VIRTUAL PRINTING SOLUTIONS WITH VIEW IN HORIZON 7
VMware Horizon 7.x
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Overview
Access to printers is an important requirement for all virtual desktop infrastructure (VDI) and published-application environments. Typically, each desktop is configured to access one or more network printers. In many scenarios, this arrangement is sufficient. In other cases, mobile users also need to connect to their View desktops from different locations, sometimes from outside the corporate network.

Regardless of the scenario, end users must be able to send print jobs to the nearest available printer. IT administrators also need an easy way to manage printers and printer drivers.

VMware Horizon® 7 satisfies both requirements with two advanced features for printing from View virtual desktops: printer redirection and location-based printing.

Printing from virtual desktops or virtual applications is called virtual printing. This paper discusses the types of virtual printing for View desktops, use cases, the data flow and topology, and how to configure printer redirection and location-based printing.

Printer Redirection
Printer redirection enables end users to send print jobs from a View virtual desktop to a network printer or to a printer locally attached to the user’s client device. There is support for a wide range of client devices, including Windows and Linux PCs, Macintosh computers, and thin and zero clients. PCs and Macs need to run VMware Horizon Client™ software, which redirects print jobs from the View desktop or published application to a network printer or a locally attached printer.

Network and locally attached printers are supported and displayed on the View desktop—either in the application print dialog or in the system control panel—so that end users can select the printer they want to use for a given print job. Network printers are accessed across the local network. Local printers can be attached to the USB, serial, or parallel ports of users’ client devices.

Printer redirection is especially useful with

• Printers directly connected to USB or serial ports on the client device
• Specialized printers such as bar code printers and label printers connected to the client
• Network printers on a remote network that are not addressable from the virtual session.

With printer redirection, printer driver management is simplified for the IT administrator. The View desktop or RDSH server hosting the application is not required to have the printer driver as long as the printer driver is correctly installed on the client device.

Location-Based Printing
Location-based printing determines which printer to use based on the location of the end user’s client device and the mapping rules specified by the IT administrator.

The location-based approach simplifies the user experience by limiting the number of choices in a corporate environment to the printers closest to the end user’s current location. For example, suppose that when an end user connects to a View desktop from one floor of an office, the only printers available to that end user are on the same floor. When the end user moves to a different floor and logs in, the only printers available are located on that floor.

Print jobs in location-based printing are sent from the View desktop directly to the printer, which means that the printer driver must be installed on the View virtual machine master image in the data center.
There are two types of location-based printing:

- IP-based printing, using printer IP addresses to define mapping rules
- UNC-based printing, using Universal Naming Convention (UNC) pathnames to define mapping rules

For organizations that require UNC-based printing, we recommend the use of VMware User Environment Manager™ to map UNC-based printers.

Virtual Printing Compatibility Matrix

View in Horizon 7 supports several kinds of client devices. Both types of virtual printing solutions can be configured for end users who access View desktops from Windows, Linux, or Macintosh computers, or from thin clients.

For those end users who use zero or mobile clients, or HTML access, location-based printing is the only option.

Table 1 lists access methods and the applicable virtual printing solutions.

<table>
<thead>
<tr>
<th>ACCESS METHOD</th>
<th>PRINTER REDIRECTION</th>
<th>LOCATION-BASED PRINTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows client</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Linux client</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Mac client</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>iOS client</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>Android client</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>Windows 10 UWP client</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>HTML access</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>Chrome OS</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>Zero client</td>
<td>×</td>
<td>✓</td>
</tr>
</tbody>
</table>

Table 1: Virtual Printing Solution Matrix for Horizon Clients

Because printer redirection requires that printer drivers be installed on client devices, it is not supported on zero clients, mobile clients, or HTML access. However, both printer redirection and location-based printing are supported on virtual desktops and virtual applications, including:

- View desktops
- RDSH desktops
- Windows Server 2008 R2 and Windows Server 2012 R2 desktops
- Published applications
Use Cases and Topology

This section describes the use cases and topology for each type of virtual printing solution.

**Printer Redirection**

Printer redirection suits those end users working from home or outside the corporate network who want to send documents from a View desktop or a published application to a printer locally attached to their client device. Printer redirection is designed in particular for

- Users who work at home, or in hotels or customer offices, and use printers attached to their client devices
- Users who work in an office and rarely move from one location

Figure 1 shows a common printer redirection topology in a View virtual desktop environment.

![Diagram of Printer Redirection](image)

**Figure 1: Printer Redirection**

The client device is connected to multiple printers, including a locally attached USB printer and network-based office printers. The end user connects to the View desktop from the client device over PCoIP or RDP and can print documents to any of the printers illustrated.
The components and data-transfer path for printer redirection are shown in Figure 2. There is no need to install a printer driver on the View master image.

