WANSync®

WANSync User Guide

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Chapter 5: Creating Replication Scenarios

Chapter 6: Running the Replication Process

Chapter 7: Monitoring Replication

Appendix A: Using the Command Line Interface (CLI)

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Change History

This section lists all changes that have been made in this guide.

6/05

- Initial release of new format.

8/05

- Rearranged chapters.

10/05

- Removed erroneous index entries.

11/05

- New software release.

12/05

- Added a note regarding mapped drives to Chapter 5.

4/06

- New software release.

5/06

- Added *Recover active server* to *Creating Replication Scenarios*.
- Added *Read only Web GUI*.
- Editorial changes.
- Added an entry to *XO system event IDs*.

7/06

- New software release.
- Editorial changes.

10/06

- New software release.

11/06

- New software release.

12/06

- New software release.

2/07

- Updated format to match CA doc set.
- Updated *Replication Data Values Table* - Automatic run/ synchronization.
- Updated *Using the Command Line Interface (CLI)*.

Chapter 1: Getting Started

This guide contains all the necessary information for configuring and initiating the WANSync application, synchronizing, replicating and distributing data, monitoring and reporting, and of course, switchover and recovery.

About WANSync contains important general information about the WANSync products, their various modules, and a list of key features.

The WANSync Solution contains important information about how WANSync, WANSyncHA and WANSyncCD work, and how the various modules function in the replication process.

To get up and running quickly, you may begin with *Creating Replication Scenarios* and continue reading through to the end of *Recovery*. It is also recommended that you read the appropriate operations guide (you can find the most up to date operations guides for each application on www.caxosoft.com under the Support menu).

Installing WANSync on Microsoft (MS) Windows explains installing, upgrading, and un-installing the WANSync application.

Important! This manual applies to WANSync Server, WANSync Exchange, WANSync Oracle, WANSync SQL, WANSyncIIS, WANSyncHA products (which include all the capabilities of WANSync) and WANSyncCD. Throughout this document, the term WANSync refers to all products, unless otherwise specified.

Related Documentation

Use the following guides along with this user guide:

- *WANSync SQL Server Operations Guide*
- *WANSync Exchange 200x Operations Guide*
- *WANSync Red Hat Server Operations Guide*
- *WANSync Solaris Server Operations Guide*
- *WANSyncHA Exchange 200x Operations Guide*

- *WANSyncHA SQL Server Operations Guide*
- *WANSyncHA Oracle Server Operations Guide*
- *WANSyncHA File Server Operations Guide*
- *WANSyncHA IIS Server Operations Guide*
- *WANSyncHA for BlackBerry Enterprise Server Operations Guide*

White papers offering a broader introduction to disaster recovery, business continuity and content distribution solutions using WANSync and WANSyncHA are also available on the CA XOsoft website: www.caxosoft.com.

Terms and Abbreviations

The following terms and abbreviations are used throughout the document.

Terms

Term	Definition
Bookmark	Checkpoint that is manually set in the Rewind log to mark a state that you may want to rewind back to. Usually set before a major set of operations is performed on the data.
Data Rewind	Data recovery solution that uses the rewind points or bookmarks in the Rewind log to reset the current data back to a previous state.
Master	Main or production server where database and file activities are taking place. The server in the replication scenario that you want to replicate.
Node	A master or replica host in a replication scenario tree.
Recovery	Process of retrieving lost or corrupted master data from any replica by activating a synchronization process in the reverse direction.
Replica	Server set up to receive replication data from a master server.
Replication	Real-time capture of changes to files and databases on a master server and transfer to its replica server(s).
Replication Tree	The connection scheme of replication from master host to its replica host(s) represented as a tree.
Rewind point	Checkpoint in the Rewind log marking an event or operation. The actual information stored includes the operation that will undo the event, in case the rewind point is activated.
Scenario	Full Replication process definition including master and replica servers and their connectivity (replication tree), report and event handling rules, properties of nodes, directories, sub-directories, databases and files that will be participating in the replication process. Each scenario is saved as an XML file.
Synchronization	The process of producing an exact copy of the master server's contents on remote replica servers.
Suspend replication	Temporarily cease delivering changes to the suspended replica. Changes are accumulated in a spool until replication is resumed so that re-synchronization is not required.
Resume replication	Begin transferring accumulated changes to a replica that was previously suspended.

Abbreviations

Term	Definition
CLI	Command Line Interface. A non-GUI interactive shell enabling full control and monitoring of the replication process, including configuration of the replication scenarios.
MSSQL	Microsoft SQL Server

Chapter 2: About WANSync

This chapter describes WANSync and its modules.

WANSync

WANSync is a data protection solution that uses asynchronous real-time replication to provide cost-effective disaster recovery capabilities for Microsoft Exchange, Microsoft SQL Server, Oracle, Microsoft IIS webservers, file servers, and other applications on AIX, Solaris, Red Hat and both 32- and 64-bit Windows.

WANSync's asynchronous data replication over LAN or WAN of database and other files from a production server to one or more local or geographically distant replica servers offers rapid data recovery, integrated continuous data protection as a guard against data corruption, and completely non-disruptive automatic testing of your disaster recovery system, all in a system that sets the standard for ease of configuration and management.

When disaster strikes, and anything that puts a stop to your ability to do business is a disaster, it is critical that you respond effectively. Whether a flood or a blackout, or the more probable virus attack or user error, you must recovery quickly with minimal data loss or risk losing productivity, revenue, customers and opportunities, perhaps even the viability of your entire business.

WANSync data protection and data recovery software helps ensure that you are ready to respond.

WANSyncHA

WANSyncHA is a high availability solution based on asynchronous real-time replication and automated application switchover and switchback to provide cost-effective business continuity for Microsoft Exchange, Microsoft SQL Server, Oracle, Microsoft IIS webservers, file servers, and other applications on both 32- and 64-bit Windows servers.

WANSyncHA offers push-button or fully automatic switchover of mission-critical application servers over a LAN or WAN, application-aware status monitoring, integrated continuous data protection as a guard against data corruption, and completely non-disruptive automatic testing of your disaster recovery system, all in a system that sets the standard for ease of configuration and management.

When disaster strikes, whether in the form of a hurricane, a blackout, or far more likely, a virus attack or software or user error, your ability to respond well to the crisis can make the difference between a bright future and the end of your business. At the very least, you are likely to incur significant costs in lost business and, perhaps more importantly, lost confidence by your customers, investors, and other stakeholders. Business continuity is not just about insurance. It is about maintaining your competitive edge. WANSyncHA is designed to give you that edge.

WANSyncCD

WANSyncCD is a highly versatile content distribution, delivery and consolidation solution for the distributed enterprise based on asynchronous real-time or scheduled software replication of files over a WAN.

WANSyncCD may be used to deliver, synchronize and consolidate corporate information repositories among multiple locations and branch offices around the globe. With WANSyncCD, employees and representatives in the field will always have the right information at the right time.

WANSyncCD is also a powerful content delivery and web publishing solution that can serve your external customers through portals and web sites with any kind of information that is stored in files, from music to movies to documents to news.

Historically, the enterprise-class technology infrastructure needed to reliably distribute and manage information across a highly distributed environment has been tremendously expensive. The playing field has changed with CA XOsoft's WANSyncCD. Our content distribution software is simple, highly flexible, and very cost-effective content delivery, content consolidation, content publishing, and website publishing.

Your company is living and competing in a connected world. WANSyncCD helps you make the connection.

Limitations

One-way replication only is permitted and the replica database must be offline. Bidirectional replication is not supported. Cross replication with different data sets is however supported. A server running WANSync can act as a master and/or replica for an unlimited number of scenarios so long as each data set only has a single master server, i.e., one way replicationWANSync.

WANSync Server and Database Solutions

See the CA XOsoft website, www.caxosoft.com, for an up-to-date list of supported platforms and applications.

Software Modules

WANSync includes the following software modules:

- **XOsoft Engine**. WANSync's service - runs on each server involved in the scenario
- **WANSync Manager**. Management GUI - used to manage and configure WANSyncHA
- **WANSync CLI**. Provides a command-line alternative to the WANSync Manager for all platforms supported by WANSync
- **XOFS**. Filter file system driver - installed together with the engine and loaded on the master automatically

XOsoft Engine

The XOsoft Engine is the executable service/daemon that lies at the heart of the system. It is installed on every server participating in the replication process, and must be running before any scenario can begin. Each engine supports both a master (source) and replica (target) functionality for both disaster recovery and high availability scenarios. It may participate in multiple scenarios and serve in a different role in each scenario.

WANSync Manager

WANSync Manager is a GUI application that manages all replication services (definition, configuration, monitoring and running) of the replication servers. Offline operation is mainly the definition of replication scenarios. Once a replication scenario is sent to the participating servers, the Manager also provides the means for online control (running, synchronizing, etc.) and monitoring (i.e. scenario status, log files, etc.). The WANSync Manager can be operated from any PC with connections to WANSync servers. It can manage all WANSync participating servers, regardless of the operating systems on which they are running.

The Manager connects as a TCP client only to the master defined in the replication scenario. Once a replication process is running, the Manager shows runtime statistics and events. In general it is no longer required for the process to continue.

WANSync CLI

The Command Line Interface (CLI) is offered as an alternative for those users who prefer to manage the replication process from the command line instead of from a GUI interface. This CLI is an interactive shell enabling full control, including configuring a replication scenario and controlling and monitoring the replication process. Note that the WANSync CLI does not support HA-related commands at this time.

The CLI can run in interactive mode like a UNIX shell, in which case it displays a prompt; in non-interactive mode it executes commands taken from the command line or standard input.

For more details, see *Using the Command Line Interface (CLI)*.

XOFS

The XOFS is a proprietary file system filter driver. The driver captures all the file events. The WANSync engine manages the XOFS driver.

