

# Check 21 Guide to Connectivity Options

For FedForward<sup>®</sup>, FedReturn<sup>®</sup>, and FedReceipt<sup>®</sup> Services

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Version 3.0

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# Overview

The Federal Reserve Banks' *Check 21 Guide to Connectivity Options for FedForward<sup>®</sup>, FedReturn<sup>®</sup>, and FedReceipt<sup>®</sup> Services* provides an overview of connectivity options for your organization and vendor personnel responsible for deploying and supporting connectivity to facilitate the exchange of image cash letters (ICLs) with the Federal Reserve Banks. This document provides an overview of each connectivity option in order to assist your organization in selecting the best alternative. The document includes:

- Description of each option for ICL transfer;
- Architectural description and diagram of each option;
- Considerations for selecting the appropriate option; and
- Implementation considerations associated with each option.

The FedForward, FedReturn and FedReceipt services are Check 21-enabled clearing services that provide your organization with the opportunity to deposit and receive ICLs. In order to facilitate efficient and effective transfer of ICLs the Federal Reserve Banks have identified a set of connectivity options designed to meet the spectrum of your organization's needs. Before your organization can deliver or receive ICLs from the Federal Reserve Banks, you must identify and implement the appropriate option and complete the enrollment and testing process for the selected FedForward, FedReturn and/or FedReceipt services. For more information on the Federal Reserve Banks' Check 21-enabled services, please visit <http://www.frb services.org/check/index.html> or contact your Account Executive.

In addition, a high-level outline of the testing and implementation process is available in the Customer Implementation Overview at [https://www.frb services.org/files/servicesetup/check/pdf/check21\\_implementation\\_overview.pdf](https://www.frb services.org/files/servicesetup/check/pdf/check21_implementation_overview.pdf).

The options for transferring ICL files include the following:

- **Option 1: Customer-Initiated Manual Upload and Download via the Internet using the FedLine Web<sup>®</sup> access solution.** This option is primarily for organizations with daily volume of less than 2,000 checks or those able to complete file transfer within 20 minutes.
- **Option 2: Customer-Initiated Automated Upload and Download via the Internet using FedLine Web and Axway Secure Client software.** This option is primarily for organizations with daily volume of less than 100,000 checks and those that can transfer files effectively within specified guidelines (detailed in Option 2).
- **Option 3: Upload and Download via a direct network connection using the Check 21 Large File Delivery (LFD) solution and IBM<sup>®</sup> Sterling Connect:Direct<sup>®</sup> Secure+ software.** This option is primarily for organizations with daily volume greater than 100,000 checks and those that cannot transfer files within specified guidelines on a consistent basis (detailed in Option 3).

# Connectivity Options for ICL File Transfer

ICLs transferred between your organization and the Federal Reserve Banks must adhere to the Federal Reserve Banks' adoption of the Check and Image Data DSTU X9.37-2003 format. For more detailed information on the format, please visit

[https://www.frbservices.org/files/servicesetup/check/pdf/frb\\_X937\\_standards\\_reference.pdf](https://www.frbservices.org/files/servicesetup/check/pdf/frb_X937_standards_reference.pdf)

The following sections outline the connectivity options your organization can implement in order to facilitate ICL transfer.

## Option 1: Customer-Initiated Manual Upload and Download via the Internet Using FedLine Web

Your organization can upload or download ICLs through the Internet by logging into the FedLine Web Check Services application using a web browser. During the implementation process, Subscribers will be issued Federal Reserve Bank credentials for the selected services to authenticate to the Check 21 environment. The following Check 21-enabled clearing services are available:

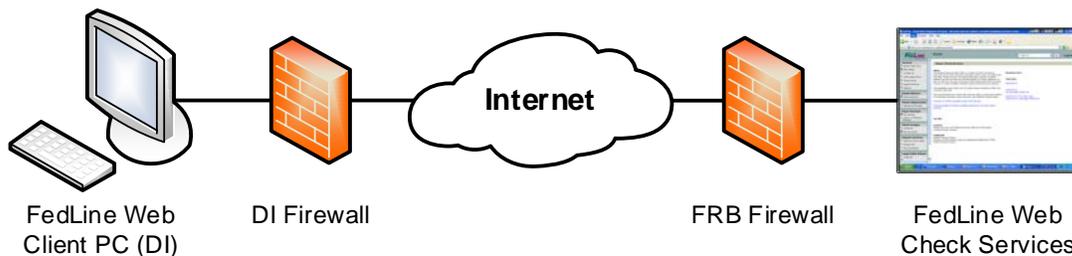
- FedForward/FedReturn, which provides the ability to upload (deliver) ICLs to the Federal Reserve Banks
- FedReceipt, which provides the ability to download (receive) ICLs from the Federal Reserve Banks

