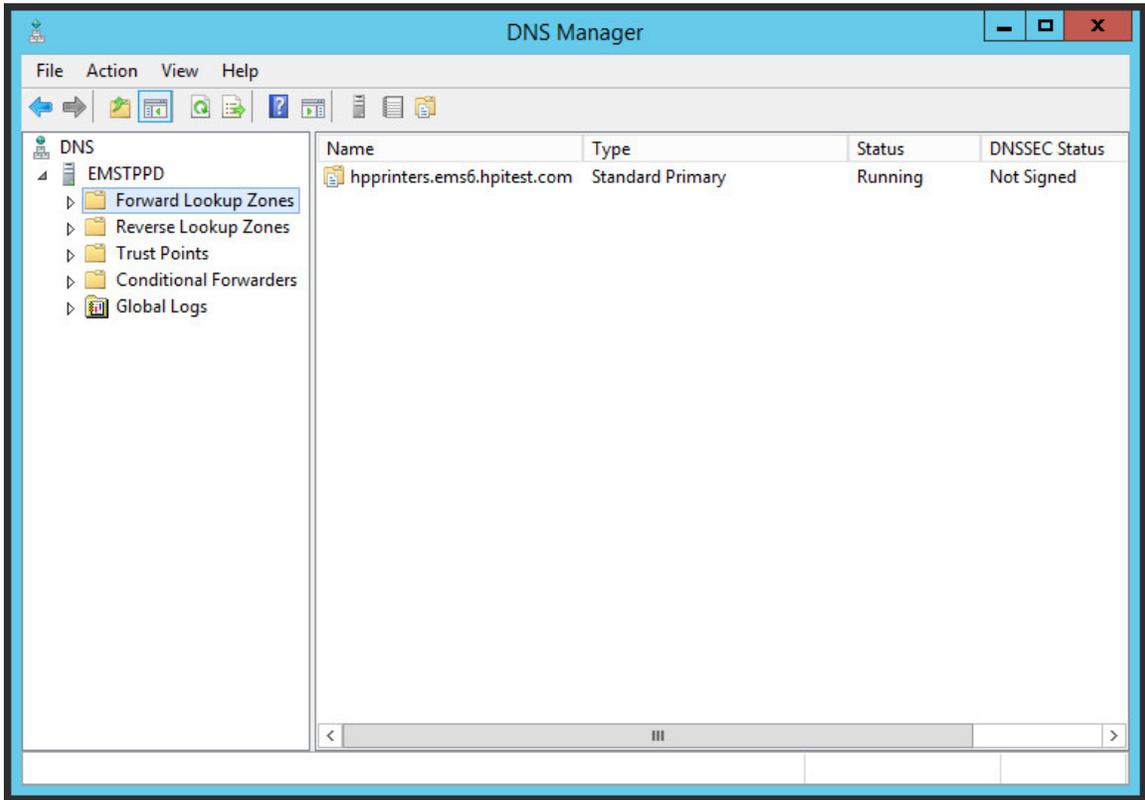
g. Keep the selection “Do not allow dynamic updates”, then click “Next”.



h. Click "Finish".



- i. Verify that the zone was created successfully.

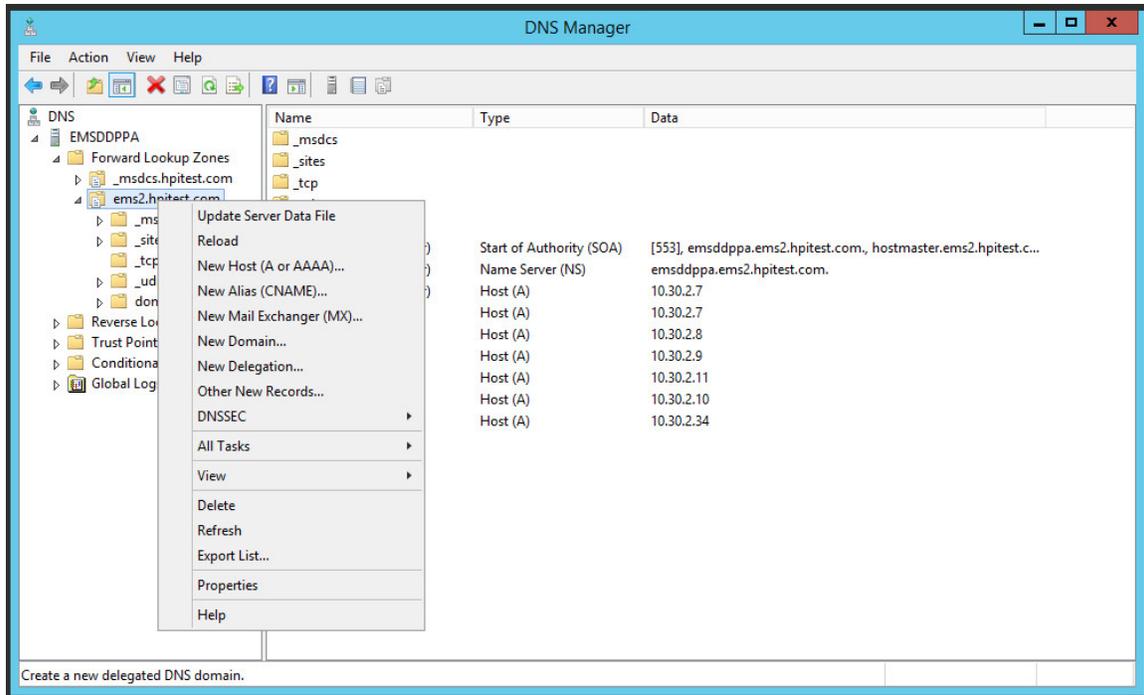


7.5 Example: Add JAC “Delegation” to the DNS server

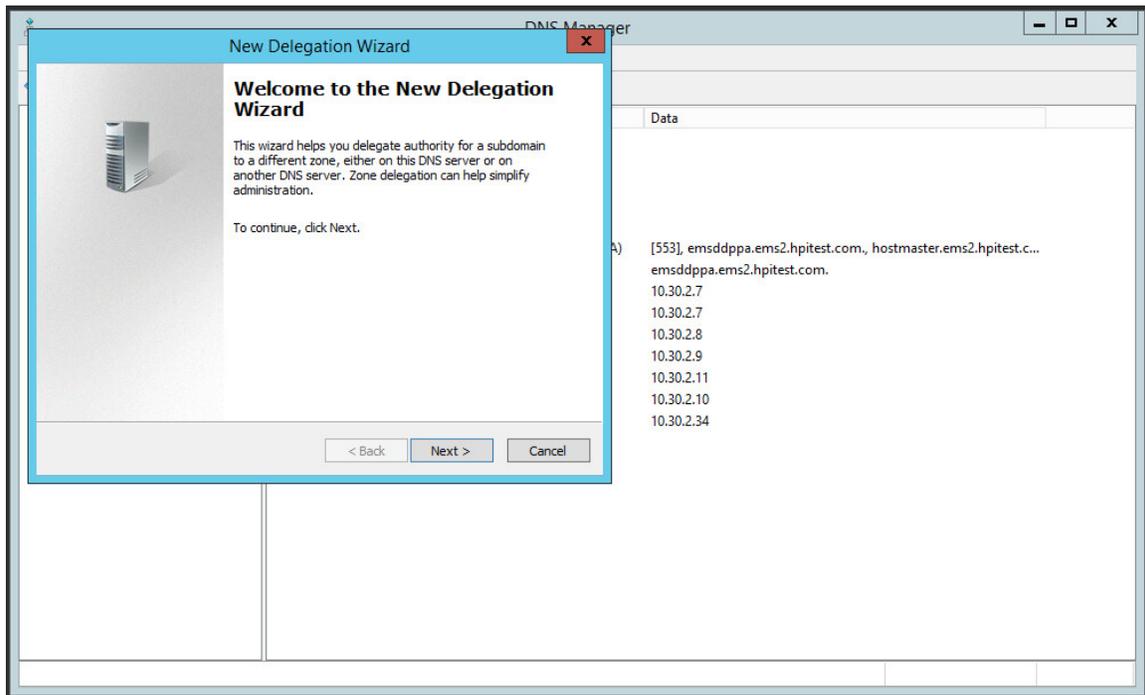
The following example shows how to create a new delegation on the DNS server to delegate all DNS queries for the JAC printer zone(s) to the Discovery Server.

On the main DNS server, create a new delegation to handle the print service requests, and forward them to the *hpprinters* domain.

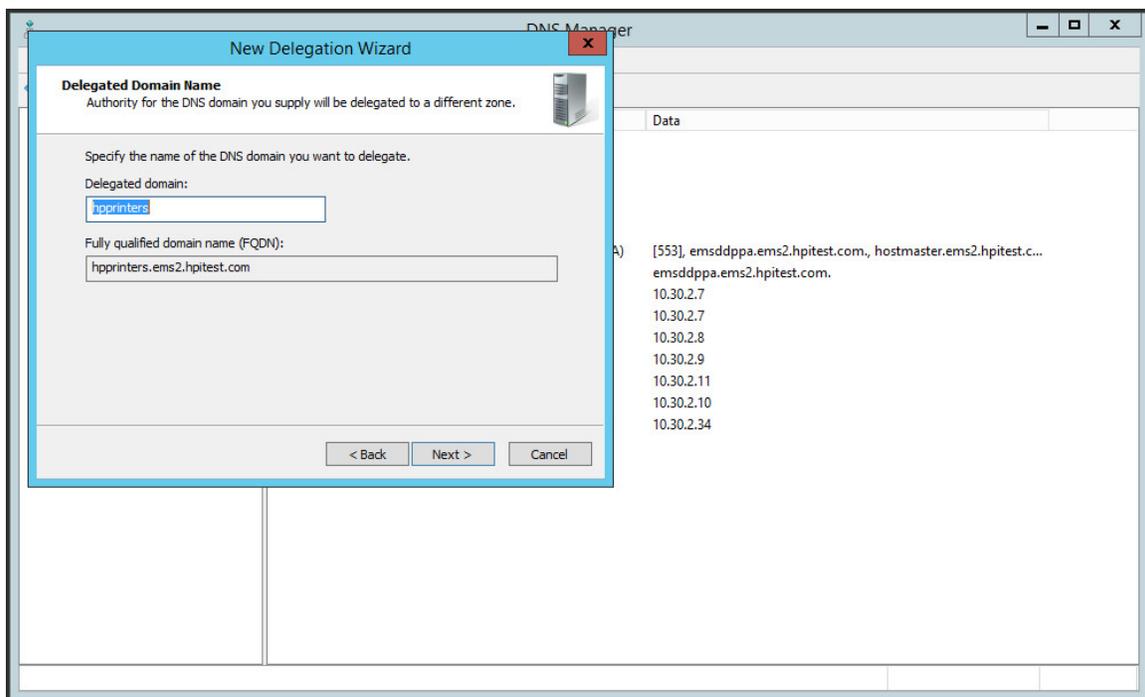
- a. Within the zone where the Discovery Server resides, Right-click, and select “New Delegation...”



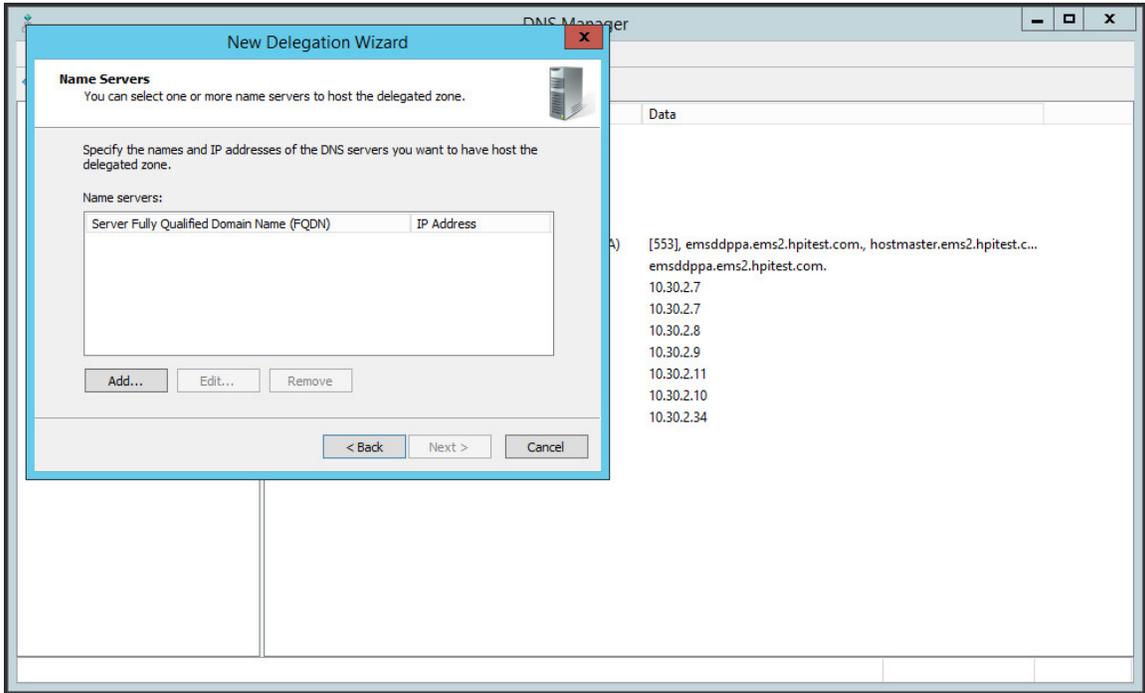
b. In the “New Delegation Wizard”, Click “Next”