WANSync Features

The following table lists the features that are built into WANSync:

Feature	Description
Replication	Maintains replicas of files and databases by means of real-time capture of changes on a master server and immediate transfer to its replica servers.
Asynchronous replication	WANSync performs real-time capture of all changes to the file system. These changes, accumulated on the master's spool directory, are transferred to the replica site asynchronously with minimal impact on either server.
Multiple configuration	Provides great flexibility in configuring replication scenarios between centrally managed multiple sites (one-to-one or one-to-many).
Single-port server	All networking activity is carried out using a single port. This includes: data replication, WANSync configuration, multiple scenarios support.
Data integrity preservation	Data integrity is preserved at all times during replication. This is important for transactional systems such as databases and application servers.

Feature	Description
WAN optimization	Efficiently handles low bandwidth connections and latency. Automatically recovers from network failures. Can limit bandwidth requirements.
Ability to suspend replication	Replication to a specific replica may be temporarily suspended to allow maintenance or other activity without the need to perform a full resynchronization afterward.
Non-intrusiveness	WANSync does not require stopping applications or rebooting servers during installation (see *Installing WANSync on Microsoft (MS) Windows*), or activation. It attaches to always-open files and starts replicating without halting applications.
Advanced scheduling	Flexible scheduling capabilities. Synchronization can be scheduled for selected days of the week, and for specific hours or periods (e.g., every 9 hours), as well as the possibility of excluding specific dates.
Synchronization	The process of producing a current copy of the configured directories and files of a master on replica servers.
Block synchronization	Very efficient binary difference algorithm that transfers only changes. (see *Synchronization Modes* for the full range of synchronization modes).
Synchronization with replication	Can replicate and synchronize simultaneously. User does not need to halt updates on the master.
Automatic	In case of network or other failure.
Reporting differences	Checks differences between master and Replicas without actually running the synchronization process.
Recovery	Recovers lost or corrupted master data from any replica by activating a synchronization process in the reverse direction.
Rewinding data	Allows repairing a corrupted file on a replica before starting recovery. This is accomplished by rewinding it back in time as if it were a tape, to a point before corruption had occurred.
Reporting	
Events handling	All events are reported in real-time to the WANSync Manager and can be integrated into the OS event logging system. They can be automatically sent by email to a configured address, and they can also activate a notification script. Detailed real-time statistics are provided during synchronization and replication.
Live statistics reports	Statistical reports are provided during replication as well as on synchronization completion.

Feature	Description
Performance counters	WANSync adds several performance counters to the standard MS-Windows set. These can be monitored in the MS-Windows Performance Counters window.
Switchover	
Status monitoring	Automatically monitors status of production server and applications.
Automated switchover	Fully automated switchover of users and clients to a secondary server at the push of a button (or triggered automatically).
Application-aware	Tailored versions for Exchange, SQL, Oracle, and file server ensure proper client switchover.
Multiple switchover methods	Supports Redirect DNS, Move IP, hostname switch, identify network traffic direction script, and user-defined redirection methods.
Remote installation wizard	Remote installation, uninstallation and upgrades for WANSync will be facilitated by a remote installation wizard. You will be able to deploy, uninstall or upgrade the WANSync service (XOsoft Engine) on any number of servers in one step. Requires the .NET framework v2 on the machine you are running the wizard on, each server does NOT require .NET framework v2 but does require that WMI be active. The default since Windows 2000 SP4 is for WMI to be active.
New scenario wizard	The new scenario wizard will completely walk the user through entire scenario creation and configuration process. Once complete the wizard can, optionally, run the scenario.
Automatic configuration of replica Exchange installation	The new scenario wizard will have the ability to automatically configure the storage groups and stores on your target Exchange replica servers. A default install of Exchange Server (at the same version and service pack level) on the replica is all that's required. Routing and connectors should still be configured manually, if needed. You should also ensure that your replica server has the same drive letters as the master server, the underlying hardware is not important, only the drive letters. Supported only in HA scenarios.

Feature	Description
Automatic configuration of replica IIS installation	The new scenario wizard can synchronize IIS metabase settings automatically to the replica server. Settings can be synchronized at the server level or just specific sites, as needed. Settings not stored in the metabase require manual configuration. Only supported for HA scenarios. This metabase synchronization functionality is also available via a command line tool (ws_iis2iis.exe).
Replication mode: Assessment Mode	Replication mode can be set to Assessment Mode allowing accurate bandwidth usage and compression ratio benchmarking, without actually replicating data. No replication will occur but statistics will be gathered. A report will be provided after the specific report interval is reached.
Expanded status information when viewing multiple scenarios simultaneously	Easy viewing of scenario status and type from the Scenarios pane. In one pane you will be able to simultaneously see the following information for all scenarios, via added columns. Rights, Errors, Status, Extended Status, Product, Server type, Mode, and Started by. You can customize what columns will be shown or hidden in the scenarios pane.
Improved GUI view for one-to-one scenarios	GUI view for scenarios with only one replica has been modified to be more graphical and visually descriptive. Which server is active, replication direction and spool usage is graphically displayed. Users can switch between classic and graphical views by clicking a button in the top right of the pane.
Ability to apply changes to multiple scenarios simultaneously	Common scenario setting changes can be applied to multiple scenarios at once. Scenarios must be stopped to apply changes. This functionality is accessed by right clicking on the property in question and choosing *Propagate Value*. A good example would be to use this to change the e-mail notification address for multiple scenarios at once.
Exchange Storage Groups can be excluded in High Availability scenarios	In the past it was required to replicate and monitor all Exchange Storage Groups if using a High Availability scenario. Now you are given the option to exclude specific Storage Groups from replication and monitoring. This can be done during the autodiscovery process.
Scenarios can be stopped and started via a right click context menu	Rather than selecting the scenario and clicking the start button it's now possible to simply right click on the scenario (in the scenarios pane) and select an option to run the scenario.

Feature	Description
Greater scheduling granularity for scheduled tasks	This applies to Assured Recovery, Suspend and Scheduled Replication. In the past you were limited to choosing times that were on the hour and in a minimum of 1 hour increments. With this version tasks can be scheduled to start at any specified time and/or at any interval in minutes.

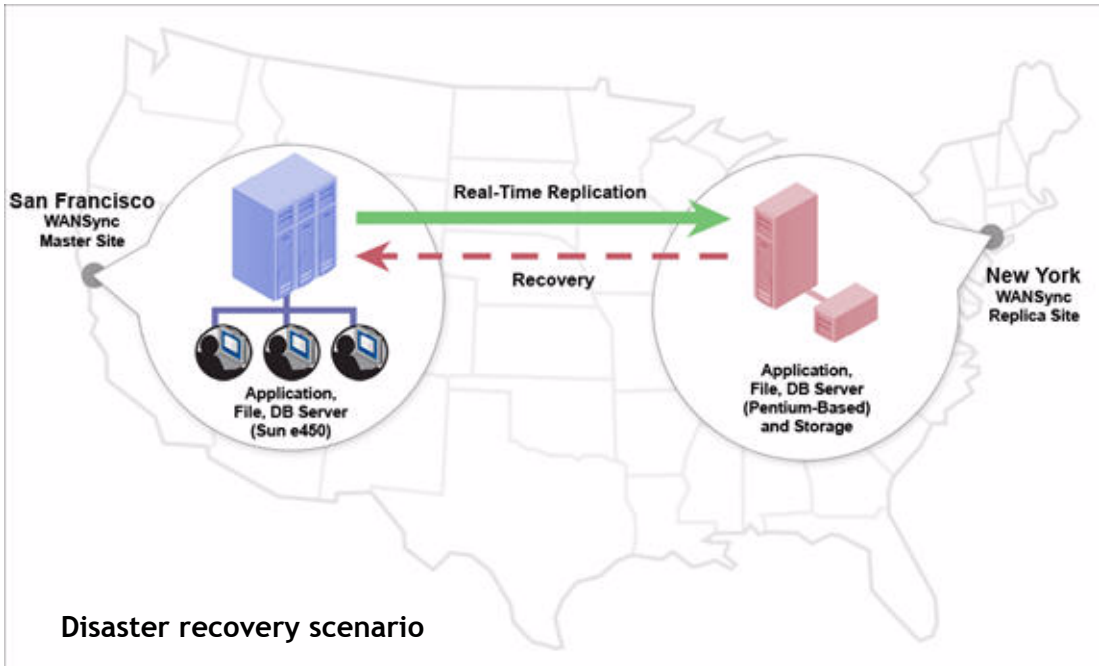
Chapter 3: The WANSync Solution

The following sections cover the scope of the WANSync solution, and the various component functions taking part in the process: what they can do, and how they do it.