Subscribers accessing the FedForward/FedReturn option will be presented with a screen that allows them to upload files from their host systems. The FedReceipt screen will present Subscribers with a list of files that are available for download. The Subscriber can select a file from the list and download it to their organization's host system.

## Security

Files are transferred between the Federal Reserve Banks and your organization via HTTPS. Data encryption is provided by a mutually authenticated session using Federal Reserve Bank-issued credentials.

The diagram below depicts Option 1:



## Considerations in Selecting Option 1

File transfer via the Internet using FedLine Web is only recommended for organizations with less than 2,000 checks per day or those able to complete file transfer within 20 minutes. Organizations with greater volume, those that cannot complete file transfer in less than 20 minutes or those desiring faster transfer speed are strongly advised to consider implementing Option 2 in order to establish an effective file transfer process and maximize the ability to meet the desired deadlines.

File transfer via Internet using FedLine Web is a manual process requiring a Subscriber to perform associated functions. In addition, it does NOT provide mid-file recovery which provides automatic resumption of the file transfer in the event of a communication line disruption. With this option, file transfer must be manually restarted from the beginning if there are any communication problems.

Your organization must have an Internet connection that can support the transfer of your daily check volume at the desired deadlines. Check image files are much larger than most other application data files. A single check, front and back, captured as a black-and-white image, is typically around 25,000 bytes, although it can vary based on the specific check stock. By identifying the number of checks in the organization's files and the desired transfer times, peak transfer rate requirements can be determined.

Your organization must carefully evaluate its Internet connection speed and daily usage patterns. Achievable transfer rates are impacted by many factors, but two that can have a significant influence include available bandwidth and your organization's operating environment.

Determining available bandwidth should include the following key parameters:

- Upload and download bandwidths provided by Internet service providers (ISPs) may differ significantly
- Connectivity that is shared by other applications may have different available bandwidth during anticipated transfer times
- Your organization's internal network infrastructure capacity

Determining the impact of your organization's operating environment on the achievable network utilization level is difficult and can vary significantly based on the following key parameters:

- Version of Microsoft® Windows® used and its maintenance level
- Workstation / Server hardware and configuration settings
- Version of Internet Explorer® used
- Shared workload on the workstation /server
- Transfer file size

Based on lab environment testing and customer experience to date, the achievable network utilization level has varied significantly based on each unique environment. The table below outlines some of the network options and their corresponding potential transfer rates. These estimates are based on extrapolations from internal testing of some connection options and should be considered as guidelines.

Testing by the Federal Reserve Banks over a dedicated T1 line could only approach a network utilization level of 30%. Your organization may experience higher or lower network utilization levels. Thus, your organization must take great care in assessing achievable performance in its specific environment.

Internet Connectivity (available bandwidth)	Potential Transfer Rate (checks/hour)			
	30%	50%	70%	90%
256 Kbps	1,100	1,800	2,500	3,300
384 Kbps	1,600	2,700	3,800	4,900
512 Kbps	2,200	3,600	5,100	6,600
768 Kbps	3,300	5,500	7,700	9,900
1.544 Mbps	6,600	11,100	15,500	20,000

Above estimates assume an average size check of 25,000 bytes.

Note: Should your organization’s internet service become unavailable, upload or download of ICLs cannot occur unless a contingency location or alternate ISP is available

### Implementation Considerations When Selecting Option 1

If a sufficient transfer rate cannot be achieved during the desired file transfer window and/or contingency service has not been established, your organization should consider one or all of the following:

- Implementing Axway Secure Client software outlined in Option 2
- Implementing additional bandwidth
- Making adjustments to the operating environment
- Implementing contingency internet service

Lead time for implementation of such enhancements must be considered in scheduling implementation of Check 21 services.