Figure 2: Printer Redirection Components and Data Transfer

In this scenario, the end user initiates a print request, which the Horizon Client sends to the View virtual machine. Virtual Printing, a component installed with the Horizon Agent in the View master image, sends an Enhanced Metafile (EMF) back to Horizon Client. Horizon Client sends the EMF to the natively installed printer driver for rendering. The rendered data is then sent for printing to a locally attached printer or a network printer.
Location-Based Printing

Some end users have requirements that cannot be met by printer redirection. For example, doctors walk from one patient room to another in a hospital and need their print jobs to be executed on the nearest printer. Location-based printing allows them to retrieve their documents from any printer. They are not forced to use a specific printer every time.

The topology of location-based printing is illustrated in Figure 3.
Location-based printing differs slightly from printer redirection. The client device connects to the View virtual machine, which then connects to the printers. There are two types of location-based printing: IP-based and UNC-based printing.

Figure 4 illustrates the components and data transfer in IP-based printing.

![Figure 4: IP-Based Printing Components and Data Transfer](image)

The end user sends a print request from an application on the View desktop. The application then sends the data to the printer driver on the View virtual machine for rendering. After rendering, the data is sent to the printer. The administrator can control the mapping between the client device and the printer by defining policies in the Active Directory or by using a script.

The key requirement of location-based printing is that the printers must be accessible from the View desktop or a published application, either directly or through mapping. Printers that cannot be accessed in either fashion, such as those used in offsite locations, need to be configured for printer redirection instead.
Follow-Me Printing Using VMware User Environment Manager

VMware User Environment Manager, part of VMware Horizon 7 Enterprise Edition, manages end-user profiles and provides an easy way to map printers. With this feature, a “follow-me” printing solution can be delivered with convenience as well as high performance. This is an easier to manage alternative to the Horizon 7 location-based printing feature described above.

The following screenshot gives an example of setting up printer mapping with User Environment Manager:

![Figure 5: Example Printer Mapping Settings in User Environment Manager](image)

One of the powerful features of printer mapping with User Environment Manager is that printers can be mapped at different times based on your specific needs.

- Printers can be mapped during the user login process. Printers are ready immediately after the login process completes.
- Printers can alternatively be mapped when a user launches an application that needs a specific printer, and the mapping can be deleted after the application exits. This streamlines the login process because the printer is mapped only when and if the user actually needs it.
Conditions can also be set when printers are mapped to get a full user-context-based printer solution. Here are some examples of the conditions:

- **Printer mapping based on endpoint properties like IP address range or host name** - Printers can be mapped based on the location of the endpoint so that a user always has a printer near their physical location. This provides a “follow-me” printer solution, ideal for roaming users.

- **Printer mapping based on Horizon Client properties, such as client location and pool name** - For example, this feature can dynamically identify whether a user is on an internal or external connection, and map an appropriate printer. The feature can even disable printer redirection entirely so a user at home would be unable to print, if that is the desired outcome.

- Mapping based on user’s organizational unit (OU).

For more details on condition settings, refer to the VMware User Environment Manager Documentation.
Configuring Printer Redirection
The tasks required to configure printer redirection are:

1. Install Virtual Printing on a View master image.
2. Configure the client device to use printer redirection.

Install Virtual Printing on the View Master Image
View virtual desktops use the Virtual Printing component of the Horizon Agent to perform printer redirection.

To enable Virtual Printing from a View desktop, install the Virtual Printing component when you install the Horizon Agent on the View master image. This is selected by default.

The Virtual Printing component redirects printers from the client device to the View virtual machine and compresses and sends data from the View virtual machine to the client device for printing on a locally attached or network printer.
Configure the Client Device
Before the Virtual Printing component redirects printers to the View virtual machine, confirm that printer drivers are installed on the client devices. The following screenshot provides an example:

![Devices and Printers](image)

After the printer drivers are installed, you can configure printer redirection on the client device.

Configure Printer Redirection on Client Devices
Configuring printer redirection varies by device type, therefore specific steps are provided in the following sections.

Configure Printer Redirection in Windows
To configure printer redirection for View on a computer running Windows, install Horizon Client.

Configure Printer Redirection in Linux
To configure printer redirection for View on a computer running Linux:
1. Install Horizon Client v 3.4 or later.
2. During the installation, the virtual printing service can be selected for installation and launch. When the user launches the client, a configuration file is automatically created and placed in the user's home directory.

For more detail about installing virtual printing on a Linux client refer to the Using VMware Horizon Client for Linux document.
Configure Printer Redirection in Mac OS X
To configure printer redirection for View on a Mac:

1. Install [Horizon Client](https://www.vmware.com/products/horizon-client).  
2. Enable the printing service in one of several ways:
   - Enable the printing service the first time you launch [Horizon Client](https://www.vmware.com/products/horizon-client).
   - Enable virtual printing before connecting to a View desktop or an application.
   - Enable virtual printing after connecting to a desktop.