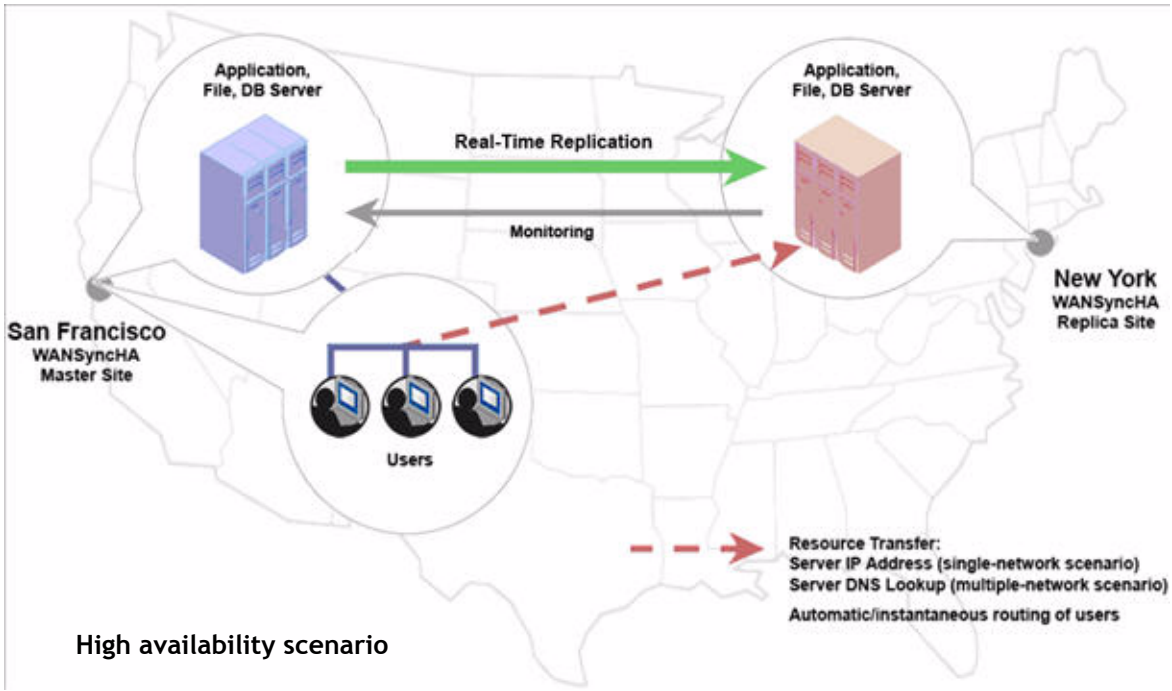
WANSync Process Flow

The Replication Process can replicate data between any set of servers running the WANSync replication service. Replication can be performed over a WAN (wide area network), the Internet, or over a LAN (local area network), so long as all participating servers have the required software installed, and TCP connections between them.

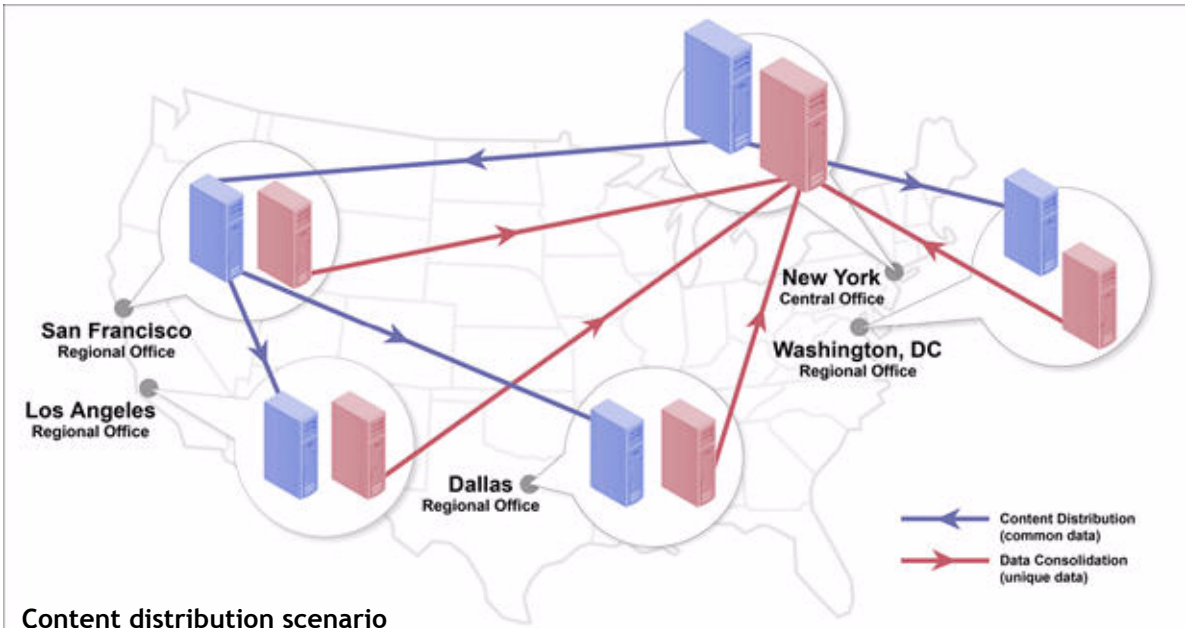
The process requires first setting up a valid scenario, then beginning the replication process. Once the replication process has commenced, then at any given time, the data may be retrieved. The WANSync Manager assists in the process, and also in monitoring both the replication and the retrieval of data.



Disaster recovery scenario



High availability scenario



Content distribution scenario

How Synchronization Works

Synchronization of files is the process of making the set of files to be protected identical on the master and replica servers. It is usually necessary to synchronize the master and replica as the initial step of a replication scenario.

Important! We strongly recommend running the initial synchronization during off-peak hours.

Synchronization Modes

In order to properly synchronize the master and the Replica, we must first perform a comparison of their two file structures in order to determine what content (files and folders) on the master is missing or different from that on the Replica. WANSync supports several different synchronization modes, each with a different comparison algorithm and method of operation.

Synchronization Filter

The Synchronization window includes a check box that can be toggled on or off:

Synchronization Filter	Explanation	Recommended Use
Ignore same size/time files	Skips comparison of files with the same path, name, size and modification time. This assumes that the files are identical. Only use this option in conjunction with either the File Synchronization mode or the Block Synchronization mode.	When you are absolutely sure that files of this type are indeed identical. This option is not appropriate for database files for such applications as Exchange, SQL, or Oracle. This option can reduce the overall synchronization time dramatically.

Automatic Synchronization

When on, the automatic synchronization property causes the master and replica servers to be automatically resynchronized in the event one of the following occurs:

- If the replica is rebooted, WANSync resynchronizes the master and the replica automatically after reboot
- If the master is rebooted, WANSync resynchronizes the master and the replica automatically after reboot
- If the master spool overflows because of network failure, WANSync resynchronizes the servers automatically upon resumption of the connection

Simultaneous Synchronization and Replication

WANSync allows simultaneous synchronization and replication. This means that servers can be synchronized while files are in active use and being updated; all changes that occur while the initial synchronization is performed are replicated without any need for administrative intervention.

Important! When modifications to master server files are occurring during synchronization, do not use the Simple Copy Synchronization method.

Reporting Synchronization Differences

The data sets on the master and replica servers may be checked without actually performing a full synchronization through the Difference Report command.

How Replication Works

The replication mechanism maintains identical copies of files and databases by real-time capture of byte-level changes in files on the master server using the WANSync Engine. The captured changes are asynchronously transmitted to the replica servers, using a file-system filter-driver. The replication process does not interfere with write operations.

To accommodate real-time replication of all types of files, WANSync supports the following replication modes:

Replication Mode	When Used
Online mode	Replicates all changes of files, even if files are always open (as is the case for most database and mail servers). This mode maintains the order of file system operations. In this mode, the engine records all I/O operations related to the root directories in journal files. The journal files are then sent to the Replicas where the operations that were recorded in the journal are replayed on the replicated files.
Scheduled mode	Synchronization of servers takes place at fixed times. There is no online replication in this mode, however, online changes made during synchronization are replicated.
Assessment mode	Replication mode can be set to Assessment Mode allowing accurate bandwidth usage and compression ratio benchmarking, without actually replicating data. No replication occurs but statistics are gathered. A report is provided after the specific report interval is reached.

How Recovery Works

When master data is lost or corrupted for any reason, WANSync can recover the data from any of the Replicas in the scenario.

The Restore Data option basically activates a synchronization process in the reverse direction: from replica to master.

When recovery is initiated, WANSync Manager builds a temporary tree, containing a single branch. In this tree, the replica becomes the source of data and the original master becomes the target (i.e., the terminating replica).

Once the synchronization process completes, the WANSync Manager reverts to the original replication scenario, and continues working.

Important! All file system activity must be halted on the master host until the recovery process finishes.

How Replication Suspension Works

At times it may be necessary to suspend updates on a replica machine in order to perform system maintenance or some other form of processing that does not modify the replicated data there. It is not desirable to stop replication since this requires a full resynchronization afterward.

The replication suspension feature of WANSync makes this possible. Replication may be suspended either manually or on a scheduled basis. During the period of the suspension all changes are spooled on the master or on the replica located upstream of the suspended Replica. In other words, changes continue to be recorded for update on the suspended replica, but are not actually transferred until replication is resumed. Once replication is resumed, the accumulated changes are transferred and applied without any need to perform a full resynchronization of the data.

How Data Rewind Works

Because replication continuously updates source data to another machine, a replica always holds the same data as in the master. In the case of data corruption, recovering files from the replica will not help, since chances are high that data in the replica is also corrupted.

Data Rewind is a new technology that allows repairing a corrupted file by rewinding it back in time as if it were a tape.

Data Rewind can be compared to the Undo feature of Microsoft Office where user actions can be cancelled, thus bringing the file to a previous state in time. Data Rewind is based on rewind journals that store I/O operation information that result in modified files. Using the rewind journal, it is possible to *undo* I/O operations, thus rewinding the file to a previous point in time, supposedly to a valid, non-corrupted state.

How High Availability (HA) Works

WANSyncHA monitors all critical events, including global server failure and all database service failures, and either automatically or on command, initiates High Availability switchover.

Should the master server become unavailable, service can be switched over automatically to a remote site (Replica). The switchover that is transparent to the user includes immediate startup of a synchronized standby database, and redirecting all users to it in minimum time, without any need to reconfigure either clients or the network.

- Depending on the requirements of the application being protected, redirection can include:
- Move IP (if the standby site is implemented within the same network segment)
- Redirect DNS, when the remote standby site is located on a different IP network (cross-network switchover)
- Switching the application hostname/NetBIOS name
- Identify Network Traffic Direction scripts, required to fully support custom, or customized, redirection methods. Custom scripts or batch files are used to identify the active server. This script determines if the forward or backward scenario is run when the scenario is started. The script runs on both master and replica: the one that returns zero is active. If both return zero, a conflict is reported.
- Triggering custom scripts to add or replace the built-in redirection methods

Chapter 4: Assured Recovery

This chapter describes the use of Assured Recovery automatic replica database testing for users with the appropriate license.