## Option 2: Customer-Initiated Automated Upload and Download via the Internet Using FedLine Web and Axway Secure Client

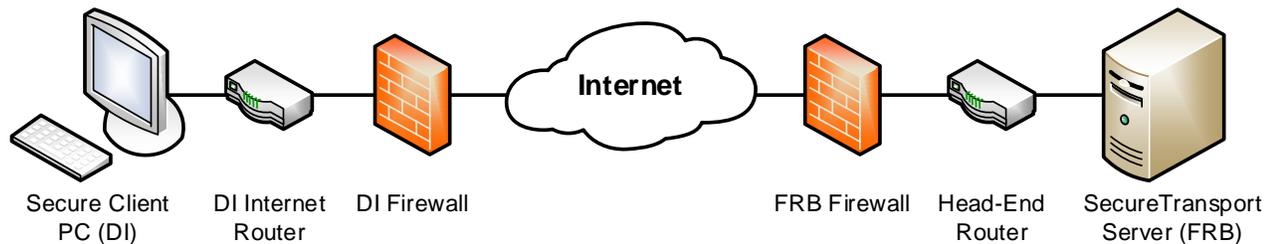
Your organization can automate the file upload and download processes through the Internet and the FedLine Web access solution by purchasing and installing Axway Secure Client software on your host system. Axway offers Secure Client for multiple operating systems, including versions of the Microsoft Windows, Linux®, and Oracle® Solaris operating systems. Secure Client communicates with the Federal Reserve Banks' SecureTransport server to facilitate file transfers.

During the implementation process, a Subscriber will be issued Federal Reserve Bank credentials in order to facilitate authentication of Secure Client at your organization's location with the SecureTransport server software at the Federal Reserve Banks' site. Your organization can customize the Secure Client settings to automatically upload and download ICLs at designated times. In addition, Secure Client offers mid-file recovery capabilities, which automatically resume file transfers in the event of communication line disruptions.

### Security

Files are transferred between the Federal Reserve Banks and your organization via HTTPS. Data encryption is provided by a mutually authenticated session using Federal Reserve Bank-issued credentials.

The diagram that follows depicts Option 2:



### Considerations in Selecting Option 2

File transfer via the Internet using FedLine Web and Axway Secure Client software is suggested for consideration by organizations with daily check volume of less than 100,000 in either deposits or presentments and those that can consistently transfer files effectively within the following guidelines:

- Total daily transfer time for either all deposit files or all presentment files should be less than 2 hours
- If total daily transfer time for either all deposit files or all presentment files exceeds 2 hours, minimum transfer rate of 3 Mbps must be achieved
- Total daily transfer time for either all deposit files or all presentment files cannot exceed 3 hours
- Total number of daily deposit and presentment files from/to a single customer is less than 400 (a single customer is defined as a Financial Institution or a Third Party Provider supporting multiple Financial Institutions)

Those customers that cannot achieve the above guidelines must take corrective action to comply with the guidelines or to evaluate Option 3 in order to establish the most effective file transfer process and maximize the ability to meet the desired deadlines.

Your organization can purchase Secure Client software directly from Axway utilizing the on-line portal that has been established for Federal Reserve Banks' customers at <https://usfrbstore.axway.com>.

Secure Client provides mid-file recovery, which resumes file transfers from the point of communication line disruption. It also provides the ability to automate authentication and the upload/download functions. For more information on this software product, please visit the Axway website at <https://www.axway.com/en/enterprise-solutions>.

Your organization must have an Internet connection that can support an effective transfer of your daily check volume at the desired deadlines. Check image files are much larger than most other application data files. A single check, front and back, captured as a black-and-white image, is typically around 25,000 bytes, although it can vary based on the specific check stock. By identifying the number of checks in your organization's files and the desired transfer times, peak transfer rate requirements can be determined.

Your organization must carefully evaluate your Internet connection speed and daily usage patterns. Achievable transfer rates are impacted by many factors, but two that can have a significant influence include available bandwidth and the organization's operating environment.

Determining available bandwidth should include the following key parameters:

- Upload and download bandwidths provided by Internet service providers (ISPs) may differ significantly
- Connectivity that is shared by other applications may have different available bandwidth during anticipated transfer times
- Your organization's internal network infrastructure capacity

Determining the impact of your organization's operating environment on the achievable network utilization level is much more difficult and can vary significantly based on the following parameters:

- Operating system (e.g. Microsoft Windows, Linux, Solaris, etc.) and its maintenance level
- Workstation / Server hardware and configuration settings
- Internet browser
- Shared workload on the workstation /server
- Transfer file size

Based on lab environment testing and customer experience to date, the achievable network utilization level has varied significantly based on each unique environment. The table below outlines some of the network options and their corresponding potential transfer rates. These estimates are based on extrapolations from internal testing of some of the connection options and should be considered as guidelines.