   **Note:** See the [VMware Horizon Client for Mac Documentation](https://www.vmware.com/support/pubs/horizon_client_for_mac.html) for detailed steps to enable the printing service in Horizon Client on a Mac.

Configure Printer Redirection in Thin Clients
To configure printer redirection on a thin client:

1. Look up the configuration, according to the type of OS, in the [VMware Compatibility Guide](https://www.vmware.com/products/compatibility-guide.html), which provides a list of thin clients that support printer redirection.
2. Under **Custom Setup**, select the **Virtual Printing (printer redirection)** option.
3. Select one of the supported operating systems, such as WES 7 Embedded Thin Client.

Setting Printing Preferences and Printing
After you configure the Horizon Agent on the View master image and Horizon Client on the end user’s client device, end users can set printing preferences both from the View desktop and from published applications.

Set Preferences from a Desktop
For connections to a View, RDSH, or Windows Server 2008 R2 or Windows Server 2012 desktop:

1. To see the default printer, open **Devices and Printers**.
   
   The printers attached to the client device are now redirected and listed on the View desktop.


   Only the default printer from the client device is listed here.
2. To see all the redirected printers, right-click the listed redirected printer. All the printers redirected from the client device are listed. You can change the default printer and set printing preferences for each printer. These actions do not affect the printers when they are accessed directly from the client device.

The following example shows several printers redirected from the client device.

![Redirected Printers](image.png)

**Note:** End-user modifications to a printer from a desktop remain in effect whenever that user submits a print job, regardless of application.

**Set Preferences from a Published Application**

For connections to a published application, end users can select a printer and set printing preferences while printing from the application. The following example shows the selection of a printer to print a text file from a published application. Printing preferences can also be changed from this dialog.

![Published Application Print Preferences](image.png)

**Note:** End-user modifications to a printer from a published application remains in effect whenever the user submits a print job from that application, but do not apply to other applications.
Configuring Location-Based Printing

The following sections provide instructions for configuring location-based printing by IP address.

Configure IP-Based Printing

Before configuring IP-based printing, install Virtual Printing and the printer drivers on the View master image in the data center. For specific instructions, see Install Virtual Printing on the View Master Image and the printer manual that the manufacturer supplies with the printer.

To configure IP-based printing in a View environment:

1. Register the location-based printing group policy DLL file in the Active Directory server that your View Connection Server uses. Alternatively, register the DLL file to the domain computer that you use to configure group policies.

   See Register the Location-Based Printing Group Policy DLL File in Setting Up Desktop and Application Pools in View for Horizon 7 version 7.0 and earlier, or the same section in Configuring Remote Desktop Features in Horizon 7 for Horizon 7 version 7.1 and later.

2. Configure the mapping rules in the group policy.

   The mapping rules are defined in the Active Directory group policy setting, AutoConnect Map Additional Printers for VMware View. Refer to Configure the Location-Based Printing Group Policy in Setting Up Desktop and Application Pools in View for Horizon 7 version 7.0 and earlier, or the same section in Configuring Remote Desktop Features in Horizon 7 for Horizon 7 version 7.1 and later.

   The following example shows mapping rules:

   The path of the group policy is GPOName > Computer Configuration > Software Settings > AutoConnect Map Additional Printers for VMware View, where GPOName is the name of the GPO you are editing.

3. Double-click Configure AutoConnect Maps Additional Printers.

   In the AutoConnect Map Additional Printers for VMware View dialog box, the table contains a mapping rule in each row, and eight columns. The meaning of each column is described in Location-Based Printing Group Policy Setting Syntax in Setting Up Desktop and Application Pools in View for Horizon 7 version 7.0 and earlier, or the same section in Configuring Remote Desktop Features in Horizon 7 for Horizon 7 version 7.1 and later.
Note: The last three columns: Printer Name, Printer Driver, and IP Port/ThinPrint Port, are mandatory. The backgrounds of these columns are red if they are empty. You cannot apply the modifications without completing these fields unless you delete this row.

In the example, the network printer specified in the second row is mapped to a View desktop only if the client system has an IP address in the range 192.168.1.100 through 192.168.1.200.

4. As the settings are machine Group Policy configurations, the virtual desktop will need to have the policy applied. There are several ways to get Windows to reapply its machine GPO including:
   • Reboot the View virtual machine(s).
   • Configure the GPO before you create the desktop pool or recompose and push a new image to the pool.