This chapter covers WANSync/WANSyncHA for Exchange, SQL, and Oracle. Throughout this chapter the term WANSync refers to all products, unless otherwise specified.

About Assured Recovery

You've already secured your business' most critical assets by implementing a replication solution to protect your data and applications – but are you certain that you'll be able to flawlessly switchover when the time arrives? If it was worth your time and the resources to your organization to implement a disaster recovery solution, isn't it sensible to test to ensure that it works? It's critical, in fact. No disaster recovery solution is complete without a test.

An effective test of data that has been replicated to a backup server requires ensuring that the application that uses it can successfully start, read, and write the data on which it depends. This kind of test modifies the database and then requires a time-consuming resynchronization with the production copy. This process ties up bandwidth and system resources and leaves the production system vulnerable in the interim.

Assured Recovery offers a solution. It enables a full transparent test of the recoverability of your data on a replica system by actually starting up application services and performing whatever operations are required to verify the integrity of the data, including updates to the database, without any need to perform an expensive resynchronization or to leave the production system vulnerable during the test.

Assured Recovery testing is tailored to the mission-critical applications that are being protected including Exchange, SQL, Oracle, and File Servers while integrating the state-of-the-art Continuous Data Protection (CDP) technology. In addition, the test can be fully automated and performed on a scheduled basis as often as makes sense – once a week, once a day, even once an hour. Upon completion, appropriate staff can be alerted with the status of the test, and additional actions can be triggered on success, for example, running a snapshot or a backup of the data -- data that has been verified as fully consistent.

Note: Assured Recovery is available for WANSync and WANSyncHA scenarios for Exchange, SQL, Oracle, and IIS running on Windows Server 2000 or 2003. WANSync version 3.71, build 30 or later, is required. File Server Assured Recovery is also available and by default takes VSS snapshots on the replica. Since there is no *application* per se, testing of the data with File Server scenarios requires additional custom scripts.

Rewind Technology

The difficulty with validating a database on a passive standby replica by starting the database application and running transactions against it is that most databases modify the data even when they simply start. Once this occurs, the replica database is out of sync with that on the production system and a resynchronization is required.

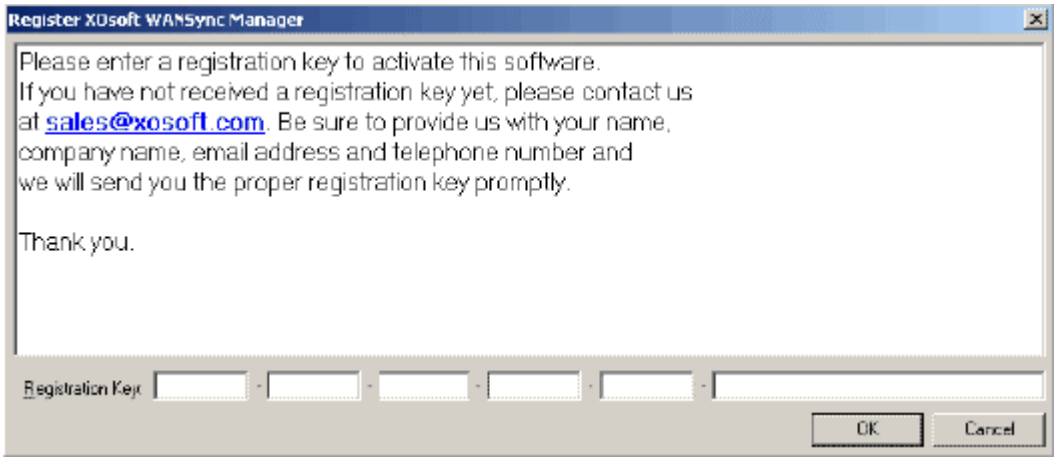
Assured Recovery builds on the unique rewind technology built into both WANSync to resolve this problem. When the Replica Integrity Test function is invoked, WANSync suspends application of the replicated changes on the selected replica server by accumulating changes on the selected replica server in the replica spool, ready to be replayed when testing is complete. Once application of changes on the replica has been paused, a process is started on the selected replica to record all changes that occur to the database there in a rewind journal. Once testing is complete, all the changes that occurred during the test are backed out; for example, the MS Word undo function, so that the database is restored to precisely its state when application of new changes was suspended. At that point, accumulated changes on the replica server are applied.

License Registration

If WANSync has been registered previously, update it with the new registration license for Assured Recovery.

To update the registration:

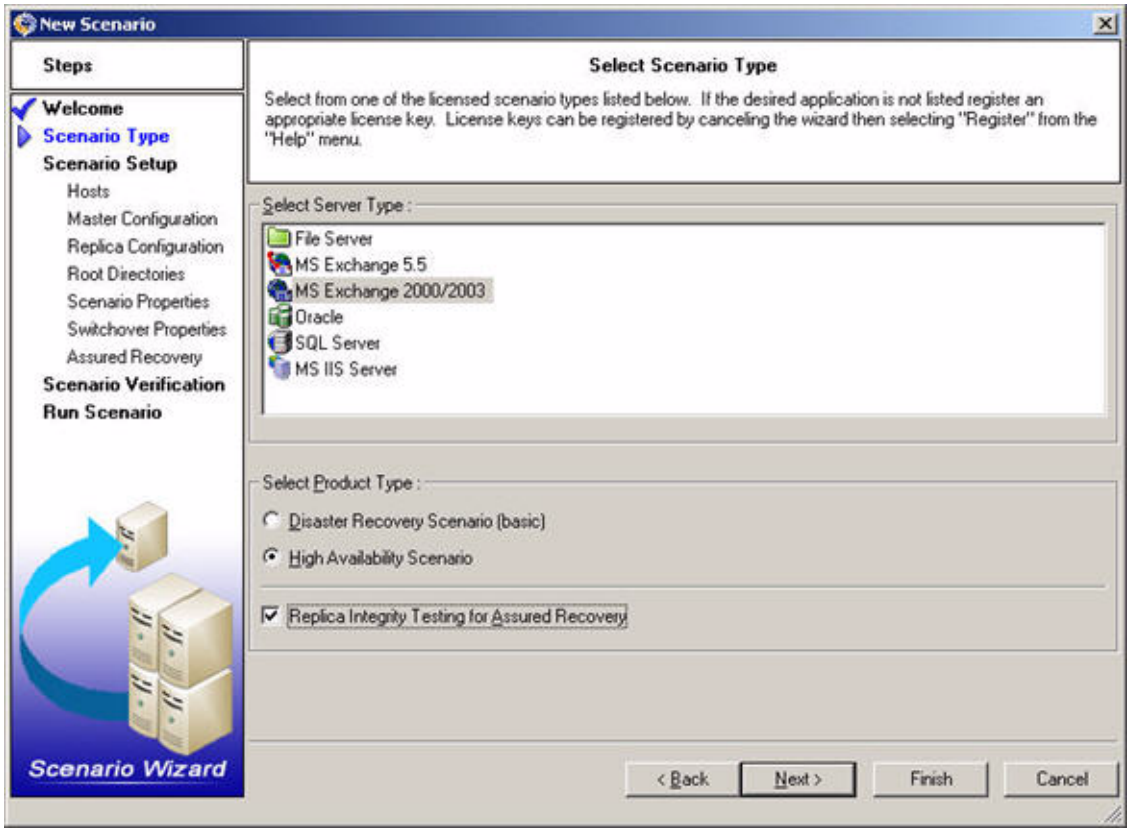
1. Start WANSync Manager.
2. Select Help > Register. A dialogue box appears:



3. Enter the new registration key.
4. Select OK.
5. Close WANSync Manager and start it again in order for Assured Recovery to take effect.

Set Up Assured Recovery Replica Testing

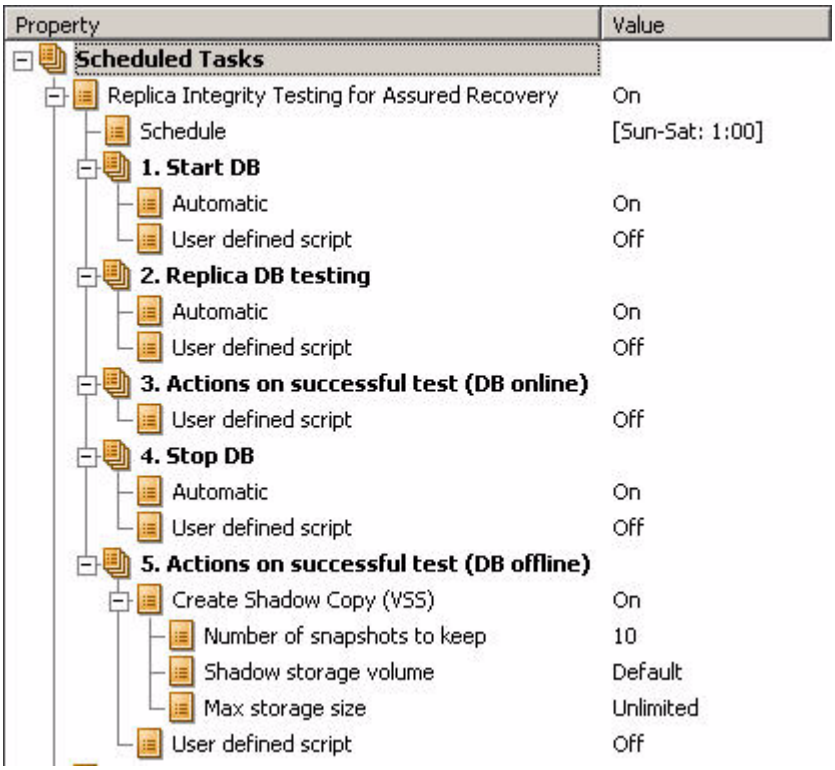
The automatic replica testing provided by Assured Recovery must be enabled when the scenario using it is created. For this reason, if you wish to perform replica testing within a disaster recovery or high availability scenario that is currently running, it is necessary to create a new scenario with the same configuration and with replica integrity testing for Assured Recovery turned on.