Testing Secure Client software over a dedicated T1 line by the Federal Reserve Banks resulted in a network utilization level of about 90%. Your organization may experience higher or lower network utilization levels. Thus, your organization must take great care in assessing achievable performance in its specific environment.

The following table summarizes the impact different network utilization levels can have on the potential transfer rate of checks for various network bandwidths:

Internet Connectivity (available bandwidth)	Potential Transfer Rate (checks/hour)			
	30%	50%	70%	90%
256 Kbps	1,100	1,800	2,500	3,300
384 Kbps	1,600	2,700	3,800	4,900
512 Kbps	2,200	3,600	5,100	6,600
768 Kbps	3,300	5,500	7,700	9,900
1.544 Mbps	6,600	11,100	15,500	20,000
2 Mbps	8,600	14,400	20,100	25,900
3 Mbps	12,900	21,600	30,200	38,800
4 Mbps	17,200	28,800	40,300	51,800

Above estimates assume an average size check of 25,000 bytes.

The current Federal Reserve Banks' security infrastructure limits file transfer time of a particular file to one hour in duration, thus consideration must be given to assure effective file transfer.

Should your organization's ISP service become unavailable, upload or download of ICLs cannot occur unless a contingency location or alternate ISP is available.

Organizations that initially selected Option 1 can upgrade to Option 2 at any point.

## Implementation Considerations When Selecting Option 2

1. If a sufficient transfer rate or time cannot be achieved or contingency service has not been established, your organization should consider additional bandwidth, alternative ISP providers, adjustments to the operating environment and contingency Internet service. Lead time for implementation of such enhancements must be considered in scheduling implementation of Check 21 services.
2. Your organization needs to allocate adequate lead time and resources to obtain, install and set up Secure Client.

3. The time that files will be available for delivery to the Federal Reserve Banks or receipt from the Federal Reserve Banks should be verified prior to setting a scheduled time for automated file upload or download within Secure Client.
4. The Federal Reserve Banks will monitor customer transfer time and effective transfer rates on monthly basis. Those exceeding the guidelines will be notified and customers will be requested to provide a corrective action plan within 30 days of notification.

## **Scripting Considerations with Axway Secure Client**

### **Microsoft Windows**

Secure Client for Microsoft Windows is designed to run with either a graphical user interface or through the command line within the operating system.

Though Secure Client offers a scheduler function within the graphical user interface, the command line version offers a higher level of control over the operation of the client.

Scripts can be run from a Windows-based scheduler program to upload and download files between the customer network and the Federal Reserve Banks along with custom processing scripts written by the customer. Please contact Axway for support on custom scripting using Secure Client for Microsoft Windows.

### **Linux and Oracle Solaris**

Customers may use the scheduler feature within Secure Client or create a CRON job within the Linux and Solaris-based operating systems for regularly scheduled execution. Please contact Axway for support on custom scripting using Secure Client for Linux and Solaris.

### **Scheduling and Execution of Custom Scripts**

The Federal Reserve Banks require at least a 15 minute script interval for interrogating the system for new FedReceipt files for download. For customers with volumes of greater than 45,000 checks per day, there may be added benefits in using a Linux or Solaris platform and client over the Microsoft Windows client for a higher degree of script customization and efficiency in file retrieval.

## Option 3: Upload and Download via Direct Network Connection Using Check 21 Large File Delivery and IBM Sterling Connect:Direct Secure+

Your organization can initiate upload and download of ICLs automatically or manually with the Check 21 Large File Delivery (LFD) solution, which utilizes a direct network connection to the Federal Reserve Banks' network and IBM Sterling Connect:Direct Secure+ software installed on its host systems. To initiate ICL transfer, your organization's Connect:Direct Secure+ software authenticates with the Federal Reserve Banks' Connect:Direct Secure+ software using Federal Reserve Bank-issued server certificate credentials.

Connect:Direct Secure+ software allows your organization to schedule automated transfers of files to the Federal Reserve Banks or to manually control such transfers. In the event of a communication line disruption, the software also provides the ability to resume a file transfer from the point of disruption rather than from the beginning, thus minimizing the impact of communication problems on file transfers.