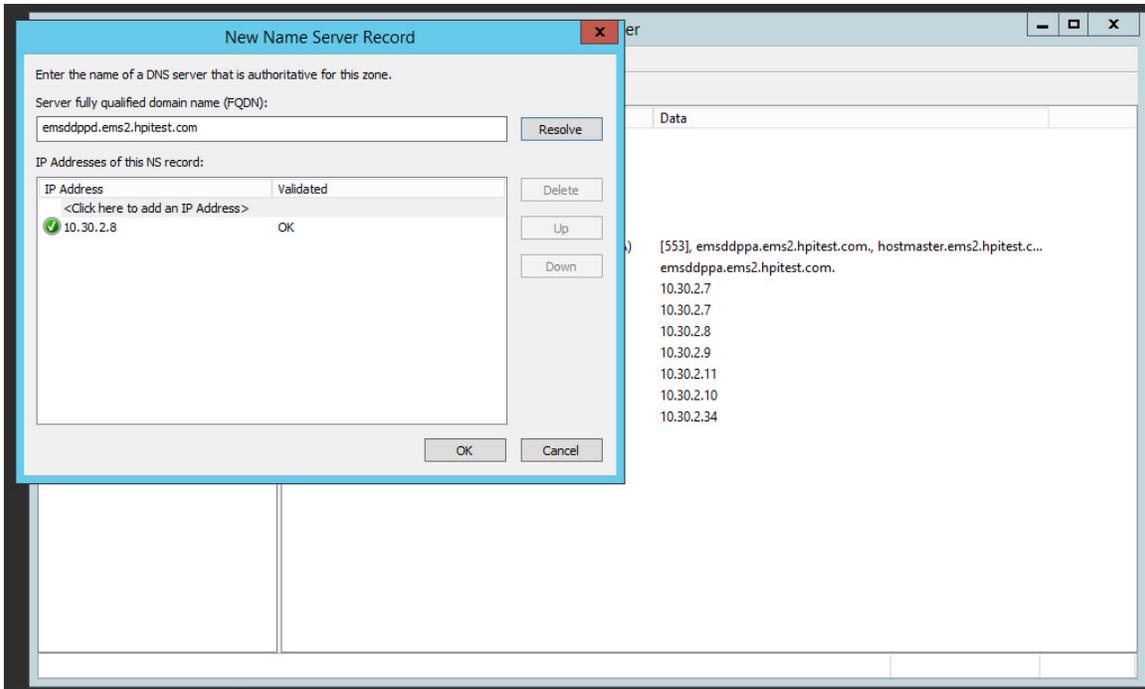
c. Type in “hprinters” for the Delegated domain.



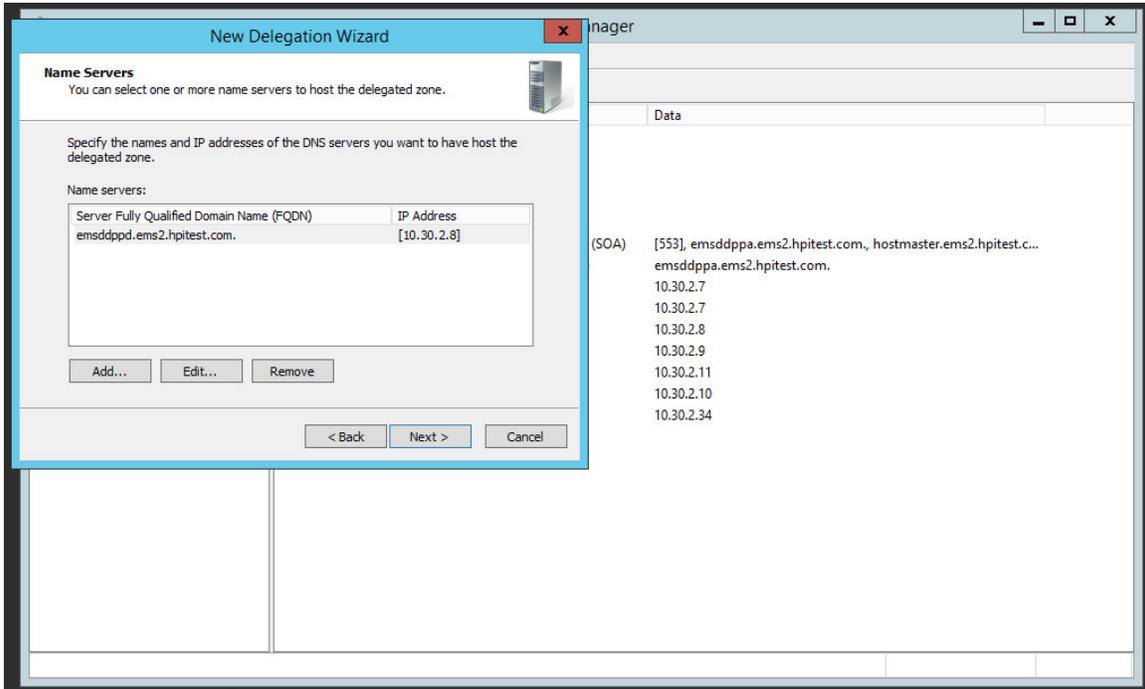
a. Click “Next”



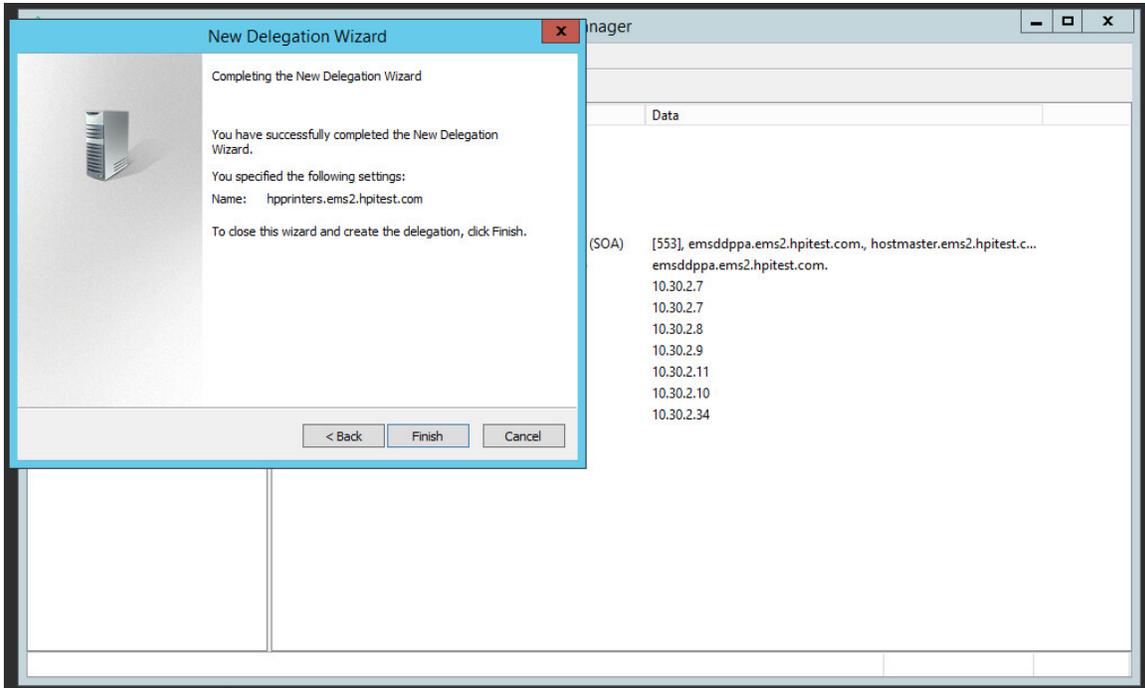
- b. Click on “Add” then add the Fully Qualified Domain Name of to the Discovery Server, and click “Resolve”.



- c. Click “OK”

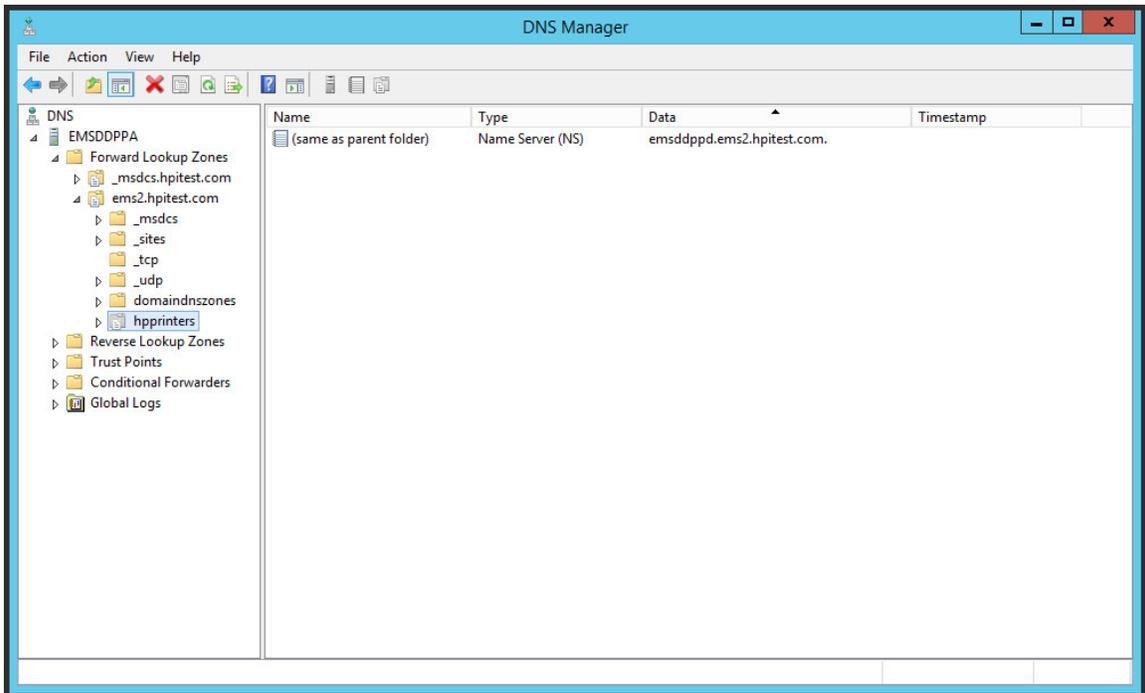


d. Click "Next"



e. Click "Finish"

f. Delegate has been created.



Here is an example of the DNS record created by the DNS manager after going through the above steps:

```

;
; Delegated sub-zone: hpprinters.ems2.hpitest.com.
;
hpprinters           NS      emsddppd.ems2.hpitest.com.
; End delegation

```

7.6 Example: Add DNS-SD Records to the DNS Server

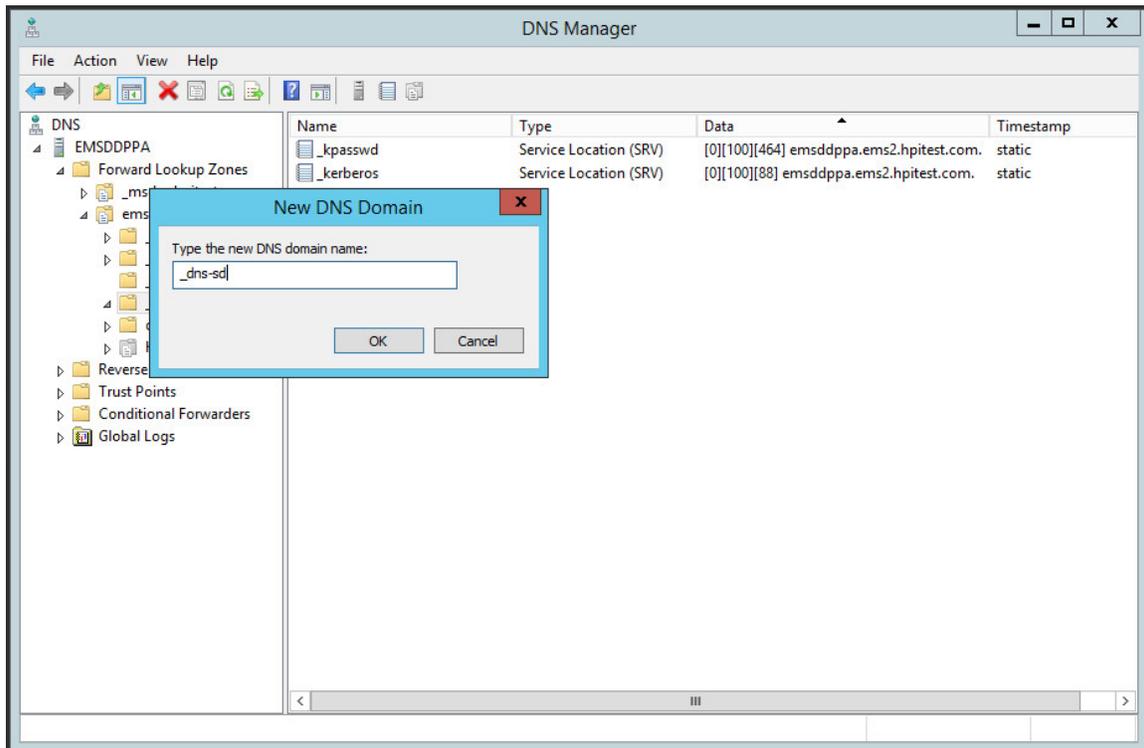
This step will add the necessary DNS-SD PTR to the main DNS server. Two example are provided below, both of which apply to Microsoft Server DNS. The specific steps necessary for enterprise environments that use other DNS implementations may be different.

The DNS-SD PTR records will point to the “hprinters” domain that will be setup on the Discovery Server.