Set up the scenario as you would normally, either duplicating the settings in the scenario you plan to replace, or following the instructions in the appropriate operations guide.

Configure Assured Recovery Testing on the Replica Server

Assured Recovery testing is configured in Scheduled Tasks in the Properties panel associated with the replica server on which the application data is validated.



Note that you can define only one scheduled task per scenario. If you attempt to configure replica testing and already have a scheduled Suspend operation configured, the following message appears: *Only one scheduled task per scenario can be set. Suspend for this host is already switched on. Do you want to turn this option off now?* Click Yes or No.

If you have multiple replica servers in the scenario and have already configured replica testing for one of the others, the following message appears: *Only one scheduled task per scenario can be set. Replica integrity testing for Assured Recovery for host replica is already switched on. Do you want to turn this option off now?* Click Yes or No.

Pressing Yes in either case switches off the previously configured scheduled task.

To configure the schedule verification, set replica integrity testing for Assured Recovery to On.

The default behavior is to verify that database services can be successfully started and that databases mount properly. If this is sufficient, all that is required is to select the Schedule field and to define the schedule on which verification should occur. Scheduling is configured using the standard WANSync scheduler.

You can customize the default behavior as described in the next section. In addition, Assured Recovery supports non-disruptive manual testing (see *Test Assured Recovery Manually in an Exchange Environment*).

Customize Assured Recovery Testing

For supported applications, replica testing is fully automated, including starting and stopping application services. Just as in the case of high availability switchover and switchback, if the application is configured in a non-standard way, it may be necessary to customize how database services are started and stopped. In addition, you may want to add customized tests or to specify additional actions to take after the replica has been checked successfully.

Options to customize the behavior of Assured Recovery testing are presented in the order in which they occur during operation, from starting application services through operations to perform after a successful test before and after the application is stopped on the replica server.

Start DB

In this section, you can specify a script to augment or replace the standard steps to start the application services. To replace the standard steps, set Automatic to Off and specify the full pathname of the script to be executed in their place in User defined script. If you specify a script and leave Automatic set to On, the script is executed following the standard steps.

Replica DB Testing

The standard test for application integrity on the replica is to verify that all application services have started properly and that all databases or information stores have mounted successfully and are in a valid state. You can also customize the actions performed during database validation by specifying in User defined script the full pathname of a script to be run following the standard test (or in place of it if Automatic is set to Off).

Actions on Successful Test (DB Online)

After the replica is successfully tested, the application data is in a known, valid state, and you may want to make use of this fact, for example, to ensure that a backup is performed at this point on validated data. If the action you want to take requires that the application is running and the databases or information stores mounted, then it should be registered through a script here, in this step, by specifying the full pathname of a script in User defined script. This section has no default actions.

Stop DB

In this section, you can specify a script to augment or replace the standard steps to stop the application services. To replace the standard steps, set Automatic to Off and specify the full pathname of the script to be executed in their place in User defined script. If you specify a script and leave Automatic set to On, the script is executed preceding the standard steps.

Actions on Successful Test (DB Offline)

As noted in *Actions on Successful Test (DB Online)* above, at this stage the application data is in a known, valid state and you may want to copy it or perform a backup or snapshot. If the action does not require the application to be running, it should be registered through a script here, in this step, by specifying the full pathname of a script in user-defined script. On Windows Server 2003 only, you can generate a snapshot automatically using Microsoft's Volume Shadow Copy Service (VSS) by changing the Create Shadow Copy (VSS) field to On (see *The vss_util*).

By default, WANSync creates ten snapshots and then begins replacing the oldest snapshots with newer ones. You can change the setting for the number of snapshots created using the Number of Snapshots Set To Keep property. You can also specify the volume on which snapshots are stored as well as limiting the maximum total storage used by snapshots (see *The vss_util*).

Note: By default, File Server Assured Recovery takes VSS snapshots on the replica. Since there is no *application* per se, testing of the data with File Server scenarios requires additional custom scripts.

Test Assured Recovery Manually in an Exchange Environment

When testing Assured Recovery manually in an Exchange environment it's important that user accounts no longer reference the replica server after testing. If they do, WANSync reports errors. Assured Recovery rewinds the databases back to the pre-test state. All other manual changes must be backed out (manually) after testing. An easy and effective way to test Exchange manually while ensuring that this issue does not occur is outlined below.

1. Before manual testing, create one or more test accounts with mailboxes on the production Exchange server. Log in using these accounts and verify that they work. Make sure new mail is sent/received so you can verify that replication is occurring during your test.

   Important! Test accounts are required because all mail sent or received to these accounts during testing are lost since we rewind the replica databases to the pre-test state after testing.

2. Close any Outlook clients logged in with your test account(s).
3. Switchover each test account individually by running the below command on the replica server (the executable is located in the WANSync install folder):

   ```
   Ws_ex2ex.exe -n -u -s master_name -t replica_name -f "User Account Display Name" -p
   ```

4. Start Assured Recovery manual testing (use the Manual DB testing checkbox). Wait until the following message is displayed: *Replica is ready for Manual DB Testing.*
5. On the test client, go to Control Panel > Mail. If the master server is listed, select Check Name again so the client recognizes that this test account is now on the replica exchange server.
6. Open Outlook so you can send and receive mail on the replica server. Please remember that all mail received by the test accounts during testing are lost after testing completes. You can also test other functions such as OWA at this point.
7. Once you are satisfied that your replica Exchange server is functional, close Outlook for the test account(s) and run the below command. This fails individual users back to the master server:

   ```
   Ws_ex2ex.exe -n -u -s replica_name -t master_name -f "User Account Display Name" -p
   ```
8. Stop Assured Recovery. Your replica databases rewind back to the pre-test state and resume online replication.
9. On the test client, go to Control Panel > Mail to verify that the master server is now listed. If the master server is still listed select Check Name again so the client recognizes that this test account is now on the master exchange server. Try to open Outlook again (if this fails wait five minutes and try again).

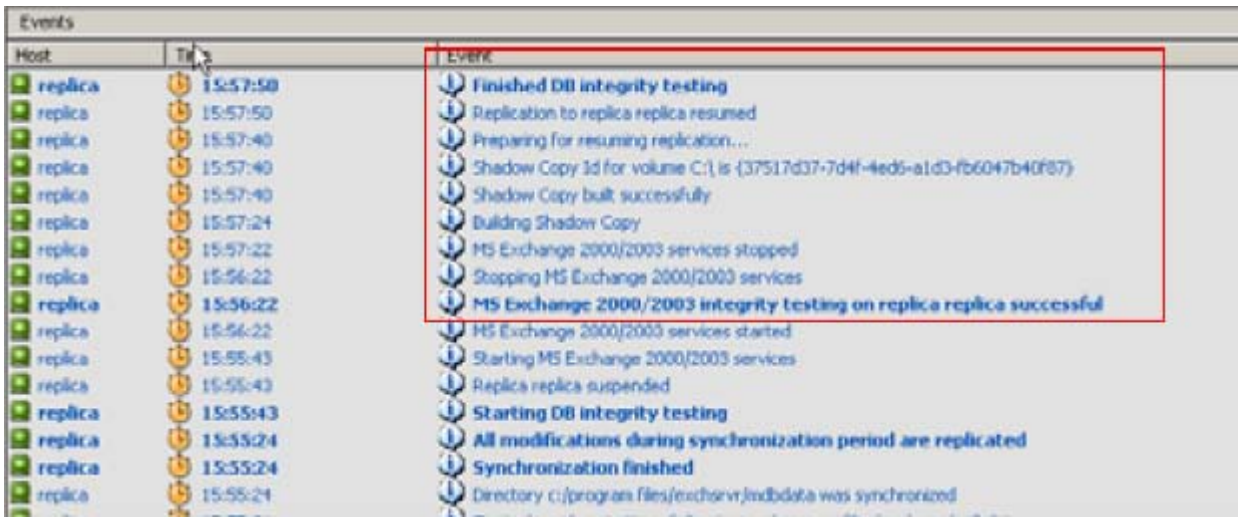
The vss_util

VSS snapshots created during database verification do not show up in the normal snapshot manager. To manage these snapshots, the vss_util.exe command-line utility is provided with WANSync in the installation directory.

The utility vss_util.exe is an interactive shell that provides a simple interface for managing the volume shadow copies (VSS snapshots) on your machine. The interface allows you to perform the following functions:

- Query a shadow copy
- Expose a shadow copy locally
- Delete a shadow copy
- Manipulate shadow copy storage association

All commands require the snapshot ID. The snapshot ID is reported in the event window of the WANSync Manager and can be displayed using the query_all command (see *Shadow Copy Query*).



List Commands

You can display a list of all commands available in vss_util using -h.

The -h command provides command-specific use.

Shadow Copy Query

You can display the properties of a given shadow copy using the query command.

```
Syntax: query <snapshot ID>
```

Example: `query {2b270bc1-ee95-4116-b54d-d341363f70f7}`

To display all snapshots with their IDs use the query_all or query_all -d commands (query_all -d provides significantly more detailed information).

```
Syntax: query_all | query_all -d
```

Expose a Shadow Copy Locally

A shadow copy can be exposed as a local read-only volume that may be mounted on a drive letter or at a mount point. It remains exposed through subsequent boots. Dismounting an exposed snapshot releases it without losing the snapshot itself.

Exposed as a drive letter

```
Syntax: expsv <snapshot ID> <drive-letter>
```

Example: `expsv {2b270bc1-ee95-4116-b54d-d341363f70f7} z:`

Note: The drive letter must be unused.