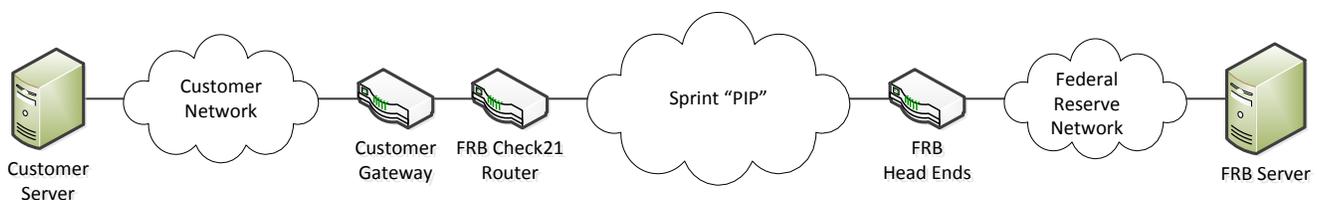
If your organization is a FedReceipt customer, ICLs will be delivered to you automatically as soon as they become available. This process follows the same authentication process as above, except the Federal Reserve Banks' Connect:Direct Secure+ software initiates the file transfer session. In addition, your organization can choose to further customize the file transfer process by adding run tasks functions.

### Security

The Check 21 LFD solution uses a private IP network. This network uses Multiprotocol Label Switching (MPLS) technology and provides private groupings in order to segment traffic to discrete areas of the network. Security is provided through point-to-point router linkages with IPsec, VPN tunneling and a dedicated WAN connection.

The network provides the ability to deploy connections ranging from T1 (1.5Mbps) to DS3 (10Mbps-45Mbps) to OC3 (35 Mbps -155Mbps). As part of the Check 21 LFD solution, the Federal Reserve Banks provide and maintain the routers and circuits for specified customer locations. Your organization is responsible for its firewall and server infrastructure including the Connect:Direct Secure+ software to support ICL transfer.

The diagram that follows depicts Option 3:



### Considerations in Selecting Option 3

File transfer via Check 21 LFD is suggested if your organization has a daily volume exceeding 100,000 checks and those that cannot meet the transfer guidelines for Internet (Option 2). This would establish an effective file transfer process that maximizes the ability to meet the desired deadlines.

Your organization must provide the host system running Sterling Connect:Direct Secure+ software. If your organization is not currently utilizing Connect:Direct Secure+ software, you should contact IBM Corporation for the associated costs since they can vary based on system configurations.

Assessing bandwidth requirements is very important in order to accomplish a desired transfer rate of checks. Check image files are much larger than most other application data files. A single check, front and back, captured as a black-and-white image, is typically around 25,000 bytes, although it can vary based on the specific check stock.

By identifying the number of checks in your organization’s files and the desired transfer times, peak transfer rate requirements can be determined.

The following table outlines the network options and their corresponding potential transfer rates. These estimates are based on extrapolations from internal testing of some of the connection options and should be considered as guidelines. There are many factors that can affect the achievable transfer rate including your organization’s internal network infrastructure and type of platform in use (e.g. hardware, operating system, software).

Line Size	Potential Hourly Transfer Rate	Line Size	Potential Hourly Transfer Rate
T1 - 1.5Mbps	22,000	OC3 - 35Mbps	504,000
4 T1 - 6Mbps	88,000	OC3 - 50Mbps	720,000
DS3 - 10Mbps	144,000	OC3 - 60Mbps	864,000
DS3 - 15Mbps	216,000	OC3 - 75Mbps	1,080,000
DS3 - 25Mbps	360,000	OC3 - 100Mbps	1,440,000
DS3 - 35Mbps	504,000	OC3 - 125Mbps	1,800,000
DS3 - 45Mbps	648,000	OC3 - 155Mbps	2,232,000

Above estimates assume an average size check of 25,000 bytes.

The Check 21 LFD direct network connection solution is dedicated to exchanging Check 21 files with the Federal Reserve Banks and cannot be used for other Federal Reserve Financial Services. However, organizations may leverage Connect:Direct software for other applications or connections.