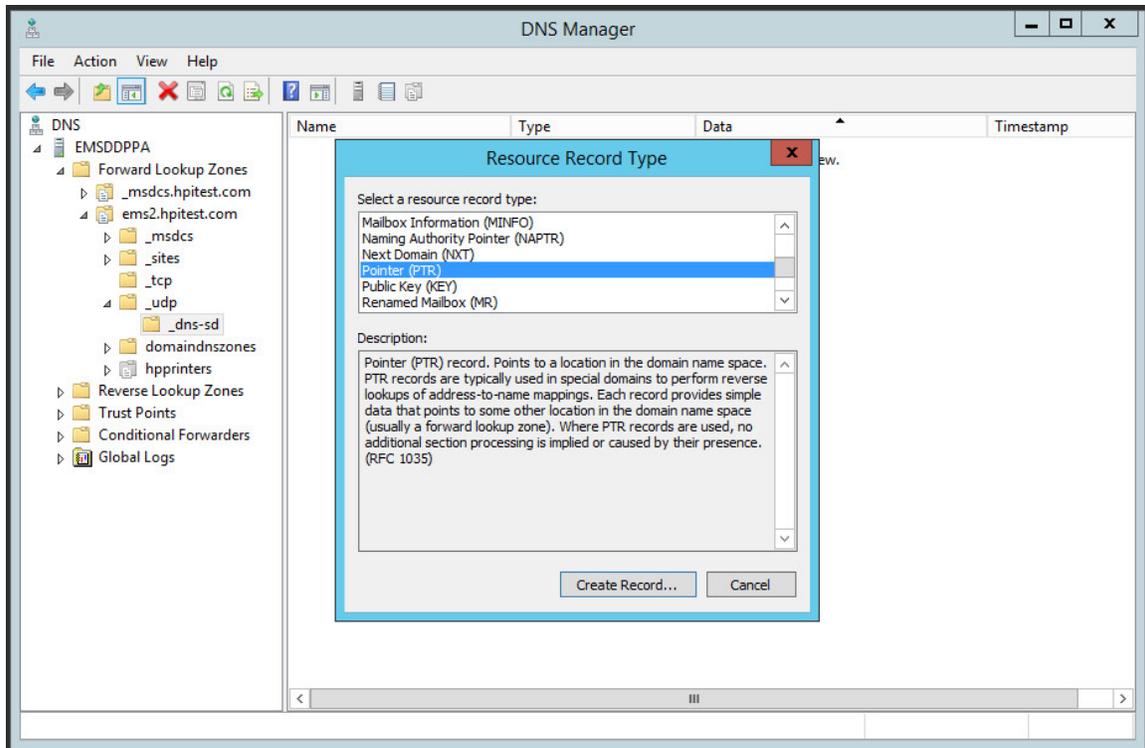
7.6.1 Add DNS-SD Records to the DNS Server using the Microsoft DNS Manager

On the DNS Server, use the Microsoft DNS Manager to perform the following steps to add the DNS-SD PTR records (which point to the “hprinters” domain).

1. Within the DNS zone where the Discovery Server resides, Right-click on the “_udp” domain, and select “New Domain...”
 - a. Enter “_dns-sd” and click “OK”.

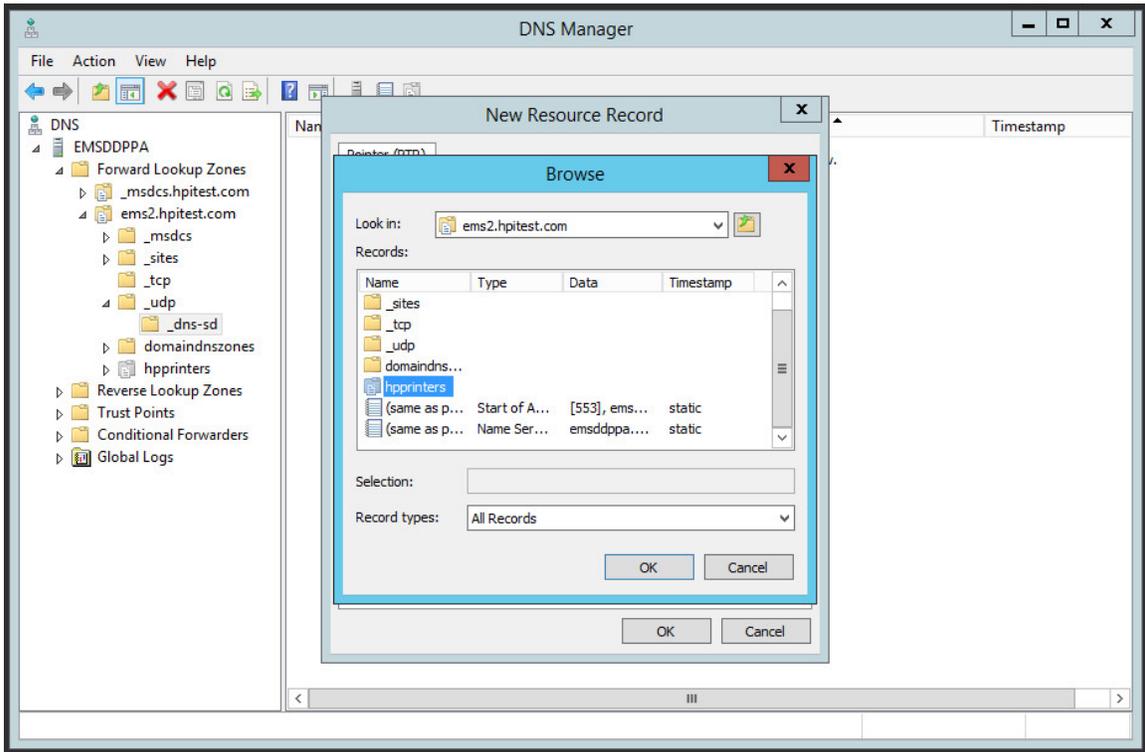


- b. Right-click on the newly created “_dns-sd” domain, and select “Other New Records...”

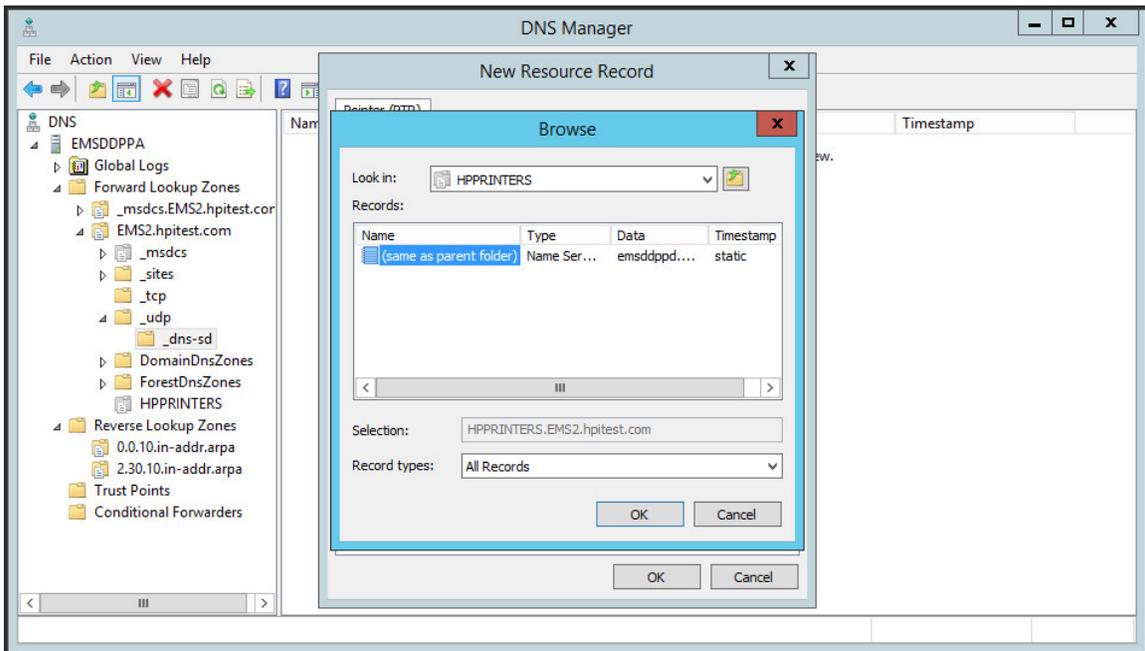


- c. Scroll down and select "Pointer (PTR)" and click "Create Record".
- d. For the "Host IP Address" field, enter "b".
- e. For the "Host name" field, click "Browse".
- f. Change the "Record Types" to "All Records" and click "OK".

g. Browse to and highlight “hprinters”.



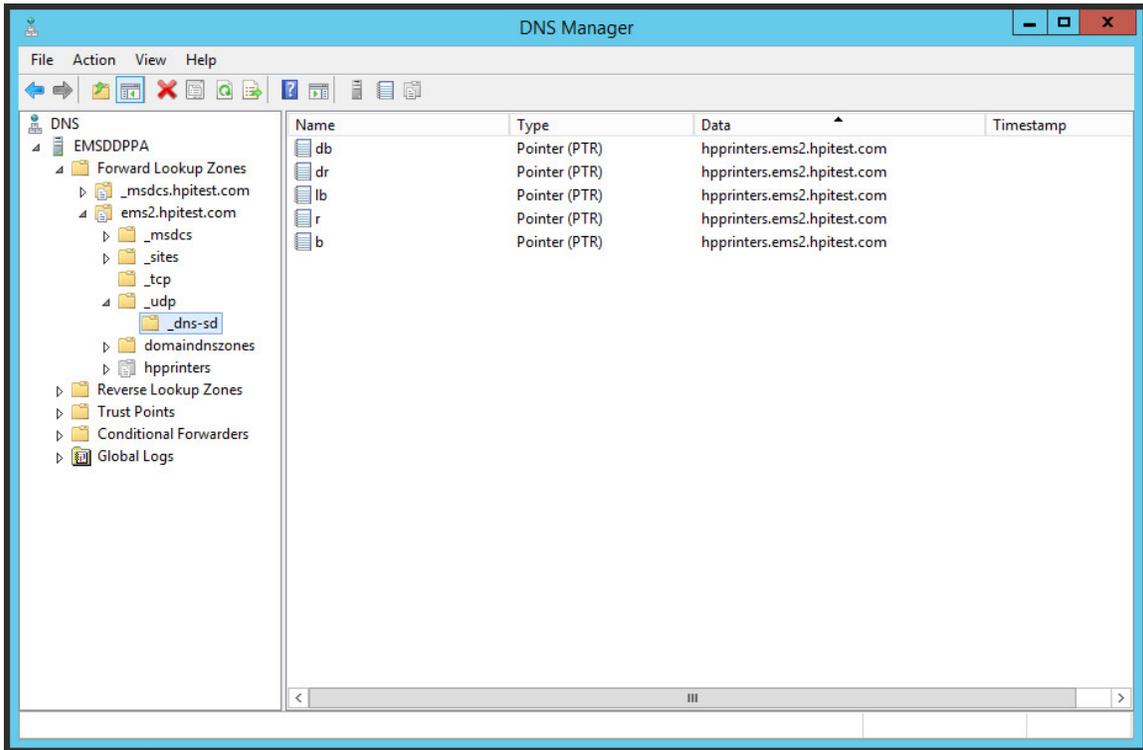
h. Select the “(same as parent folder)” entry, and click “OK”.



i. Click “OK” to finish creating the record.

- j. Repeat steps e – j specifying the following for “Host IP Address”
- “db”
 - “dr”
 - “lb”
 - “r”

The following screen shows the completed DNS SD pointer records:



The result of these steps is that the following DNS records have been added:

b._dns-sd._udp	PTR	hprinters.ems2.hpitest.com.
db._dns-sd._udp	PTR	hprinters.ems2.hpitest.com.
dr._dns-sd._udp	PTR	hprinters.ems2.hpitest.com.
lb._dns-sd._udp	PTR	hprinters.ems2.hpitest.com.
r._dns-sd._udp	PTR	hprinters.ems2.hpitest.com.

7.6.2 Add DNS-SD Records to the DNS Server using PowerShell

On the DNS Server, you can use the PowerShell command “Add-DnsServerResourceRecordPtr” to add the DNS-SD PTR records (which point to the “hpprinters” domain).

Below are examples of the PowerShell “Add-DnsServerResourceRecordPtr” command that add the DNS-SD records to the DNS server.

```
Add-DnsServerResourceRecordPtr -Name "b._dns-sd._udp.0"
-PtrDomainName "hpprinters.ems2.hpitest.com."
-ZoneName "hpprinters.ems2.hpitest.com"
Add-DnsServerResourceRecordPtr -Name "db._dns-sd._udp.0"
-PtrDomainName "hpprinters.ems2.hpitest.com."
-ZoneName "hpprinters.ems2.hpitest.com"
Add-DnsServerResourceRecordPtr -Name "dr._dns-sd._udp.0"
-PtrDomainName "hpprinters.ems2.hpitest.com."
-ZoneName "hpprinters.ems2.hpitest.com"
Add-DnsServerResourceRecordPtr -Name "lb._dns-sd._udp.0"
-PtrDomainName "hpprinters.ems2.hpitest.com."
-ZoneName "hpprinters.ems2.hpitest.com"
Add-DnsServerResourceRecordPtr -Name "r._dns-sd._udp.0"
-PtrDomainName "hpprinters.ems2.hpitest.com."
-ZoneName "hpprinters.ems2.hpitest.com"
```

7.7 Example: Configure the JAC Discovery Server

7.7.1 Entering Printers

7.7.1.1 Adding printers based upon Bonjour discovery results (local sub-net)

Since Bonjour (mDNS) printer discovery is enabled by default, the `run` option of the setup utility does not require additional parameters to add printers found via Bonjour discovery.

For this example, the printers are to be added as follows:

- Include all the printers found during Bonjour discovery into a single zone with the following zone name: “`PrinterZone000.domain.comp.com`”.
- Save the DNS file to a file share location: <\\SharedFiles\HpJac\Printers>.

Command line:

```
HP.jacdiscsetup.exe run -s \\SharedFiles\HpJac\Printers -z  
PrinterZone000.domain.comp.com
```

Output:

A DNS data file named “`PrinterZone000.domain.comp.com.dns`” is created at <\\SharedFiles\HpJac\Printers>.

These DNS files can then be loaded into the DNS service running on the Discovery Server (see section 7.7.3 below).