Exposed as a mount point

Syntax: expsd <snapshot ID> <directory>

Example: expsd {2b270bc1-ee95-4116-b54d-d341363f70f7} c:\scs\last

Note: The directory must be empty.

Dismount locally exposed snapshot

To release an exposed snapshot without losing the snapshot itself, use the unmnt command. The snapshot is still exposed but it does not use a mount point.

Syntax: unmnt <snapshot ID>

Example: unmnt {2b270bc1-ee95-4116-b54d-d341363f70f7}

You can remount the dismounted snapshot to an unused drive letter using the mnt command.

Syntax: mnt <snapshot ID> <drive-letter>

Example: mnt {2b270bc1-ee95-4116-b54d-d341363f70f7} z:

Shadow Copy Delete

You can delete shadow copies individually using the del command.

Syntax: del <snapshot ID>

Example: del {2b270bc1-ee95-4116-b54d-d341363f70f7}

Additional syntax options include:

delx <SnapshotSetID>	Deletes a snapshot-set
del_all [-e]	Deletes all shadow copies (snapshots) on the system [-e] all except client-accessible (exposed) snapshots Example: del {2b270bc1-ee95-4116-b54d-d341363f70f7}

Manipulate Shadow Copy Storage Association

The storage command gathers a group of options that handle shadow copy storage (by default, snapshots on volume X are stored on volume X).

```
storage [-c | -d | -q | -u] [Volume] [StorageVolume] [StorageMaxSize]
```

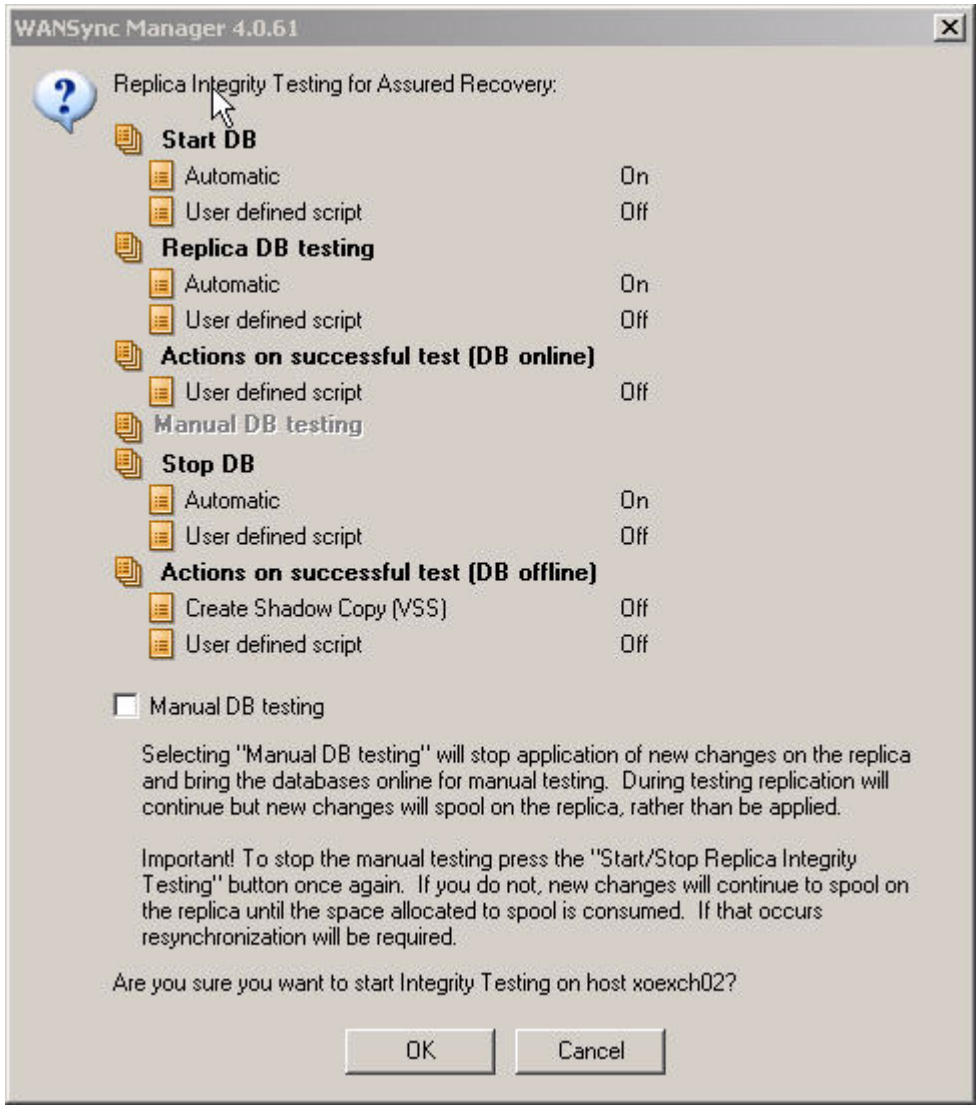
[-c] Volume StorageVolume [StorageMaxSize]	Creates shadow storage association
[-d] Volume	Deletes shadow storage association
[-q]	Queries all shadow storage associations
[-u] StorageMaxSize	Updates shadow storage max size
Volume	Specifies the shadow copied volume
StorageVolume	Specifies the volume that is used as a storage
StorageMaxSize	Specifies the max storage size in Mega bytes

Important! Please note that you can use VSS only on Windows Server 2003 (not earlier versions).

Assured Recovery in Non-Scheduled Mode

You can test the database on a replica manually by selecting Tools > Replica Integrity Test (or by pressing the Start/Stop Replica Integrity Testing for Assured Recovery button on the toolbar).

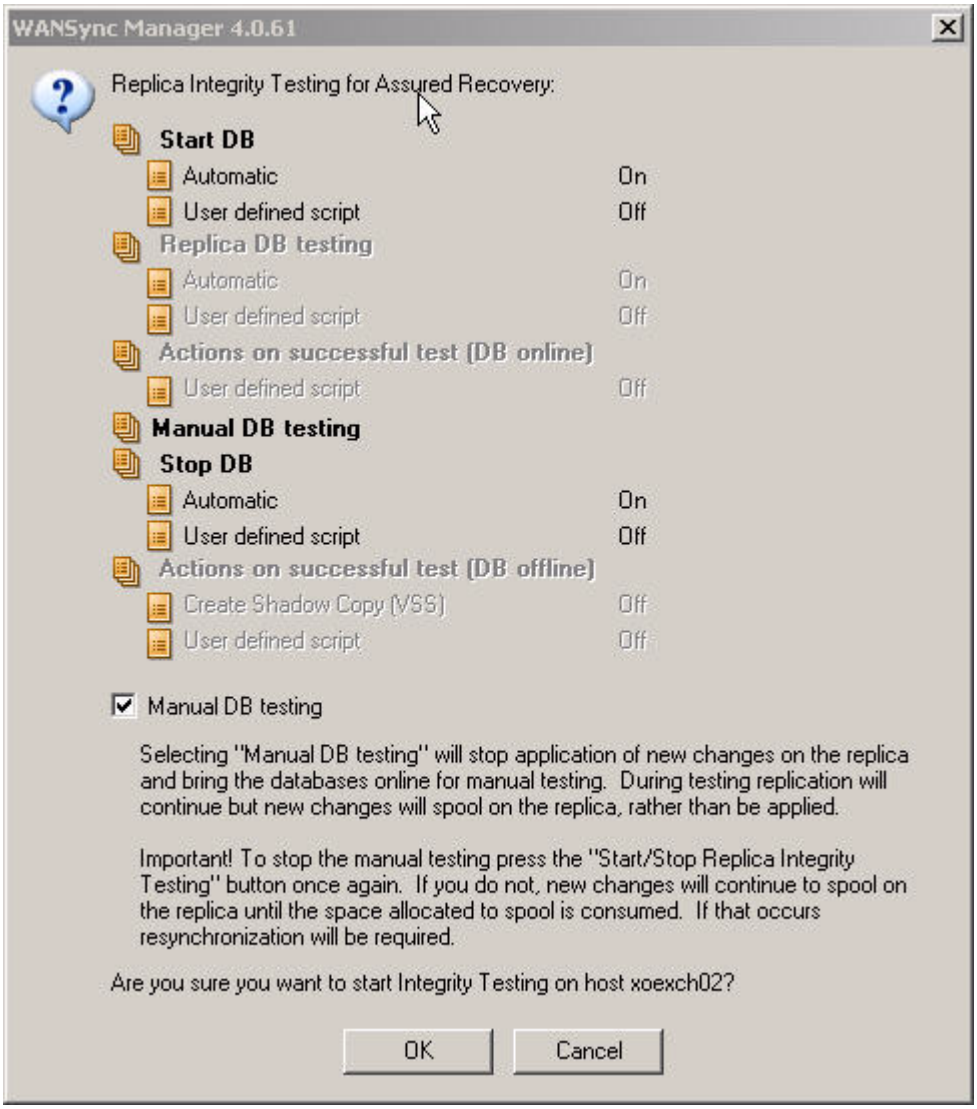
The resulting window displays the settings that are used for the test – they are taken from those you have set in the replica properties tab. If you press the OK button now, the configured tests are performed in the same way as on a scheduled basis.



At this point, you also have the option of performing full manual testing by selecting the Manual DB testing check box. In this mode, the Assured Recovery product starts application services on the replica and informs you when the server is ready for testing. You can then perform any testing directly on the replica server. When you are done, you must press the Start/Stop Replica Integrity Testing for Assured Recovery button again to resume replication.

Important! If you do not press the Start/Stop Replica Integrity Testing for Assured Recovery button a second time, changes will continue to spool up on the replica server. Eventually, the spool on the replica server overflows and the scenario is stopped.

