PRINTERON
PRINT SIMPLY ANYWHERE

Remote Printing

A PrinterOn White Paper

mobile printing solutions | enterprise | education | public printing locations

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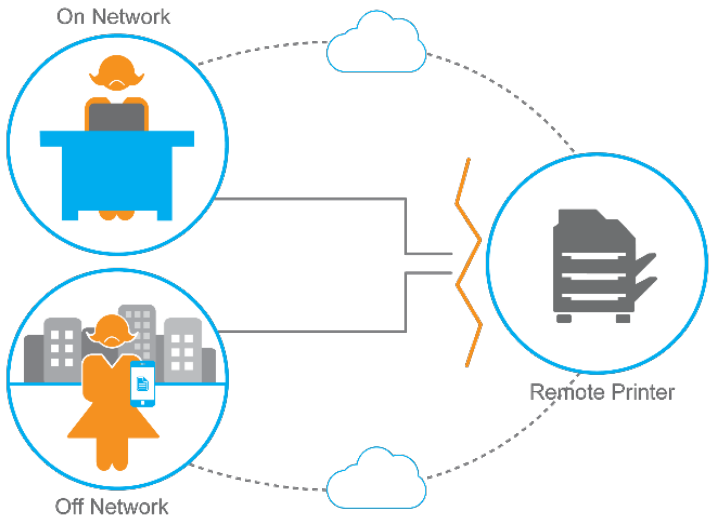
Introduction to Remote Printing

The world is rapidly moving to a do-business-anywhere-at-anytime mode. The Internet and related technologies have made this possible. With the underlying business processes that support this new mode, document printing should be considered *earlier* in the business transformation process instead of *later*. The rationale is that printing actually facilitates many critical business processes. Orders and fulfillment are one example.

Leaving printing considerations to later makes it difficult, and sometimes impossible, to transform business processes because the printing step of the process is too difficult or expensive to deploy and support. Reasons for this include IT infrastructure changes, carrier network lead times, and security requirements.

A segment of these revised business processes involves a subject called *Remote Printing*. Remote Printing enables secure print data delivery and release between multiple networks over the Internet to the intended recipient. The sender connects to printing software on the originating network and is able to securely print to the receiving network, even though the originating and receiving networks are not connected, except by the Internet.



Remote printing functionality comes into play in use cases such as:

- A manufacturer needing to print shipping documents to their 3rd party warehousing contractor
- A hospital needing to print lab test results to a printer at a doctor's office
- Corporate home office workers printing at home just as in the office
- An organization moves their ERP system "to the cloud" and needs to print to the same printers on their local trusted network
- Printing across separate disparate networks as a result of divestitures or acquisitions
- Users with Virtual Desktop Integration (VDI) technology, such as Citrix, who need to print to printers on the trusted network

Here are some of the challenges in actually *implementing* Remote Printing services:

1. Networking issues involving connecting two or more disparate networks
2. Cost barriers related to setting up and running network infrastructure to multiple remote endpoints
3. Security compliance related to authenticating, encrypting, and tracking remote print jobs
4. Bandwidth consumption concerns caused by sending uncompressed print data streams across wide area networks
5. Training impacts caused by disrupting users' application habits simply to accommodate printing to a remote location

The big picture solution to implementing Remote Printing is to view the solution as a *service platform solution,* not an *application point solution*. A Remote Printing service platform should address the need to handle a remote printing request from any device, anywhere. It should easily and securely deliver output to any printer, anywhere, without disrupting the user workflow. And it should meet all compliance and governance requirements.

This paper will examine the drivers in the market leading to the increased demand for Remote Printing. Then it will detail the business use cases for Remote Printing services and the challenges to implementing them. Next it will take a step back and lay out a general solution architecture for a Remote Printing service *platform* and note some evaluation criteria for selecting an off-the-shelf commercial solution and the benefits of implementation.

Remote Printing Market Drivers and Enablers

The market drivers for Remote Printing are ultimately related to the need for businesses to simultaneously increase sales and profits, increase customer service, and reduce costs. The Internet has obviously been the biggest enabler to accomplish this. That produced enablers such as mobile and business "cloud" services that today underpin most every business process transformation to achieve this.

Several business trends have emerged because of these enablers. Each helps to drive increases in sales and profits and/or customer service or reduce costs.