7.7.1.2 Adding printers based upon Bonjour discovery results (other sub-nets)

In order to add multiple printers that are connected on multiple subnets using Bonjour discovery, it is necessary to run the setup utility on one or more clients that are connected to the various different sub-nets.

Since Bonjour (mDNS) printer discovery is enabled by default, the `run` option of the setup utility does not require additional parameters to add printers found via Bonjour discovery.

For the first example, the printers are to be added as follows:

- Printers are to be added from three sub-nets: Sub-net 1, Sub-net 2, and Sub-net 3.
- Include all the printers found during Bonjour discovery into a single zone with the following zone name: “`PrinterZone000.domain.comp.com`”.
- Save the DNS file to a file share location: <\\SharedFiles\HpJac\Printers>.

Example Procedure:

1. Run the setup utility on the Discovery Server first, adding one or more printers (or print servers) to the printer zone. Here is an example command line that manually adds a single printer (with IP address 15.41.142.178) to the zone and saves the files to the share location:

```
HP.jacdiscsetup.exe addprinters -a 15.41.142.178 -s  
\\SharedFiles\HpJac\Printers -z PrinterZone000.domain.comp.com
```

2. Copy the Discovery Setup Utility to a laptop client PC.
3. Connect the laptop to each sub-net, and run the command line shown below.

Command line:

```
HP.jacdiscsetup.exe run -s \\SharedFiles\HpJac\Printers -z  
PrinterZone000.domain.comp.com
```

Output:

A DNS data file named “PrinterZone000.dns” is created at <\\SharedFiles\HpJac\Printers>.

These DNS files can then be loaded into the DNS service running on the Discovery Server (see section 7.7.3 below).

Note: When gathering a large number of printers, it is important to consider the limitations discussed in Section 4.2 above.

For the second example, the printers are to be added as follows:

- Printers are to be added from three sub-nets: Sub-net 1, Sub-net 2, and Sub-net 3.
- Include printers found on each sub-net in separate zones named “PrinterZone001.domain.comp.com”, “PrinterZone002.domain.comp.com”, and “PrinterZone003.domain.comp.com” respectively.
- Save the DNS files to a file share location: <\\SharedFiles\HpJac\Printers> .

Example Procedure:

1. Run the setup utility on the Discovery Server first, adding one or more printers (or print servers) to each printer zone.

Command lines:

```
HP.jacdiscsetup.exe addprinters -a 15.41.142.178 -s  
\\SharedFiles\HpJac\Printers -z PrinterZone001.domain.comp.com
```

```
HP.jacdiscsetup.exe addprinters -a 15.31.142.179 -s
\\SharedFiles\HpJac\Printers -z PrinterZone002.domain.comp.com
HP.jacdiscsetup.exe addprinters -a 15.21.142.169 -s
\\SharedFiles\HpJac\Printers -z PrinterZone003.domain.comp.com
```

2. Copy the Discovery Setup Utility to a laptop client PC.
3. Connect the laptop to Sub-net 1, and run the command line shown below.

Command line:

```
HP.jacdiscsetup.exe run -s \\SharedFiles\HpJac\Printers -z
PrinterZone001.domain.comp.com
```

4. Connect the laptop to Sub-net 2, and run the command line shown below.

Command line:

```
HP.jacdiscsetup.exe run -s \\SharedFiles\HpJac\Printers -z
PrinterZone002.domain.comp.com
```

5. Connect the laptop to Sub-net 3, and run the command line shown below.

Command line:

```
HP.jacdiscsetup.exe run -s \\SharedFiles\HpJac\Printers -z
PrinterZone003.domain.comp.com
```

Output:

Three DNS data files named “PrinterZone001.domain.comp.com.dns”, “PrinterZone002.domain.comp.com.dns”, and “PrinterZone003.domain.comp.com.dns” are created at <\\SharedFiles\HpJac\Printers>.

These DNS files must then be copied to the Discovery Server and loaded into the DNS service running there (see section 7.7.3 below).

Note: When adding multiple printer zones to the Discovery Server, it is required to add Delegation and DNS-SD records for each printer zone to the main DNS service as mentioned in sections 4.6 and 0.

7.7.1.3 Adding printers from an MPL Server

For this example, the printers are to be added as follows:

- An HP Managed Printing Administration server has been setup at: <http://site.printerAdmin.company.com/hpmpa/>
- Multiple Managed Printer Lists have been created and are available at:
 - <http://site.printerAdmin.company.com/hpmpa/hpmpml/?mplId=1>

- <http://site.printerAdmin.company.com/hmpa/hpmp1/?mplId=2>
- <http://site.printerAdmin.company.com/hmpa/hpmp1/?mplId=3>
- Include the printers found from all three MPLs in a single zone named “PrinterZone004.domain.comp.com”.
- Save the DNS file to a file share location: <\\SharedFiles\HpJac\Printers> .

Command lines:

```
HP.jacdiscsetup.exe run --mplserver
http://site.printerAdmin.company.com/hmpa/hpmp1/?mplId=1 -s
\\SharedFiles\HpJac\Printers -z PrinterZone004.domain.comp.com

HP.jacdiscsetup.exe run --mplserver
http://site.printerAdmin.company.com/hmpa/hpmp1/?mplId=2 -s
\\SharedFiles\HpJac\Printers -z PrinterZone004.domain.comp.com

HP.jacdiscsetup.exe run --mplserver
http://site.printerAdmin.company.com/hmpa/hpmp1/?mplId=3 -s
\\SharedFiles\HpJac\Printers -z PrinterZone004.domain.comp.com
```

Output:

A DNS data file named “PrinterZone004.domain.comp.com.dns” is created at <\\SharedFiles\HpJac\Printers>.

These DNS files can then be loaded into the DNS service running on the Discovery Server (see section 7.7.3 below).

Note:

It is acceptable to add printers from different MPLs into different printer zones. See Section 7.7.1.2 for an example and notes for adding printers into multiple zones.

7.7.1.4 *Adding printers from an MPL File*

For this example, the printers are to be added as follows:

- An HP Managed Printing Administration server has been setup and an MPL XML file has been exported and is located at:
 - C:\HpJacDisc\Setup\MplFiles\hpmp1-5.xml
- Include the printers found from the MPL in a single zone named “PrinterZone005.domain.comp.com”.
- Save the DNS file to a file share location: <\\SharedFiles\HpJac\Printers> .

Command lines:

```
HP.jacdiscsetup.exe run --mplfile C:\HpJacDisc\Setup\MplFiles\hpmpl-5.xml  
\\SharedFiles\HpJac\Printers -z PrinterZone005.domain.comp.com
```

Output:

A DNS data file named “PrinterZone005.domain.comp.com.dns” is created at <\\SharedFiles\HpJac\Printers>.

These DNS files can then be loaded into the DNS service running on the Discovery Server (see section 7.7.3 below).

Note:

It is acceptable to add printers from different MPLs into different printer zones. See Section 7.7.1.2 for an example and notes for adding printers into multiple zones.

7.7.1.5 Adding printers individually by IP address

For this example, the printers are to be added as follows:

- Add printers from the following IP addresses:
 - 10.20.45.8
 - 10.20.45.9
- Include the printers in the default zone.
- Use the default output files location.

Command lines:

```
HP.jacdiscsetup.exe addprinters -a 10.20.45.8
```

```
HP.jacdiscsetup.exe addprinters -a 10.20.45.9
```

Output:

A DNS data file named “hpprinters.<default domain>.dns” is created at “.\output” (relative to the directory where the setup utility was run).

These DNS files can then be loaded into the DNS service running on the Discovery Server (see section 7.7.3 below).

7.7.1.6 Adding printers in bulk using a list of IP addresses

For this example, the printers are to be added as follows:

- Add multiple printers from a list of IP addresses.
 - A text file “C:\HpJacDisc\Setup\Printers\printer_ip_list.txt” contains the following:

```
10.86.162.162
10.86.162.152
10.86.162.163
10.86.162.132
10.86.162.178
10.86.162.211
10.86.164.63
10.86.162.128
10.86.162.182
10.86.162.129
10.86.162.90
10.86.162.169
10.86.162.171
10.86.162.180
10.86.162.176
```

- Include the printers in the default zone.
- Use the default output files location.

Command line:

```
HP.jacdiscsetup.exe addprinters -l
C:\HpJacDisc\Setup\Printers\printer_ip_list.txt
```

Output:

A DNS data file named “`hpprinters.<default domain>.dns`” is created at “. \output” (relative to the directory where the setup utility was run).

These DNS files can then be loaded into the DNS service running on the Discovery Server (see section 7.7.3 below).

7.7.1.7 Failures when adding printers

There are some situations where the Discovery Setup Utility will report an error stating the following:

```
Some printers failed to respond to IPP data requests and have not been
added, check ipp_failed_printers.json for a list.
```

The printers that have failed to be added are listed in the file `ipp_failed_printers.json` which is located in the output folder (relative to where the Discovery Setup Utility was run).

The possible reasons for this failure are as follows:

- The printer is offline.
- The IP address provided for the printer is incorrect.
- A route does not exist between the printer and the machine running the Discovery Setup Utility.
 - For all of the above, try pinging the IP address, and opening the printers EWS page to verify that the printer is online and accessible at the given IP address.
- The printer does not support IPP or AirPrint™.
 - If the printer is ping-able, then the printer likely does not support IPP or does not support some aspect of AirPrint™.

7.7.2 Removing printer entries

7.7.2.1 Removing a single printer

For this example, the entry for a specific printer is to be removed as follows:

- For the zone named “`PrinterZone000.domain.comp.com`”
- Using the data files located at: “`\\SharedFiles\HpJac\Printers`”
- Remove the printer that corresponds to the following IP address:
 - 15.86.162.162

Command lines:

```
HP.jacdiscsetup.exe removeprinters -a 15.86.162.162 -s  
\\SharedFiles\HpJac\Printers -z PrinterZone000.domain.comp.com
```

Output:

The DNS data file named “`PrinterZone000.domain.comp.com.dns`” is updated at “`\\SharedFiles\HpJac\Printers`” such that entries have been removed for the printer referenced by IP address “`15.86.162.162`”.

These DNS files can then be loaded into the DNS service running on the Discovery Server (see section 7.7.3 below).

7.7.2.2 Removing printers in bulk using a list of IP addresses

For this example, the printers are to be added as follows:

- For the zone named “PrinterZone000.domain.comp.com”.
- Using the data files located at: [\\SharedFiles\HpJac\Printers](#).
- Remove multiple printers from list of IP addresses.
 - A text file “C:\HpJacDisc\Setup\Printers\printer_ip_list.txt” contains the following:

```
10.86.162.162
10.86.162.152
10.86.162.163
10.86.162.132
10.86.162.178
10.86.162.211
10.86.164.63
10.86.162.128
10.86.162.182
10.86.162.129
10.86.162.90
10.86.162.169
10.86.162.171
10.86.162.180
10.86.162.176
```

Command line:

```
HP.jacdiscsetup.exe removeprinters -l
C:\HpJacDisc\Setup\Printers\printer_ip_list.txt -s
\\SharedFiles\HpJac\Printers -z PrinterZone000.domain.comp.com
```

Output:

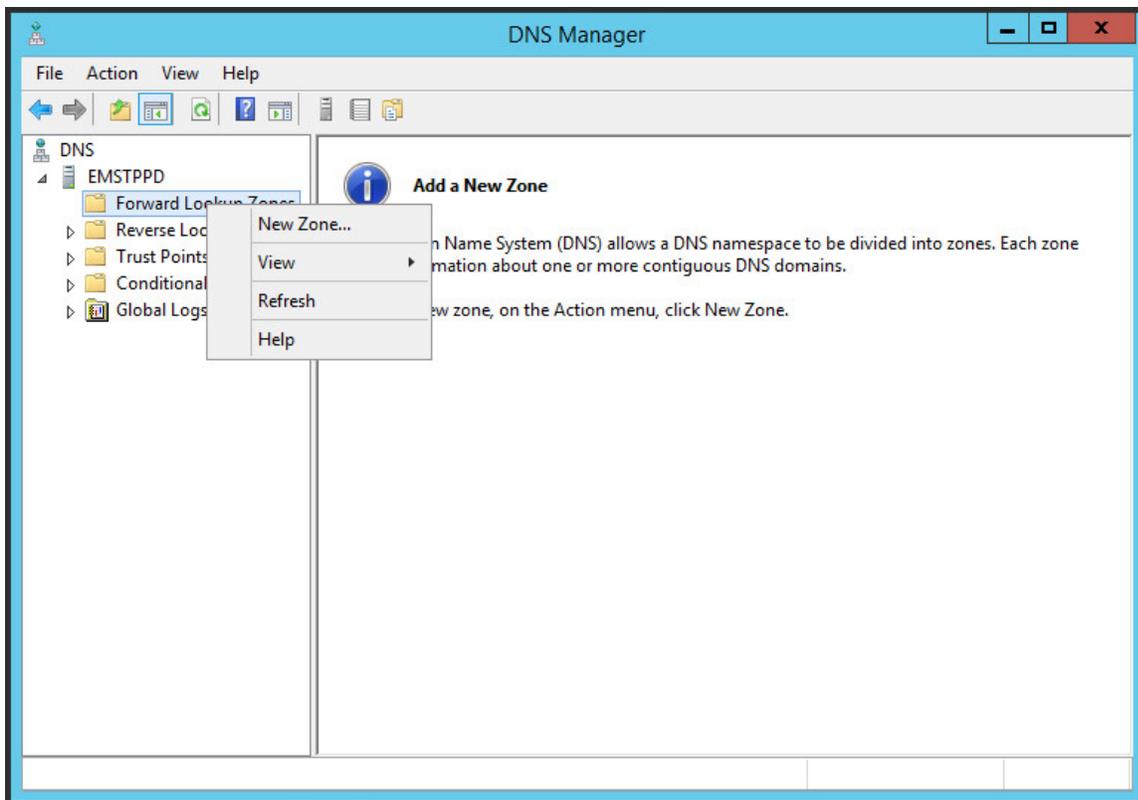
The DNS data file named “PrinterZone000.domain.comp.com.dns” is updated at “\\SharedFiles\HpJac\Printers” such that entries have been removed for the printer referenced by the IP addresses listed in “C:\HpJacDisc\Setup\Printers\printer_ip_list.txt”.