The following example shows the result with the mapping rule configured in step 2 above:

Find Printer Information
Use the following steps to find the printer name, printer driver, and IP port or ThinPrint port:

1. Log in to a desktop where you can access the printers or print servers.
2. Click Start and run MMC.
3. In the file menu, select Add/Remove Snap-in.
4. Scroll down the list and select the Print Management snap-in, and click Add.
5. In the dialog, click Browse to select the server that manages the printer you are looking for.
6. Click Add to List.
7. If the printer is connected to the desktop that you are using, click **Add the Local Server.**

![Add Local Server](image)

8. Click **Finish.**

9. In the **MMC**, expand **Print Management > Print Servers > <your print server>**, and select **Printers.** The information for all of the printers is shown in the right panel.

**Element Size Limit Calculations**

The size of a standard format registry element value should not be larger than 1 MB. The group policy setting **AutoConnect Map Additional Printers for VMware View** from the Active Directory is loaded into the following registry key on the View virtual machine:

```
HKLM/SOFTWARE/Policy/thinprint/tpautoconnect/PrinterCreateListEx2
```

Consequently, the maximum size of the mapping rules is 1 MB. If the average length of each rule is 256 bytes, then the maximum number for one rule is about 5,000. If the single IP address is used in the mapping rules, then only 5,000 client devices can be involved in this configuration. For more information, see [Registry Element Size Limits](#).

VMware recommends using the IP range in the rules rather than a single IP address in MAC addresses to reduce the number of required rules. If this method does not meet your requirements, there are third-party solutions, such as [Cortado ThinPrint](#).
Integration with Third-Party Printing Solutions
VMware supports integration with third-party printing solutions such as Cortado ThinPrint to cover cases when there are additional printing requirements, such as
- Central management of printer drivers
- Deployment of UNC-based printing for multiple branch offices

This section describes how the integration of View and Cortado ThinPrint works. This solution includes the following software from VMware and Cortado:

- View in Horizon 7
- Horizon Client
- ThinPrint Engine
- ThinPrint AutoConnect
- ThinPrint Management Center
- ThinPrint Client

Figure 6 illustrates one possible scenario for the integration between Horizon 7 and ThinPrint.
The integrated solution has three main parts:

- **Data center** – All the servers, desktops, and domain controllers reside in the data center.
  - View desktops, RDSH desktops, Windows Server 2008 and Windows Server 2012 R2 desktops, and published applications
    - Central print server – ThinPrint Management Center and ThinPrint Engine
    - Active Directory with ThinPrint AutoConnect – Used to control the Group Policy Object
- **Locations** – A location is a logical concept. Each location has Horizon Client software, printers, and a local print server or gateway. Print jobs launched by Horizon Client are handled by the printers in the same location.
- **Home or mobile users** – Users who initiate print jobs that are handled by their locally attached printers.

This solution uses driver-free printing. The central print server manages all of the printer drivers, so that neither View virtual machines nor client devices with Horizon Client software require separate printer drivers.

To set up this type of integration solution:

1. Set up Horizon 7.
   See the [VMware Horizon 7 Documentation](#).
2. Make sure that Virtual Printing is installed with the Horizon Agent.
   See [Install Virtual Printing on the View Master Image](#).
3. Set up and configure the ThinPrint environment, including the ThinPrint Central print server, ThinPrint Engine, and ThinPrint Management Center.
   See the [ThinPrint Documentation](#) website.
4. Install ThinPrint AutoConnect on the Active Directory.
   Two items are added to the Group Policy Objects after ThinPrint AutoConnect is installed:
   - ThinPrint AutoConnect Map Additional Printers
   - ThinPrint AutoConnect Dynamic Printer Matrix

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**Note:** If you configure the location-based printing group policy DLL file before installing ThinPrint AutoConnect on the same Active Directory, the **AutoConnect Map Additional Printers for VMware View** item disappears. The **ThinPrint AutoConnect Map Additional Printers** item inherits the content of the table. For further details, see [Register the Location-Based Printing Group Policy DLL File in Setting Up Desktop and Application Pools in View](#) for Horizon 7 version 7.0 and earlier, or the same section in [Configuring Remote Desktop Features in Horizon 7](#) for Horizon 7 version 7.1 and later.
5. Configure the mapping rules using the Dynamic Printer Matrix and Map Additional Printers tables in the Group Policy Object.
For more information see the ThinPrint White Papers website.
Summary
This paper describes two types of virtual printing solutions: printer redirection and location-based printing. Details for each solution cover the use cases, the data flow and topology, and the configuration steps. Finally, the procedures for integration with a third-party solution are discussed to enable virtual printing integration between View and a third-party product such as Cortado ThinPrint.

Additional Resources
Enhanced Metafile
Registry Element Size Limits
ThinPrint Website
VMware Compatibility Guide
VMware Horizon 7 Documentation
VMware Horizon Client Documentation
Choosing Printing Options for VMware Horizon 7 (VMware blog post)
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