- On-premise business apps moving to 3rd party cloud service providers
- Real-time information exchange between customers and suppliers displacing batch exchange of the same information
- Increases in the "virtual workforce" at the expense of "on premise" workers

With the rise of 3rd-party cloud services such as Amazon AWS, Microsoft Azure, IBM SoftLayer, and others, many organizations have found it less costly and more convenient to move their existing business applications "to the cloud" and save fixed and ongoing costs related to IT infrastructure and support personnel.

Supply chains have increasingly exploited the availability of more total business information and the means to communicate it almost anywhere instantaneously over the Internet to tighten their supply chains from supplier to customer and related third parties in order to improve service, increase efficiencies, and cut costs. This is especially evident in industries such

as manufacturing and transportation/logistics. Entire business processes that were once run in "batch mode" with multiple transactions grouped together are now being run efficiently one transaction at a time. Many times each transaction carries a document printing requirement with it.

Given broad availability of fast, high-quality Internet connections to the home, many organizations have shifted work to employees who work from home. This saves time and money for employer and employee. It also provides increased staffing flexibility for the employer. These Corporate Office-Home Office, or "CoHo" workers are able to perform all the same job functions meeting the same corporate compliance and security as if they were sitting at desks in a central office. Many of these job functions have a need to print.

Example Remote Printing Business Use Cases

Printing Orders and Shipping Document to 3rd party Locations

A product manufacturer receives an order for products which must be fulfilled with product stored at a 3rd-party location, such as a contract warehouse. The contract warehouse has no dedicated secure connection to the manufacturer but the manufacturer needs to print customer order product pick tickets and shipping documentation directly to printers at the 3rd-party warehouse. This need is independent of the order management or ERP system the manufacturer is using.

Hospital Printing Orders to Doctor's Office

A hospital staff worker needs to securely print orders, test results, or some other type of medical records to a doctor's office. This need is independent of the business application at the hospital that is used to print. The doctor's office is independent of the hospital and not connected to its secure network.

Corporate Home Office Worker Printing

A financial services sales agent is working from their home office and is preparing for a client meeting. They must print out supporting documentation for the meeting. The home office printer must be able to print the documents from any authorized system just as if the agent were in the central office, meeting the same security and tracking requirements.

Printing from ERP or other On-Premise Systems Moved to a 3rd Party Cloud

A business who uses an on premise commercial ERP system or a custom-built system for running business functions like order management, inventory, CRM, accounting, or other functions has decided to move those systems to a 3rd-party cloud provider in order reduce the complexity of their internal IT and reduce cost. Many of those applications still need to print documents to printers behind the company firewall as part of the business process.

Printing Across Separate Trusted Networks as a Result of Divestitures or Acquisitions

A company has made several acquisitions as part of executing their growth strategy. Part of the integration of the acquired businesses is to integrate all their IT functions. However due to timelines and the complexity of the task, the business processes of the integrated company must continue even if the networks are not integrated yet. Some of those business processes involve using software at the acquiring company's location but printing documents at the acquired company's location.

Alternatively, a divestiture could occur and create the same use case: a division of a company could be sold but still uses the former parent's systems even though its trusted network connection has been severed. Some of those business processes on the former parent's systems require document printing on the divested company's printers, which are no longer connected on a single trusted network.

Trusted Network Printing Using Virtual Desktop Infrastructure (VDI) Technology

In order to simplify the application infrastructure and reduce software and support costs for both desktop and mobile, many companies have implemented Virtual Desktop Infrastructure technology from a provider such as Citrix. Some of the business processes run on applications through the VDI infrastructure have printing requirements. The VDI infrastructure does not have robust capability to print to the organization's printers.

Remote Printing Technical Implementation Challenges

In all the use cases mentioned above, there are several common themes when it comes to implementing solutions. All of them are tied to this single fact:

- There is no way to print from the network where the print job processing is occurring to a destination printer on a different network unless through a routable connection or Virtual Private Network (VPN).

Here is a list of the top technical implementation challenges in light of the fact above.

Dedicated VPN Connections

One technical solution is to implement a dedicated VPN connection between the network processing the print job and the network with the destination printer. If these connections are not in place, they can be complex, time consuming, and expensive to implement and support—especially if outsourcing to a managed services provider, like a carrier. If these connections are already in place, then more and more there is pressure to eliminate them to reduce costs. With the growth of on-demand secure connections through web browsers and other technologies the need for dedicated VPN connections to a site has gone down and the costs have stayed the same. Therefore the relative costs for supporting site-based VPN connections for printing have gone up.