When the Manual DB testing checkbox is selected, the window changes to reflect the subset of actions that are performed automatically:



Press OK, then wait for the message *Replica replica-name is ready for manual DB testing*. After this message appears, you can perform tests directly on the replica server. After you are done, press the Start/Stop Replica Integrity Testing for Assured Recovery button again. Wait for the message *Finished DB integrity testing*.

Chapter 5: Creating Replication Scenarios

WANSync is a powerful, easy-to-use product for creating and maintaining full online backups of your business or other important data. WANSync monitors your file system online, intercepts and copies all additions or changes to it, and transmits this information online to your backup servers.

User-Defined Scenarios

WANSync creates and maintains backups in the context of user-defined scenarios. A scenario defines a replication tree that defines the flow of information from the master server to any number of designated Replicas, and establishes the properties of the replication and, if applicable, switchover processes.

You can configure, add or remove servers from a scenario and select or modify directories. This enables easy, complete control of the replication process over any network, large or small.

The user-friendly GUI enables you to rapidly learn and control any number of scenarios. Follow the instructions in this chapter for an easy start.

Note: In order for the replication process to succeed, verify that the user under which the WANSync Engine is running has permissions for each replication root directory, and on all participating hosts.

Install WANSync Manager

Install WANSync Manager and the Remote Installation Wizard onto the machine from which the WANSyncHA scenario will be configured. The location of the Manager is not critical so long as it is accessible in the event of a disaster. The Manager is frequently installed on a server room or an administrator's workstation.

Important! If the Manager is installed directly on either the master or replica servers, ensure that the XOsoft Engine is also installed.

If you intend to use the XOsoft Remote Installer (recommended), the machine on which you are running the remote installer should have the .Net framework 2.0 installed. The framework is required only on the machine running the remote installer wizard (GUI); the target servers do not have this requirement.

After the scenario is run it is cached on your master and replica servers. Once cached, you can download it to any installed WANSync Manager by selecting *Download* from the File menu (then enter the name of your master or replica server).

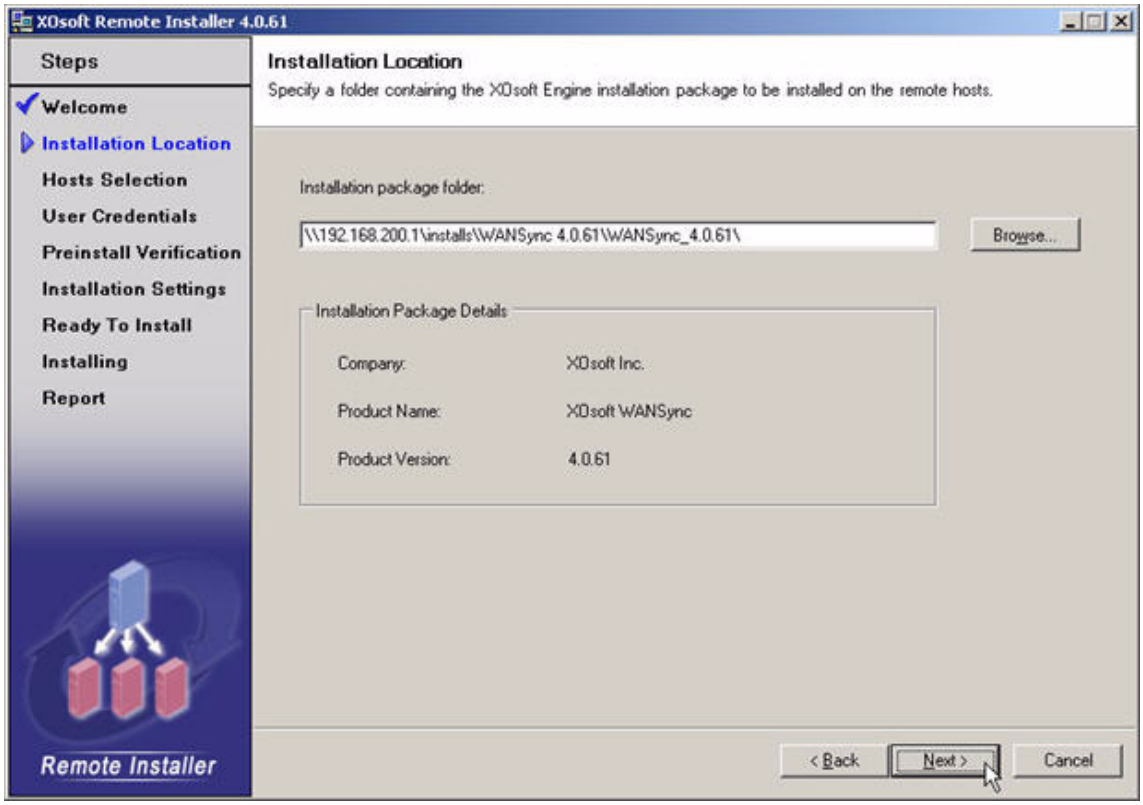
Install the XOsoft Engine Service

The following subsections describe how to install the XOsoft Engine service to the servers involved your WANSync scenarios.

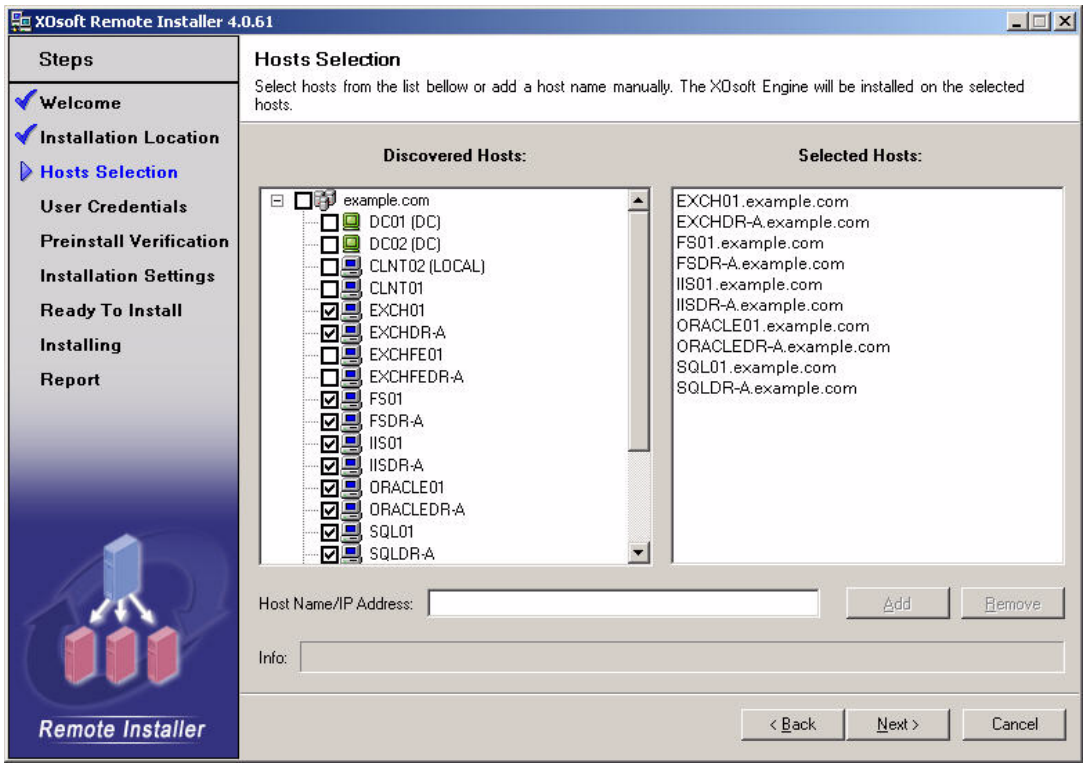
Remote Installation Wizard

You can use the Remote Installation Wizard to deploy the XOsoft Engine to any number of servers, or cluster nodes, in one step. Alternatively, you can install the XOsoft Engine manually by running setup.exe directly on each server.

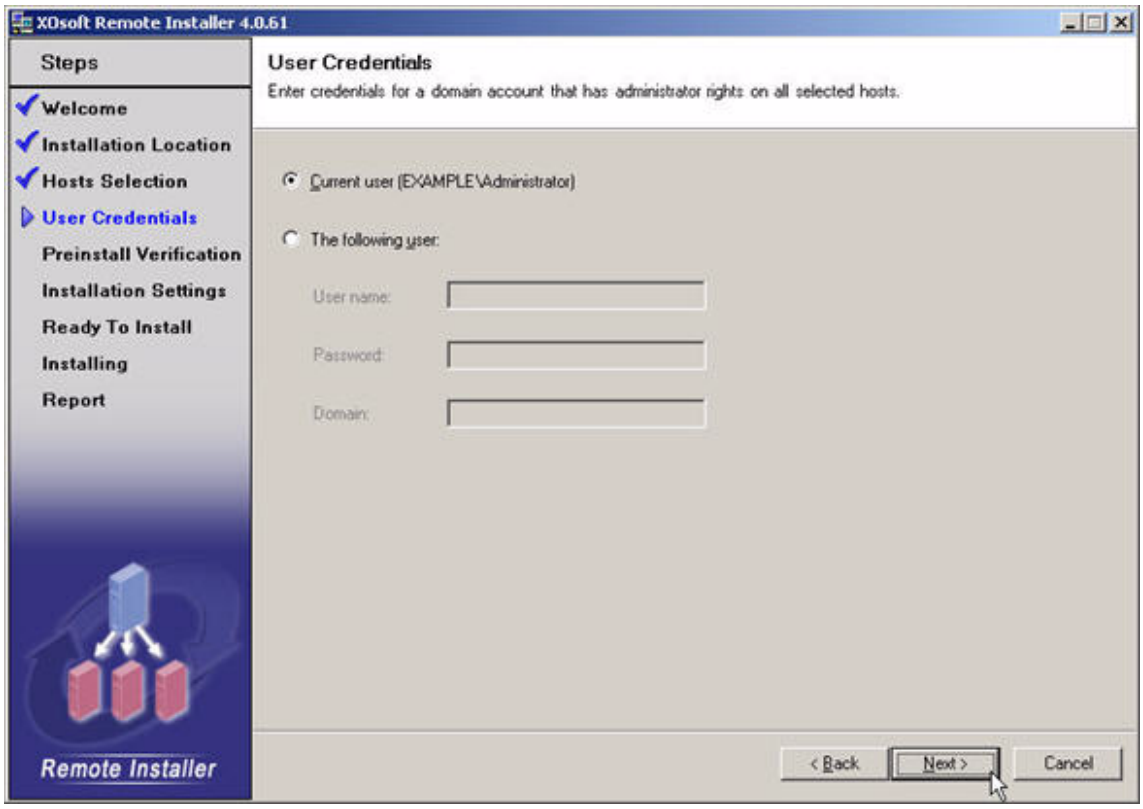
- **Installation location** - ensure that this path is correct and contains a valid WANSync setup package.