These DNS files can then be loaded into the DNS service running on the Discovery Server (see section 7.7.3 below).

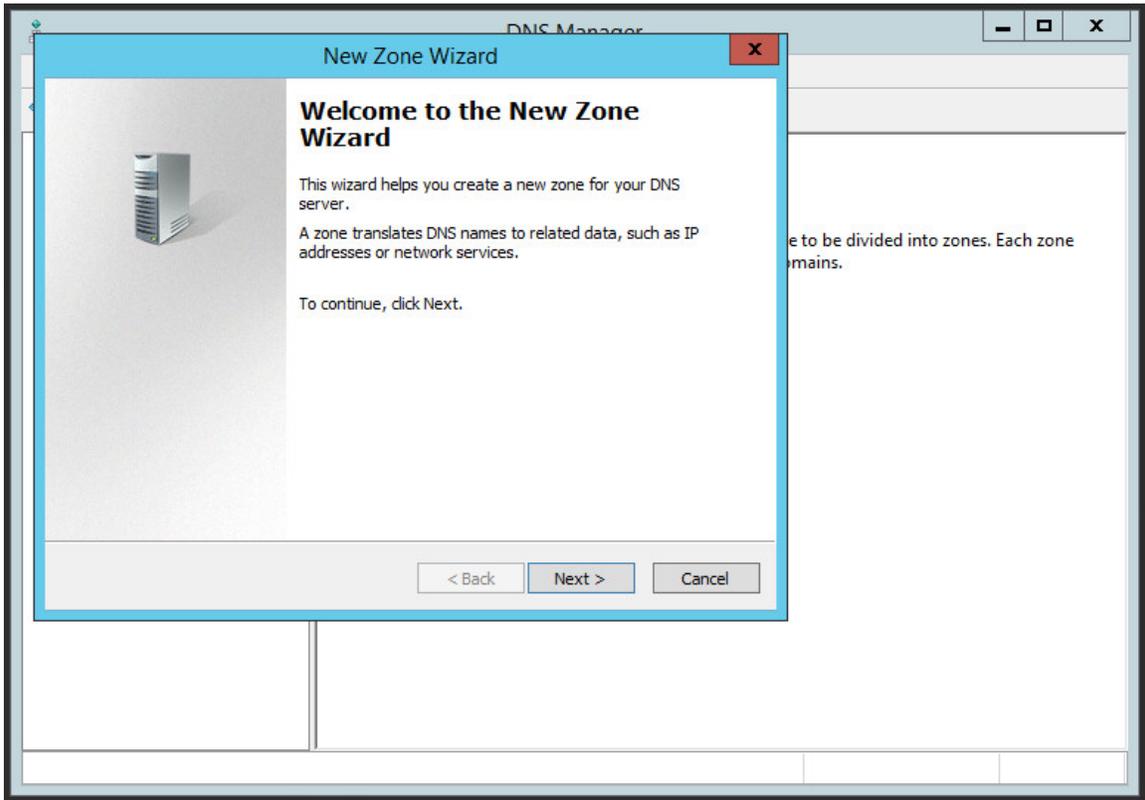
7.7.3 Loading DNS data files on the JAC Discovery Server

After running the Discovery Setup Utility, you will need to load the DNS data files that it created into the DNS service that is running on the Discovery Server.

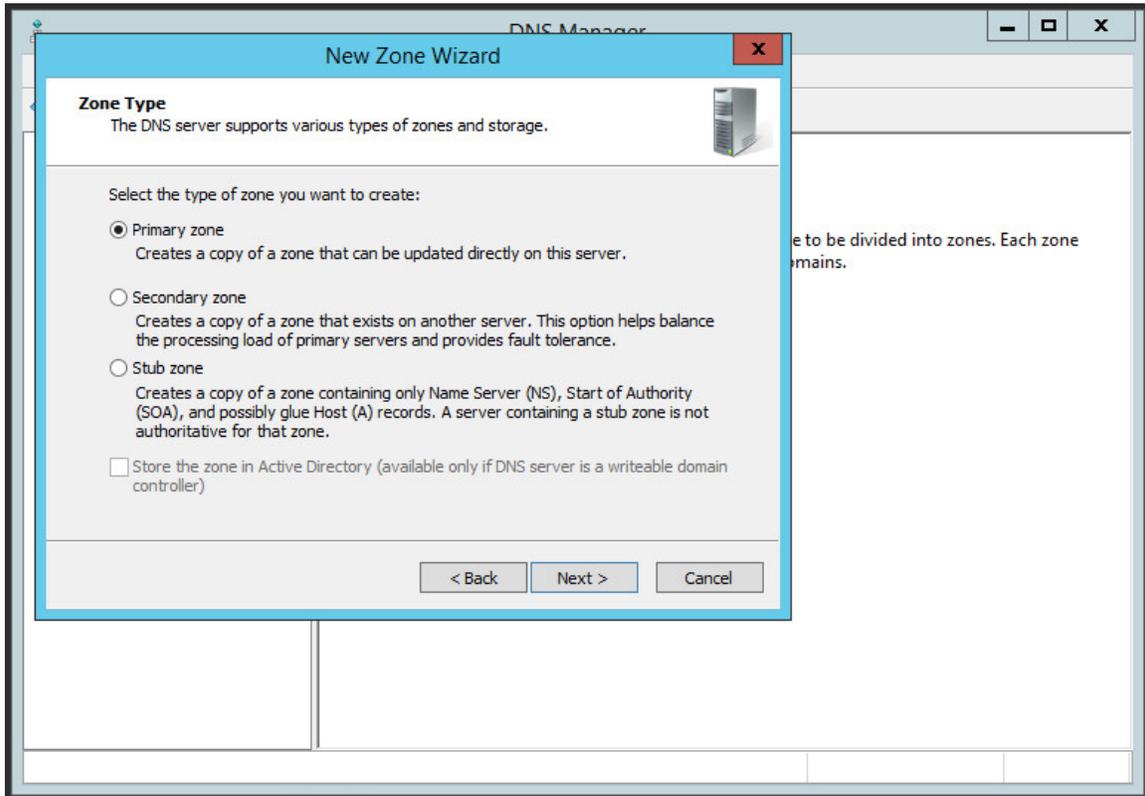
1. Copy the *.dns files created by the Discovery Setup Utility to the following location on the Discovery Server:
 - C:\Windows\System32\dns
 - If DNS files already exist in that location with the same name as what is being copied, it is best to copy the existing files to a back-up location before overwriting them with then new files.
2. On the Discovery Server, run the DNS Manager.
3. Click the “Refresh” button, and select the “Forward Lookup Zones” folder.
4. If zones have already been created in DNS for each of the *.dns files, and new DNS files have been created, load the new DNS files into DNS as follows:
 - a. Right-click on “Forward Lookup Zones” and select refresh.
 - b. Right-click on zone to be reloaded, and select “Reload”.
 - c. Right-click on zone to be reloaded, and select “Refresh”.
 - d. Repeat steps b and c for each zone that needs to be reloaded.
5. If zones do not exist in DNS for each of the *.dns files, create new zones as follows:
 - a. This example illustrates creating a new “hpprinters” zone in the “ems6.hpitest.com”.
 - b. Right-click on “Forward Lookup Zone” and select “New Zone...”



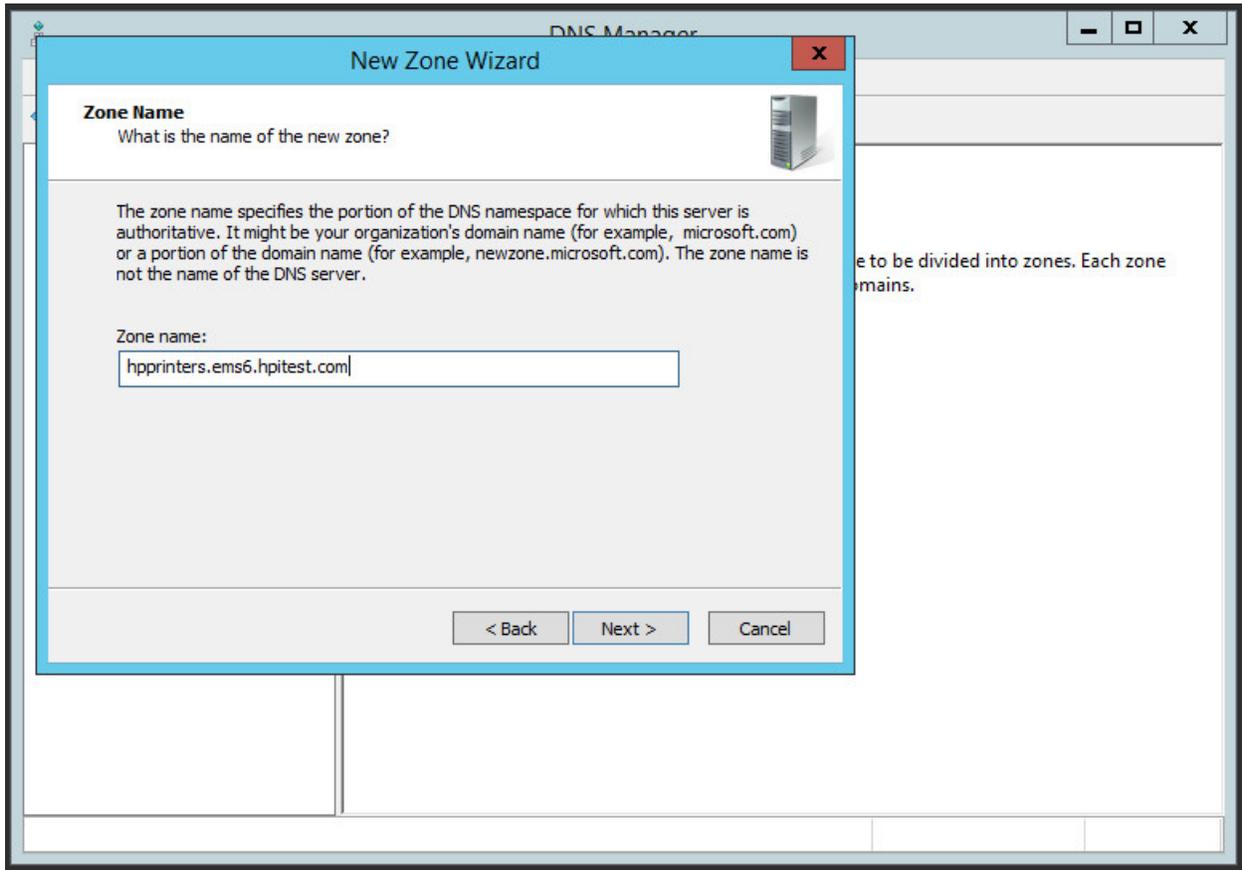
c. Click "Next".



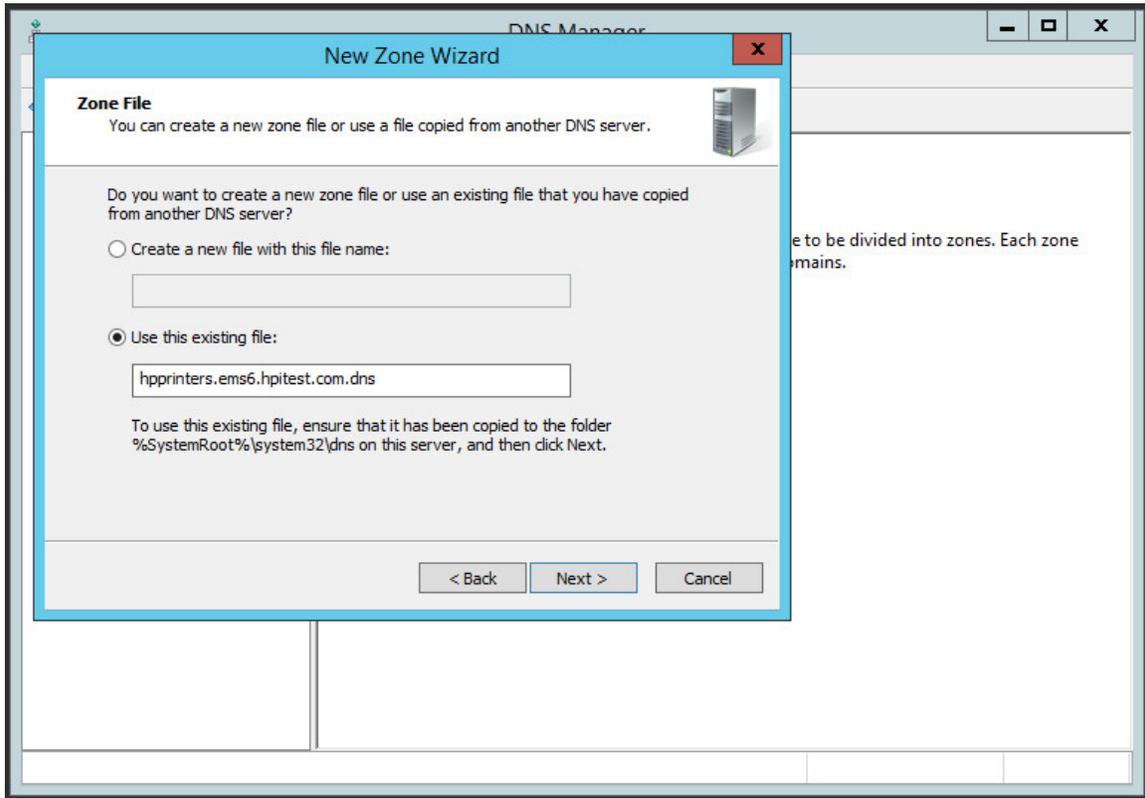
d. Select “Primary zone”, and click “Next”.