The cost of a direct network connection varies by location and increases as bandwidth increases. The Federal Reserve Banks can provide pricing information for a particular line configuration after assessing the location with the network provider. The monthly charges include the appropriate router, specific line configuration and corresponding annual maintenance and support. To price a network connection, please contact your Federal Reserve Banks Account Executive.

Lead times for implementing a new circuit for the direct network connection can vary from 60 to 90 business days. In some cases, the lead time may be even longer based on specific site considerations.

Upgrades to different line types (e.g. T1 to DS3, DS3 to OC3) require the same implementation lead time. Lead times for increasing bandwidth within a line type (e.g. DS3 10 Mbps to DS3 20 Mbps) are typically two to four weeks from the commitment date depending on the complexity of the request.

Your organization needs to consider connectivity needs to support contingency plans. These plans may require a direct network connection to a contingency location.

Your organization must agree to perform server authentication using Connect:Direct Secure+ and a Federal Reserve Bank-issued certificate. (Federal Reserve Banks' authentication of your organization's server cannot be completed using certificates issued by others.)

Due to the significant effort and costs involved, a minimum usage commitment of 12 months is required for the direct network connection Check 21 LFD solution.

Organizations that initially select other connectivity options may deploy Option 3 at any point in the future.

### **Implementation Considerations When Selecting Option 3**

1. Bandwidth and location assessments need to occur as early in the process as possible in order to determine a preliminary schedule for deployment.
2. If your organization is not currently using Connect:Direct Secure+ software, adequate lead time and resources need to be allocated to obtain, install and set up the software.
3. Depending on the network size, an organization can set up multiple concurrent Connect:Direct sessions to maximize their throughput:
  - Multiple T1s 5-10 concurrent sessions
  - DS 3 10-20 concurrent sessions
  - OC 3 up to 32 concurrent sessions
4. Circuit installation lead time needs to be considered in scheduling deployment of the Check 21 LFD solution.
5. Internet connectivity can be utilized to support initial testing and lower volume production while Check 21 LFD is being set up.

## Comparison of Connectivity Options for ICL Transfer

The following table provides a summary of the key features and differences of the three connectivity options:

Feature / Characteristic	<u>Option 1</u> Internet with FedLineWeb	<u>Option 2</u> Internet with FedLine Web and Secure Client	<u>Option 3</u> Direct Network Connection with Check 21 LFD and Connect:Direct Secure+
<b>Daily volume target</b>	<2,000 checks	<100,000 checks	>100,000 checks
<b>Total daily transfer time</b>	<20 minutes	<2 hours in either deposits or presentments; cannot exceed 3 hours	N/A
<b>Transfer rate</b>	Sufficient to meet the transfer time	>3 Mbps if total transfer time in either deposits or presentments is > 2 hours	Based on network size elected
<b>Daily number of files</b>	Few	<400 files for both deposits and presentments	Unlimited
<b>File transfer utility</b>	HTTPS	Axway Secure Client	IBM Sterling Connect:Direct Secure+
<b>Network use</b>	Shared or dedicated	Shared or dedicated	Dedicated to Federal Reserve Banks Check 21-enabled services
<b>Security</b>	<ul style="list-style-type: none"> <li>• Subscriber authenticated via Federal Reserve Bank-issued credentials</li> <li>• File encryption by mutually authenticated session</li> </ul>	<ul style="list-style-type: none"> <li>• Client authenticated via Federal Reserve Bank-issued credentials</li> <li>• File encryption by mutually authenticated session</li> </ul>	<ul style="list-style-type: none"> <li>• Server authenticated via Connect:Direct Secure+ using Federal Reserve Bank-issued credentials</li> <li>• Point to point router link with IPSec, VPN tunneling and triple DES encryption</li> <li>• Private IP network using MPLS technology</li> </ul>
<b>Line interruption recovery</b>	Requires restart of file transfer in case of line disruption	Resumes at point of line disruption (i.e. mid-file recovery)	Resumes at point of disruption (i.e. mid-file recovery)
<b>File transfer options</b>	Subscriber initiated <ul style="list-style-type: none"> <li>• File 'Push' to upload</li> <li>• File 'Pull' to download</li> </ul>	Subscriber initiated or scripted <ul style="list-style-type: none"> <li>• File 'Push' to upload</li> <li>• File 'Pull' to download</li> </ul>	Automated <ul style="list-style-type: none"> <li>• File 'Push' to upload and download</li> </ul>