Printer Discovery Services

By definition, Remote Printing uses *remote printers*. Since these printers are not on the same network as the print job processing services they are not in any kind of directory of available printers, nor are they discoverable.

Print Job Security

Many times end-to-end print job security will involve multiple pieces: user authentication, secure submission, rendering, and delivery. Secure delivery may include requirements for secure communications *and* secure print data, even at rest. Release mechanisms may also require authentication. The entire process may have to be recorded in a tracking system for compliance purposes. When the print job delivery network is not your network and there is no control of print release, it can be challenging (if not impossible) to meet security requirements.

Cumbersome and Complex Workarounds

Oftentimes in the absence of true Remote Printing services, the only options to print to remote locations are cumbersome at best and complex at worst. One example is using an email system to do it by attaching documents to an emails, sending it to a recipient at the remote location, and then having the recipient detach the document and print the attachments at the remote location. Although this methods technically works it cannot be integrated into production business processes, it cannot scale, and it cannot be tracked due to the lack of control of the recipient's email system and local network.

Architectural Solution to the Remote Printing Problem

Considering that businesses will continue to drive for better results by executing more and more processes in real time and driving down transaction costs, it is fair to conclude that more and more businesses will have a need for remote printing for those business processes with a need to print.

Believing this then, it makes sense to look at Remote Printing as a *services platform* rather than a point solution to a point problem because in the long run it will be less expensive, more flexible, and more scalable to deploy Remote Printing as a service for *any* business application that needs it (desktop or mobile) rather than analyzing, procuring, deploying, and supporting a point solution every time the subject comes up.

Let's look then at an architectural solution for Remote Printing and its requirements list. This list includes the major requirements for it to address the technical challenges and functional needs mentioned above making it worthy to be called a platform solution:

Print Submission Methods

First, a Remote Printing platform should work equally well no matter if the print job submitter is mobile- or desktop-based. The service should handle all use cases the same, as the main purpose is to deliver the rendered print job securely *to a remote printer*.

It should be device-agnostic. Remote Printing job submission should be enabled on smartphones, tablets, laptops, and desktop computers.

It should also be operating system agnostic. Job submission should be enabled on Apple iOS®, and *Android® operating systems as well as Microsoft Windows®*.

And finally the platform should have a variety of print submission methods including mobile apps for iOS and Android, a web app (for any browser), email printing, secure web printing, and "native-like" printing for those operating systems which support it. For instance, direct

integration with the Windows "File|Print" function or AirPrint® functionality on Apple iOS devices.

End-to-End Security

Security is important not only because the submitter might be mobile, but in all cases the *printer is remote and not on the trusted network*. Therefore to handle both mobile and desktop use cases, the Remote Printing platform must also have an end-to-end security model including:

- Authenticating the submitting user against an organization's database, such as Active Directory, or a user account. Alternatively, treat them as a "guest".
- Secure print job submission using a secure connection
- Secure print job delivery to the remote printer using a secure connection and encrypting the print data itself inside the secure connection in transit and also at rest.
- Secure print job release using one or more methods

Data Compression

Given that the vast majority of Remote Printing deployments use a wide-area network connection between the job processing network and the network where the printer is, saving wide-area bandwidth saves money—especially compared to sending uncompressed print data over the same connection. The Remote Printing platform should be able to intelligently compress print data streams when possible.

Platform Deployment Mode

The solution should be deployable either cloud or on-premise.

Cloud deployments relieve the burden from the organization of managing servers and infrastructure and allow them to manage Remote Printing as a service from a web-based

console. 3rd Party Cloud deployments enable the organization to have remote printing services in the same cloud as their business applications which they have moved there. This not only allows remote printing to 3rd-party locations but also printing back to the same on-premise printers on the organization's own trusted network. These printers are, in effect, now "remote" because the application driving them is now in the cloud, not on the same network.

On Premise deployments give the organization the full measure of control of exactly how the service works, including service integration with other elements of their on-premise IT infrastructure.

Platform Deployment Flexibility

On Premise deployments should be flexible in their design such that the solution components can be placed anywhere in the trusted network. This flexibility is what prevents triggering the need for changes in the network or security infrastructure in order to deploy. For instance, a remote printing platform should not require changes to an organization's DNS records or firewall settings in order to function.