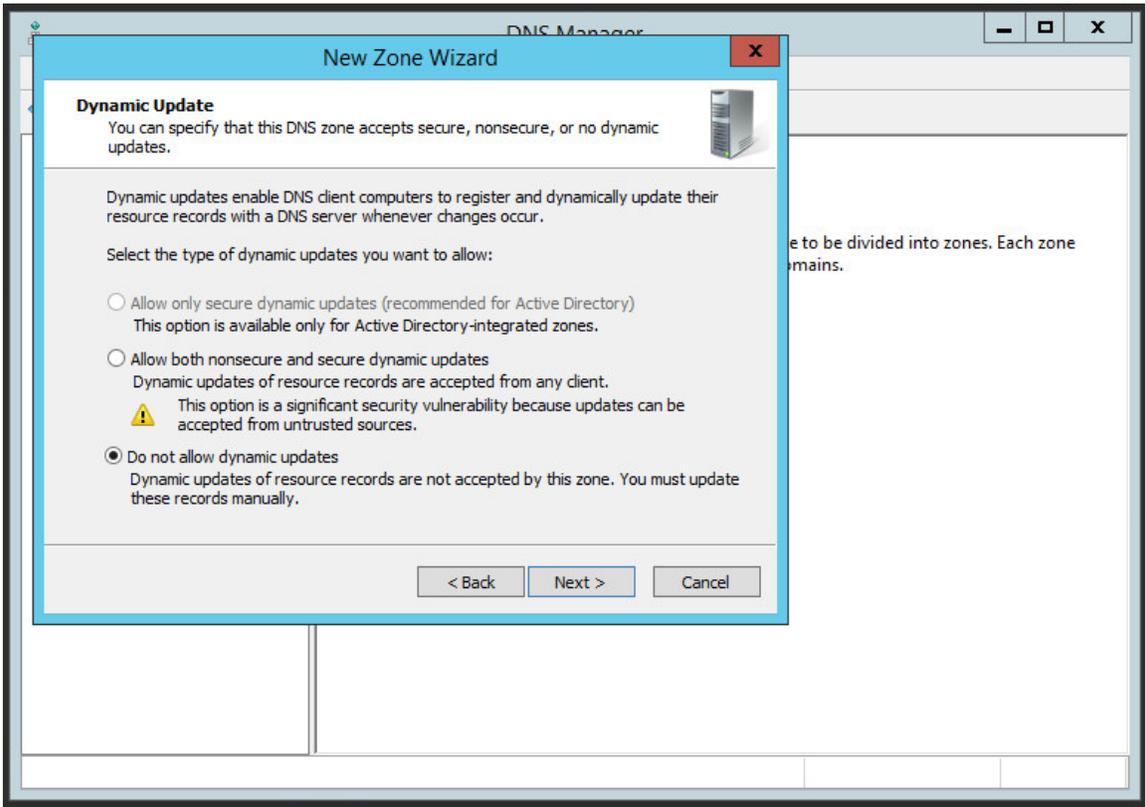
- e. Enter the full name of the zone (including the domain), and click “Next”.



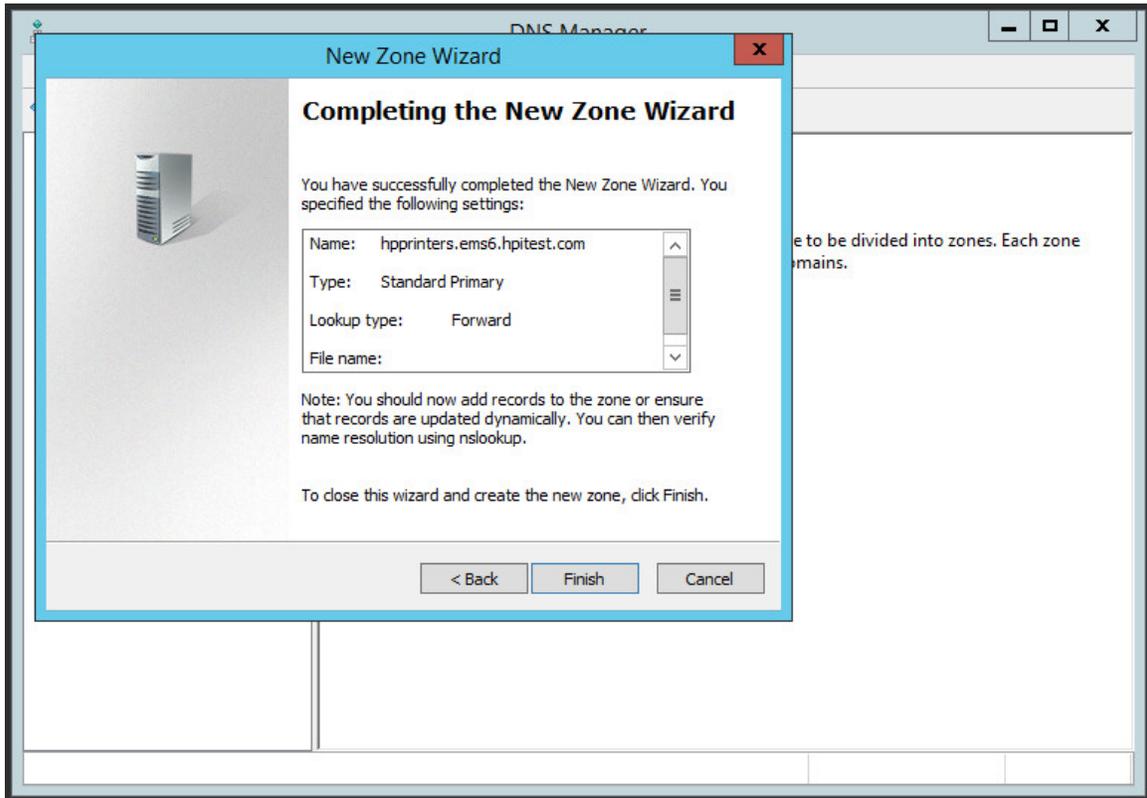
- f. Select “Use this existing file:”, then verify the file name and click “Next”.



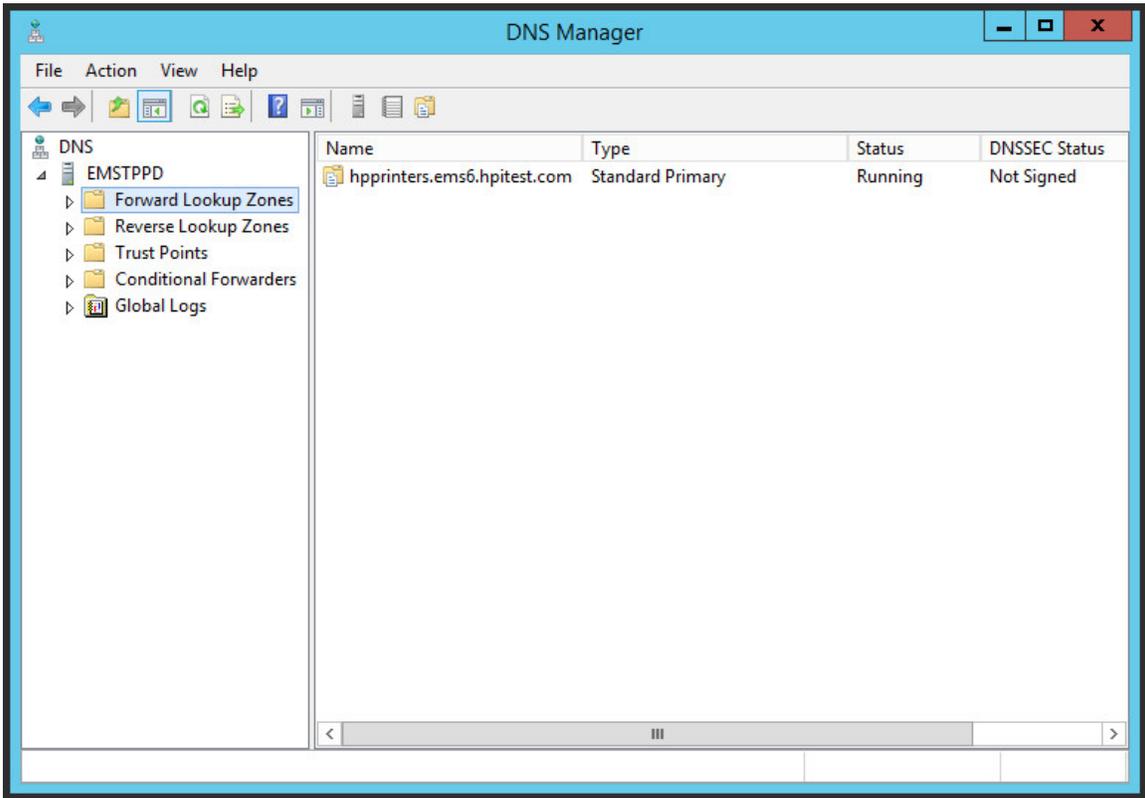
g. Keep the selection “Do not allow dynamic updates”, then click “Next”.



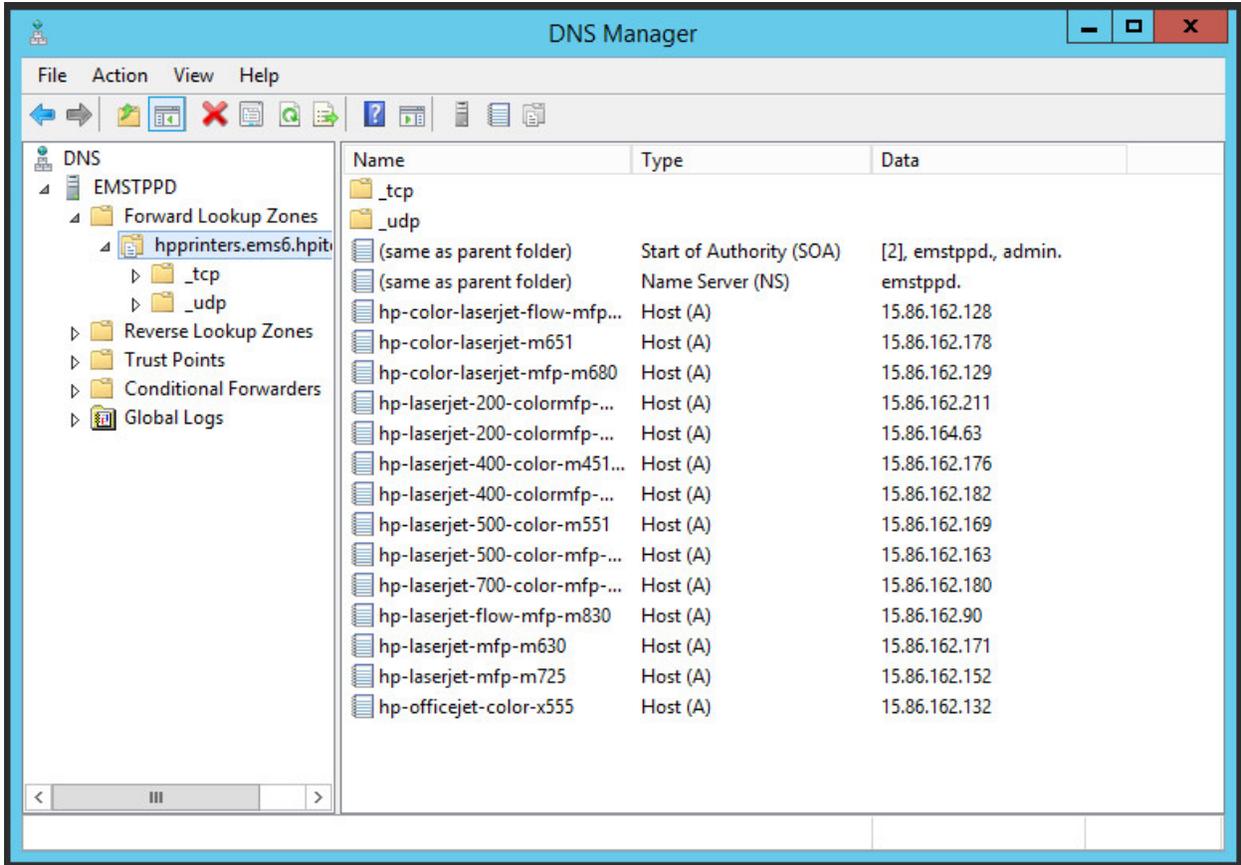
h. Click "Finish".



- i. Verify that the zone was created successfully.



- j. Open the zone, and verify that A/AAAA records for the expected printers are listed there.



- k. Repeat steps a – j for each zone that needs to be created.

8 Appendix A – HP JAC Discovery Server Setup - Quick Reference

1. Planning:
 - a. Make note of the Domain where the JAC Discovery Server is to be installed
 - i. Example: `div01.thiscompany.com`
 - b. Plan printing zones
 - i. Assume single zone: `hpprinters.div01.thiscompany.com`
 - ii. Obtain list of IP addresses for printers or MPL list of printers
 - c. Verify mobile device connectivity:
 - i. Can mobile devices connect via wireless and have access to DNS?
 1. Directly connect via Wifi?
 2. Connect via VPN?
 - ii. Does mobile device have access to the subnets where the printers are located?
2. Setup a “Search Domain” to point to the DNS server.
 - a. Add DHCP scope option 15: “`div01.thiscompany.com`”
 - b. Configure VPN to vend search domain: “`div01.thiscompany.com`”
3. Setup a new server to act as the JAC Discovery Server.
 - a. Bare metal server or VM.
 - b. Windows Server 2012 R2, running DNS.
 - c. Assume server name: `jacdiscserver`
 - d. Add server to Domain.
4. In the JAC Discovery Server DNS Manager, create new a forward zone:
 - a. Zone name: `hpprinters.div01.thiscompany.com`
5. Add a new “Delegation” to the DNS server to delegate all requests that reference the JAC printer zones to the JAC Discovery Server.

```
hpprinters           NS       jacdiscserver.div01.thiscompany.com.
```

6. Add DNS-SD records to the DNS server, which point to JAC printer “zone”.

```
b._dns-sd._udp      PTR     hpprinters.div01.thiscompany.com.
db._dns-sd._udp     PTR     hpprinters.div01.thiscompany.com.
r._dns-sd._udp      PTR     hpprinters.div01.thiscompany.com.
dr._dns-sd._udp     PTR     hpprinters.div01.thiscompany.com.
lb._dns-sd._udp     PTR     hpprinters.div01.thiscompany.com.
```

7. Configure the JAC Discovery Server to include records for all printers or print servers to be discoverable by mobile clients.
 - a. Run the Discovery Setup Utility on the JAC Discovery Server, providing a list of IP addresses for printers or an MPL list of printers

```
C:\HpJac\HP.jacdiscsetup.exe addprinters -l <address list file name>
```

OR

```
C:\HpJac\HP.jacdiscsetup.exe run --mplfile <MPL file name>
```

- b. Load DNS files into the JAC Discovery Server DNS

```
copy C:\HpJac\output\*.dns C:\Windows\System32\DNS
```

In the JAC Discovery Server DNS Manager, reload the DNS file, and refresh the zone.

9 Appendix B – Notes on using BIND DNS (*named*) on OS X Server

The Discovery Server can be setup on OS X Server. OS X Server provides a DNS service using BIND (also known as *named*) which provides all the necessary capabilities to support DNS-SD. As noted earlier in this document, the Discovery Setup Utility can be run on OS X using the Mono framework. The operation of the Discovery Setup Utility on OS X is the same as what has been described earlier in this document.

There has been observed an issue with the OS X Server Manager application (version 5.0.15) where when DNS data files are loaded into DNS, the Server Manager application does not display the DNS records correctly. In fact, the Server Manager application displays an error message “Error Reading Settings” when attempting to display the DNS records when DNS-SD records are present. This error appears to only affect the Server Manager application, and does not impact the actual behavior of the BIND/named DNS service. The BIND/named DNS service works as expected, and supports DNS-SD.

The general procedure for Loading the DNS files on OS X Server is as follows:

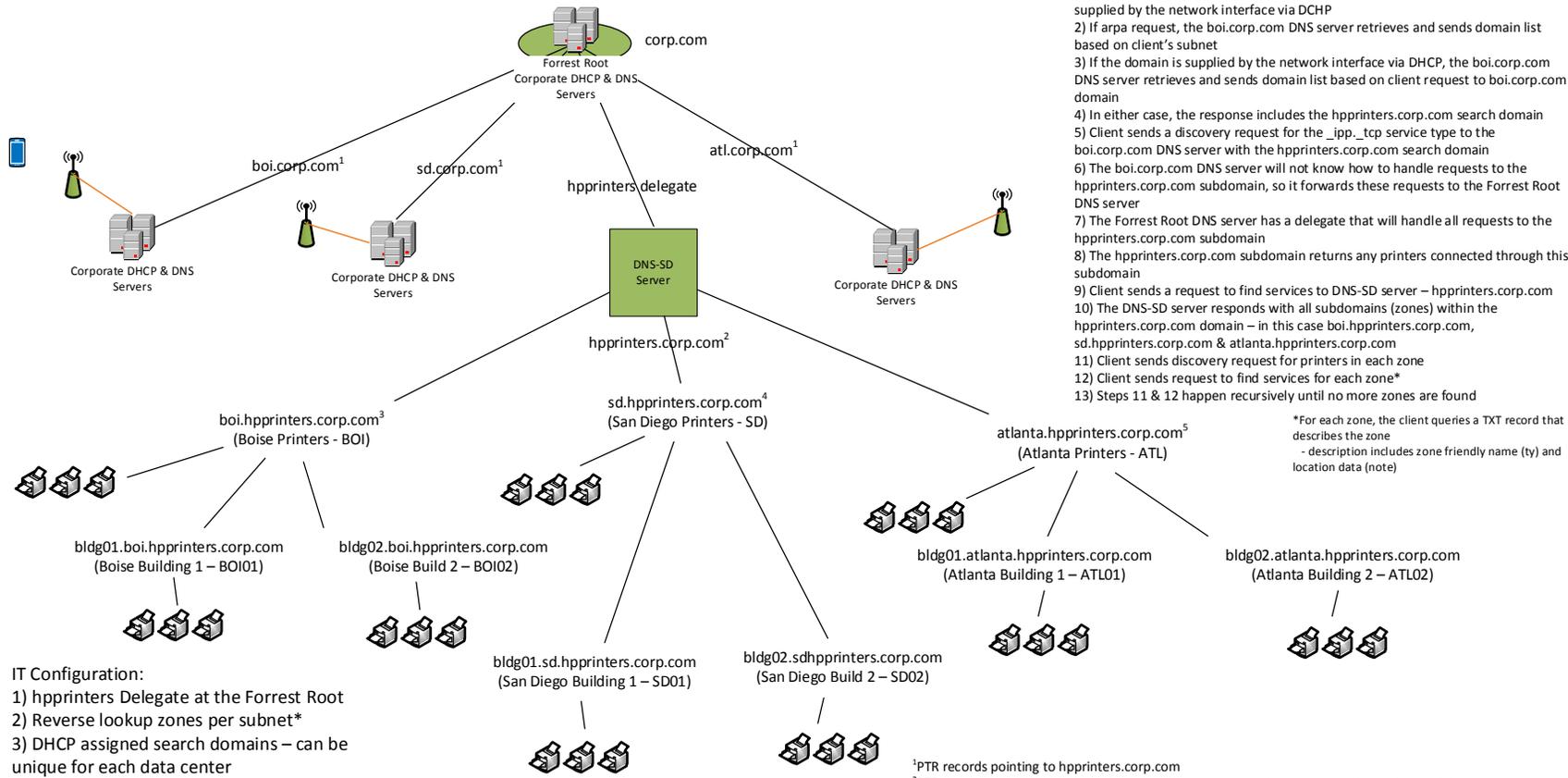
1. Run the Discovery Setup Utility to create the DNS data files for each required printer zone.
2. On OS X, the DNS data files will be named: “db.<zone name>.dns”. By convention, the files should get renamed to simply be “db.<zone name>”
3. Copy the DNS data files to the DNS directory: `/Library/Server/named`
4. Add the zones to DNS by editing the file `named.conf` (located in the `/Library/Server/named` directory).
5. Restart the DNS service.
 - a. It is not recommended to use the OS X Server Manager to restart the DNS service.
6. Verify that the zone files are loaded into DNS successfully by examining the log file: `/Library/Logs/named.log`

10 Appendix C – Notes on Multi-site Configurations.

The following pages capture notes and diagrams for some potential Discovery Server configurations that could be used to accommodate corporate DNS configurations across multiple geographic sites.

Note that in the following diagrams, the term “DNS-SD Server” is analogous to “Discovery Server”.

Multi-site Client Discovery (direct company access)



Example Sequence of events

- 1) Client sends a request to find services to boi.corp.com
 - either an arpa request based on client's subnet or a request to a domain supplied by the network interface via DHCP
- 2) If arpa request, the boi.corp.com DNS server retrieves and sends domain list based on client's subnet
- 3) If the domain is supplied by the network interface via DHCP, the boi.corp.com DNS server retrieves and sends domain list based on client request to boi.corp.com domain
- 4) In either case, the response includes the hprinters.corp.com search domain
- 5) Client sends a discovery request for the _ipp._tcp service type to the boi.corp.com DNS server with the hprinters.corp.com search domain
- 6) The boi.corp.com DNS server will not know how to handle requests to the hprinters.corp.com subdomain, so it forwards these requests to the Forrest Root DNS server
- 7) The Forrest Root DNS server has a delegate that will handle all requests to the hprinters.corp.com subdomain
- 8) The hprinters.corp.com subdomain returns any printers connected through this subdomain
- 9) Client sends a request to find services to DNS-SD server – hprinters.corp.com
- 10) The DNS-SD server responds with all subdomains (zones) within the hprinters.corp.com domain – in this case boi.hprinters.corp.com, sd.hprinters.corp.com & atlanta.hprinters.corp.com
- 11) Client sends discovery request for printers in each zone
- 12) Client sends request to find services for each zone*
- 13) Steps 11 & 12 happen recursively until no more zones are found

*For each zone, the client queries a TXT record that describes the zone
 - description includes zone friendly name (ty) and location data (note)

IT Configuration:

- 1) hprinters Delegate at the Forrest Root
- 2) Reverse lookup zones per subnet*
- 3) DHCP assigned search domains – can be unique for each data center

*Each reverse lookup zone contains b and lb PTR records that point to specific search domains (zones) for the subnet – one or more zones can be added

¹PTR records pointing to hprinters.corp.com

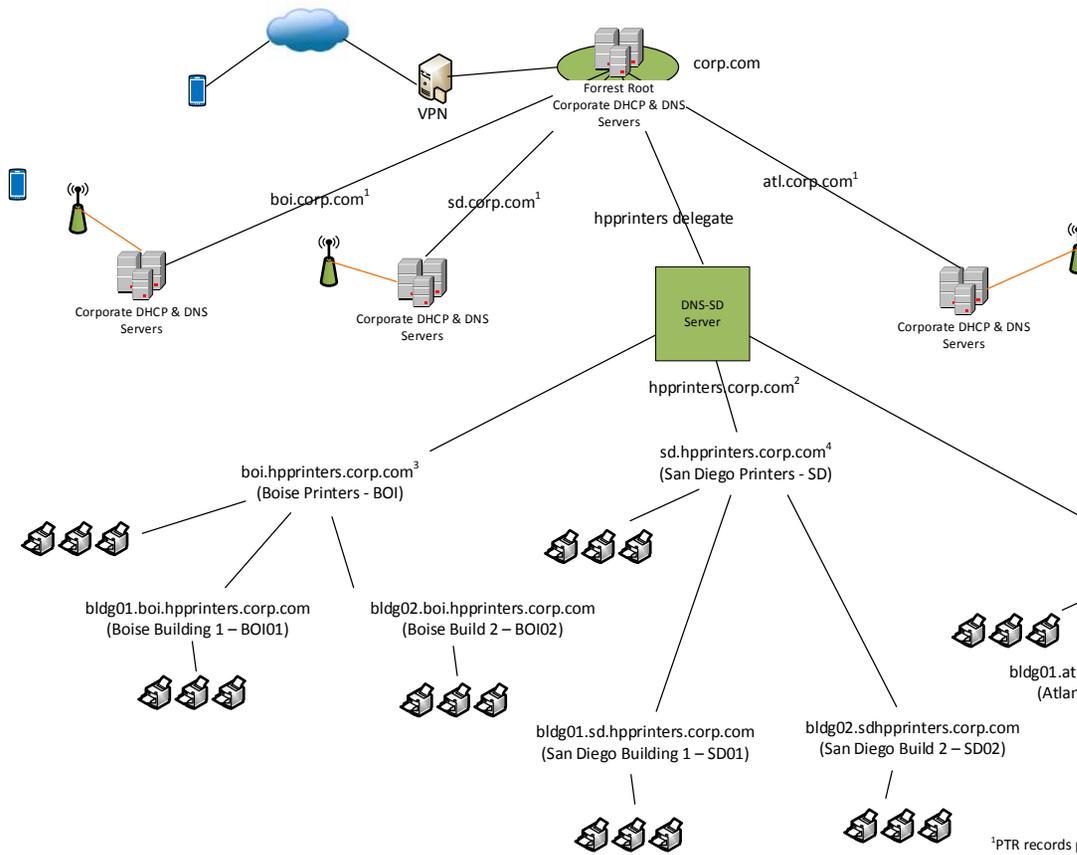
²PTR records pointing to boi.hprinters.corp.com, sd.hprinters.corp.com & atlanta.hprinters.corp.com

³PTR records pointing to bldg01.boi.hprinters.corp.com & bldg02.boi.hprinters.corp.com

⁴PTR records pointing to bldg01.sd.hprinters.corp.com & bldg02.sd.hprinters.corp.com

⁵PTR records pointing to bldg01.atlanta.hprinters.corp.com & bldg02.atlanta.hprinters.corp.com

Multi-site Client Discovery (VPN access)



Example Sequence of events

- 1) Client connects through a VPN, giving client access to company resources
- 2) Client sends a request to find services through VPN
 - ISSUE: Clients are not typically given a valid subnet mask (or put on a subnet) when connecting through a VPN. And the VPN does not typically pass along search domain(s) configured through a DHCP server. When such is the case, the search domain(s) need to be manually configured in the VPN settings. However, iOS does not expose the ability to configure search domains with the in-OS VPN client. Search domains can be manually configured via the Android in-OS VPN client.
- 3) If search domains are supplied, the DNS server configured for the VPN responds with additional domains – hprinters.corp.com is one of those search domains
- 4) Client sends a discovery request for the _ipp._tcp service type to the DNS server to the hprinters.corp.com search domain
- 5) The DNS server does not know how to handle requests to the hprinters.corp.com subdomain, so it forwards these requests to the Forrest Root DNS server
- 6) The Forrest Root DNS server has a delegate that will handle all requests to the hprinters.corp.com subdomain
- 7) The hprinters.corp.com subdomain returns any printers connected through this subdomain
- 8) Client sends a request to find services to DNS-SD server – hprinters.corp.com
- 9) The DNS-SD server responds with all subdomains (zones) within the hprinters.corp.com domain – in this case boi.hprinters.corp.com, sd.hprinters.corp.com & atlanta.hprinters.corp.com
- 10) Client sends discovery request for printers in each zone
- 11) Client sends request to find services for each zone*
- 12) Steps 10 & 11 happen recursively until no more zones are found

*For each zone, the client queries a TXT record that describes the zone
 - description includes zone friendly name (ty) and location data (note)