Platform Deployment Scalability

Of course a cloud deployment should be virtually infinitely scalable because that is one of the benefits of cloud services: it is up to the cloud services provider to provide scaling.

This capability should also extend to on premise deployments. The underlying solution architecture should be such that every solution component can not only be placed anywhere in the trusted network, *but can be scaled out at any deployment point in any quantity*. This capability is key since the usage profile of remote printing services will vary by organization depending on business process, geography, season, etc.

Platform Services Availability

Like scalability, service *availability* must meet the necessary service level agreement (SLA), organization by organization. The implications of this are that the architecture should be able to be deployed in various high availability configurations including failover and data center and geographic load-balanced setups.

Solution Configuration and Deployment

Configuration would be centrally managed regardless of the deployment mode or scale. All service configuration and integration would be done through a web-based console. Configuration changes could be applied selectively, or across-the-board.

It would be fast and simple because all services would use commonly existing network configurations (such as SSL on port 443) and avoid needing low-level service configuration, such as DNS.

Remote sites should require little or no IT resource to put into production. Ideally, once a printer is configured into the system, a physical printer should plug into the network at the remote location and just start working.

The platform would have a reporting and analytics engine that would track all remote printing requests and their outcomes. This data could be used for performance analytics or could be exported or integrated into another enterprise system.

Remote Printing Platform Benefits

Reduction in VPN costs

This Remote Printing solution can reduce the need for dedicated VPN connections in many workflows where off-network printing is desired, but remote printers must connect to the trusted network via secure connection in order to print.

Enhanced Security

Enabling a remote printing solution as described here, virtually any security requirement of any organization can be met by virtue of control of user authentication, print job data encryption, transmission encryption, and secure release methods at the print device.

Seamless User Experience

The final benefit is the elimination of much of the user training typically required for deploying new technology like this. The Remote Printing platform can be integrated directly into a user's standard workflows. The user prints as he always does using the existing method(s). Printing to a remote printer is the same experience as printing to a printer down the hall at the office.

Evaluating Remote Printing Platforms

Here are some considerations for evaluating a remote printing solution and provider:

1. Does the solution truly address printing to off-network printers as if these printers were local?
2. How does the solution meet or exceed all of the organization's end-to-end security requirements for remote printing workflows?
3. Does the solution allow users to submit print requests in a number of ways including from mobile apps, and "native" printing methods such as "File|Print" in Windows or AirPrint® on iOS?
4. Can the solution be deployed in the organization's IT environment without changes to the network, security, or application infrastructure such as routing, firewall, or DNS changes?
5. How fast can the platform be set up in an existing IT environment? How fast can a remote location be configured and put into production? What other service dependencies are there?

6. Can the solution also handle all other mobile or cloud-based printing use cases? Is it a mobile and remote printing *platform* or is it simply a point solution?
7. What is the scalability of the solution as print volume grows with applications in different use cases or with the addition of large groups of mobile users?
8. What is the deployment history of the solution in customer organizations?
9. What is the provider history and their focus on solving the remote printing challenge?
10. What is the software development capability of the provider including the timing and history of software releases and quality of the support?

About PrinterOn

Since 2001, PrinterOn has been focused solely on the market for connecting mobile and desktop users with printers both on and off the trusted network. The PrinterOn solution—available in Enterprise, Express, or Hosted Editions—enables printing from any device to any printer from any user in any location between any networks. With PrinterOn you can truly "Print Simply Anywhere®"

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PrinterOn is the world's leading enterprise-grade Mobile Printing Platform. PrinterOn has been delivering mobile printing solutions since 2001 to three major verticals: enterprise, education, and public printing locations.

PrinterOn was the first to develop a private and public cloud printing solution and today operates the largest public printing NOC (Network Operations Center) in the world. PrinterOn uses cloud technology to enable users to print documents from any smartphone, tablet, or laptop to any PrinterOn-enabled printer in the world. There are over 10,000 PrinterOn printing locations worldwide.

The PrinterOn mobile printing solution is the only patent protected, fully-agnostic solution in the market today with the ability to connect disparate networks into one simple-to-manage enterprise or hosted solution. PrinterOn has been deployed in corporations, hotels, universities, airports, libraries in over 120 countries. Since its inception, users of PrinterOn have printed over 80 million pages.

PrinterOn technology is protected in the U.S. and internationally by issued and pending patents including US Patents 7,007,093, 7,249,188, 6,990,527 and 7,827,293.

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