¹PTR records pointing to hprinters.corp.com

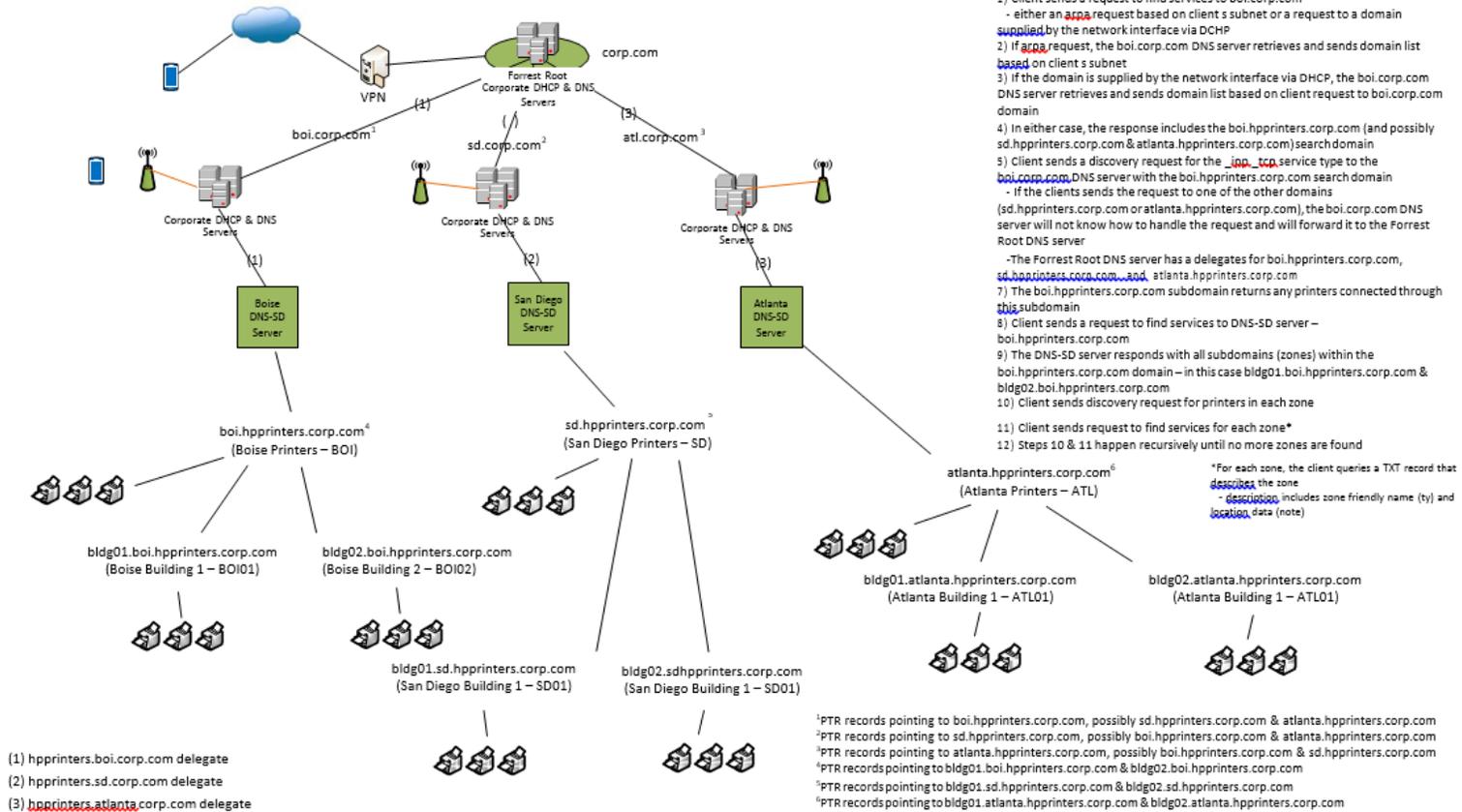
²PTR records pointing to boi.hprinters.corp.com, sd.hprinters.corp.com & atlanta.hprinters.corp.com

³PTR records pointing to bldg01.boi.hprinters.corp.com & bldg02.boi.hprinters.corp.com

⁴PTR records pointing to bldg01.sd.hprinters.corp.com & bldg02.sd.hprinters.corp.com

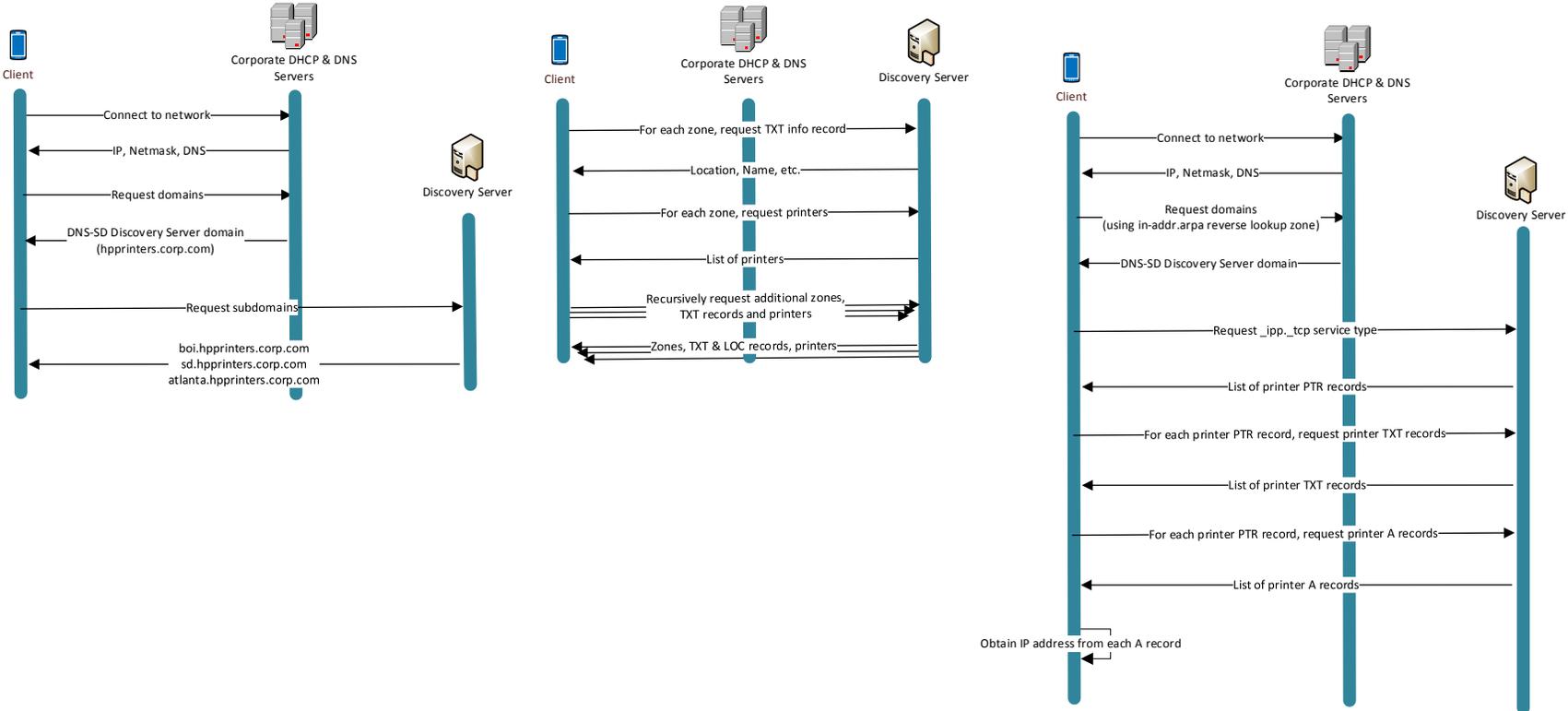
⁵PTR records pointing to bldg01.atlanta.hprinters.corp.com & bldg02.atlanta.hprinters.corp.com

Multi-site Client Discovery (single DNS-SD server per site zone)



Note: Lab validation of this configuration is still pending. |

Multi-site Client Discovery (VPN access)



11 Appendix D - Troubleshooting

11.1 Display the DNS servers and search domains that are set (Mac OS X client only)

Connect a Mac OS X (10.11.x) client to the network under test, and open a terminal window.

This step will verify that search domains have been configured correctly.

```
scutil --dns
```

Use this command to view the current DNS configuration. The first resolver displayed is the “default”, and should show the IP address of the main DNS server (nameserver), and the search domains that are set.

If no search domains are set, then DNS-SD queries will not be possible. Check the DHCP and/or VPN configuration to make certain that the correct search domain is set.

11.2 Troubleshooting using *dns-sd* command (Mac OS X and Windows)

The *dns-sd* command line tool is available natively in Mac OS X (10.11.x).

This tool can also be installed on Windows through the Bonjour SDK for Windows at:

<https://developer.apple.com/bonjour/>

Connect either a Mac OS X (10.11.x) client or a Windows client (with the Bonjour SDK installed) to the network under test to run *dns-sd*. *dns-sd* is a command line tool, and must be run from either an OS X Terminal window or from a Windows command prompt.

11.2.1 Display a list of domains available for browsing

This step will verify that the DNS-SD records have been setup correctly on the DNS server.

```
dns-sd -F
```

When the DNS server is configured correctly, you should see your printer zones listed in the list recommended browsing domains.

If your printer zones are not include in the list, check the DNS-SD records that were created on the DNS Server and verify that they are correct.

11.2.2 Display a list of printers (print services) for a zone

This step will verify that the Discovery Server has been correctly configured, and that the delegation from the DNS server to the Discovery Server is correct.

```
dns-sd -B _ipp._tcp <zone name>
```

The list of configured printers will be shown. If the JAC Print Server is setup in the zone listed, it should be shown in the list of print services.

If no printers are shown in the list for a particular zone, check the delegation (on the DNS server) for that zone and verify that it is correct.

If the delegation is correct, check the DNS configuration on the Discovery Server by using the following command line:

```
dns-sd -Z _ipp._tcp <zone name>
```

This command line will cause a list of DNS records to be displayed. This list should include the following:

1. A PTR record for `lb._dns-sd._udp`.
2. PTR, SRV, and TXT records for each printer in the zone.

If no records are displayed, check to verify that the DNS data file has been loaded successfully into the DNS service on the Discovery Server.

If records are still not displayed, the following steps may be necessary:

1. Clear the DNS cache for the DNS service on the Discovery Server.
2. Restart the DNS service on the Discovery Server.
3. Clear the DNS cache for the DNS service on the DNS Server.
4. Restart the DNS service on the DNS Server.

11.3 Verify correctness of DNS records for a zone

The DNS Data file for each printer zone should include the DNS records listed below.

1. DNS-SD records created for that zone:

```
b._dns-sd._udp PTR <zone name>
db._dns-sd._udp PTR <zone name>
r._dns-sd._udp PTR <zone name>
dr._dns-sd._udp PTR <zone name>
lb._dns-sd._udp PTR <zone name>
```

2. DNS records for each printer created within that zone:

a. A Record (with the IP address of the printer)

```
<printer name> A <ip address>
```

b. SRV Record

```
<printer name>._ipp._tcp SRV 0 0 631 <printer name>.<zone>
```

c. TXT Record

```
<printer name>._ipp._tcp TXT <TXT record data>
```

d. PTR Record

```
<printer name>._ipp._tcp PTR <printer name>._ipp._tcp.<zone>
```

e. PTR Record

```
_cups._sub._ipp._tcp PTR <printer name>._ipp._tcp.<zone>
```

f. PTR Record

```
_universal._sub._ipp._tcp PTR <printer name>._ipp._tcp.<zone>
```

11.4 Verify printers

If a particular printer is expected to be displayed in the list of configured printers, but is not, the following steps may help diagnose the issue.

11.4.1 Verify that the Printer is online

Ping IP address of the printer to verify that the printer is connected on the network and online.

```
ping <ip address>
```

If you are unable to ping the printer, check to make sure the printer is connected on the network, powered on, and that the IP address is correct.

If the printer was not connected or offline when the Discovery Setup Utility was run, or if an incorrect IP address was used when the Discovery Setup Utility was run, DNS records for that printer were not created. After correcting the situation (powering up the printer, connecting it to the network, or observing the correct IP address), it will be necessary to re-run the Discovery Setup Utility to setup the records for this printer. Please use the `addprinters` command with the `-a (--ipaddress)` option.

11.4.2 Verify that the printer supports IPP

Printers must support Internet Printing Protocol (IPP) in order to be supported by JetAdvantage Connect. If a printer does not support IPP, DNS records for that printer will not be created when the Discovery Setup Utility is run, and thus will not be displayed in the list of configured printers.

`ipptool` is a diagnostic tool that can be used to query a printer to determine if it supports IPP or not. The tool can be downloaded at: <https://www.cups.org/software.php>, and can be run on Windows, OS X, and Linux.

A simple IPP query can be made using `ipptool` as follows

```
ipptool -4 -v -X http://<printer ip address>/ getdescription.ipp.txt
```

Where `getdescription.ipp.txt` is a text file that contains the following:

```
IGNORE-ERRORS yes
{
    NAME "Get printer attributes using Get-Printer-Attributes"
    OPERATION Get-Printer-Attributes
    GROUP operation-attributes-tag
    ATTR charset attributes-charset utf-8
    ATTR language attributes-natural-language en
    ATTR uri printer-uri $uri
    ATTR keyword requested-attributes
printer-make-and-model
}
```

If a printer supports IPP, `ipptool` will display the XML result returned by the printer, and the `<string>` field for the `printer-make-and-model` will be filled in with the value corresponding to the printers make and model name.

If a printer does not support IPP, `ipptool` may show an error message. In some cases, `ipptool` may show output, but the `printer-make-and-model` will not be filled in.

While this is not a comprehensive test for IPP compliance, this does provide an initial indication if a printer does support IPP or not.