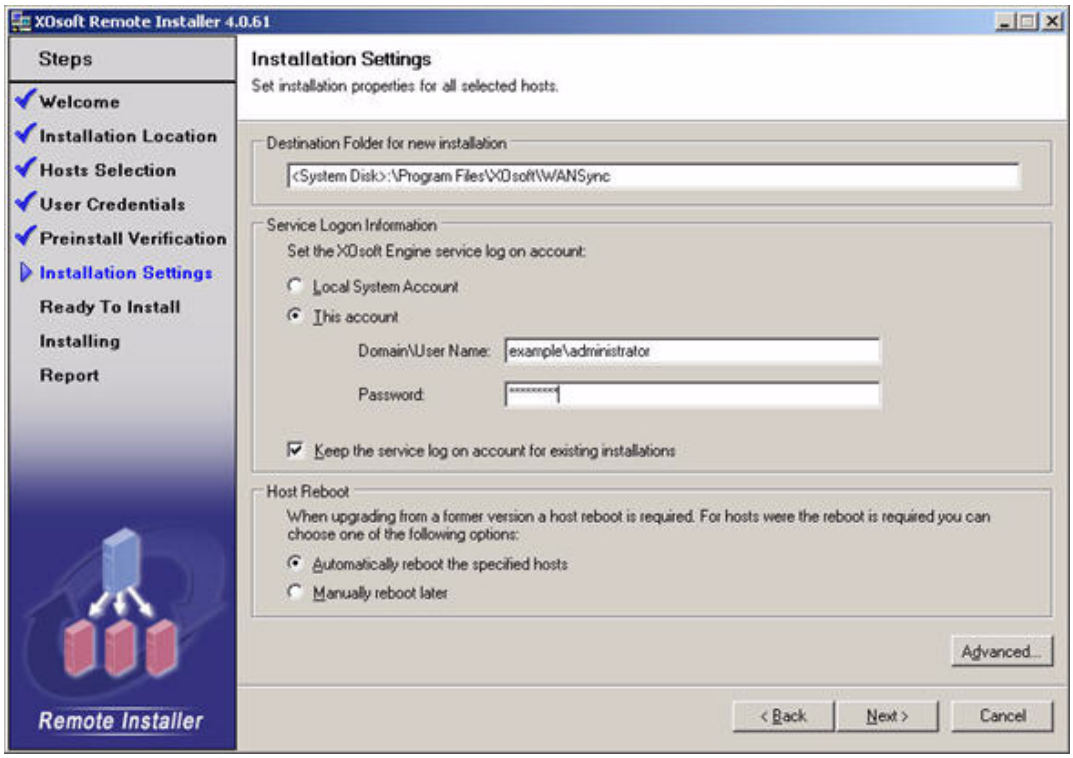
- **Hosts selection** - select the servers (or cluster) nodes to which you want to deploy the XOsoft Engine (you can add servers manually from the *Host Name/IP Address* box).



- **User credentials** - the user account that is used to install the XOsoft Engine on each target server (ensure that this account is a local Administrator on all target machines).

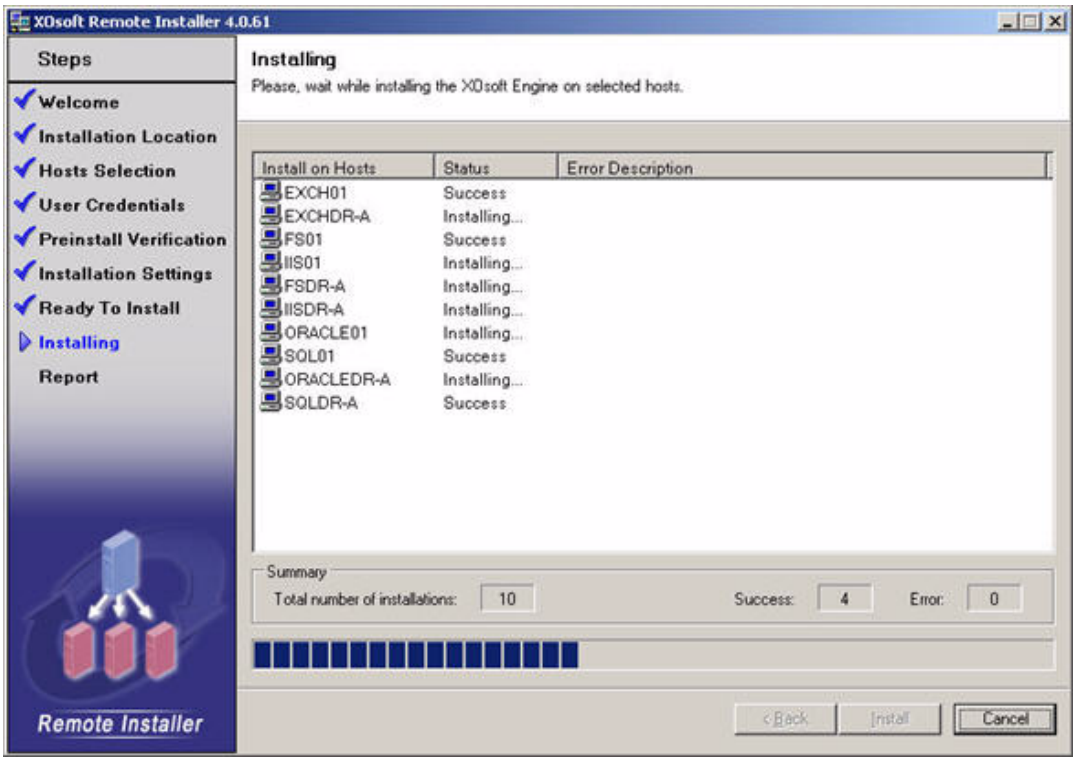


- **Preinstall verification** - click Next after all servers have reported success.
- **Install settings** - select *This Account* and enter your WANSync service account domain\username and password. Disaster Recovery scenarios can use Local System; High Availability scenarios may require higher levels of permissions (see the appropriate operations guide for details).

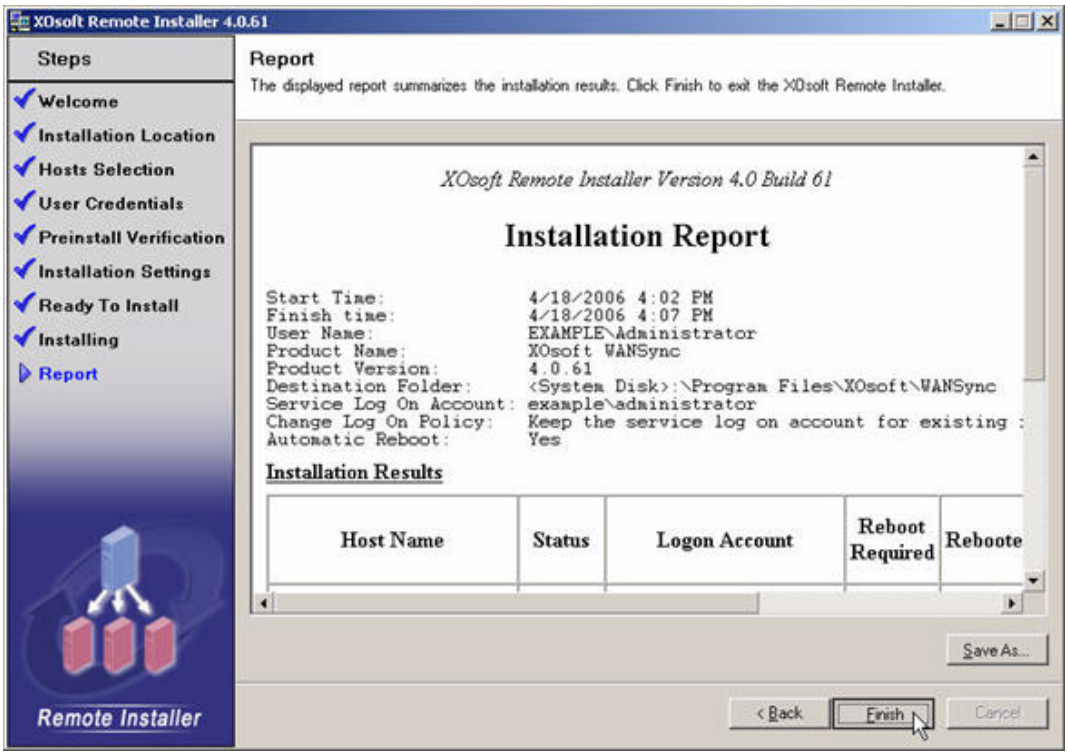


Important! Do not proceed without first setting the correct service account.

- **Ready to Install** - confirm that all desired servers are listed and then click the Install button.
- **Installing** - you can monitor the installation process from this screen.



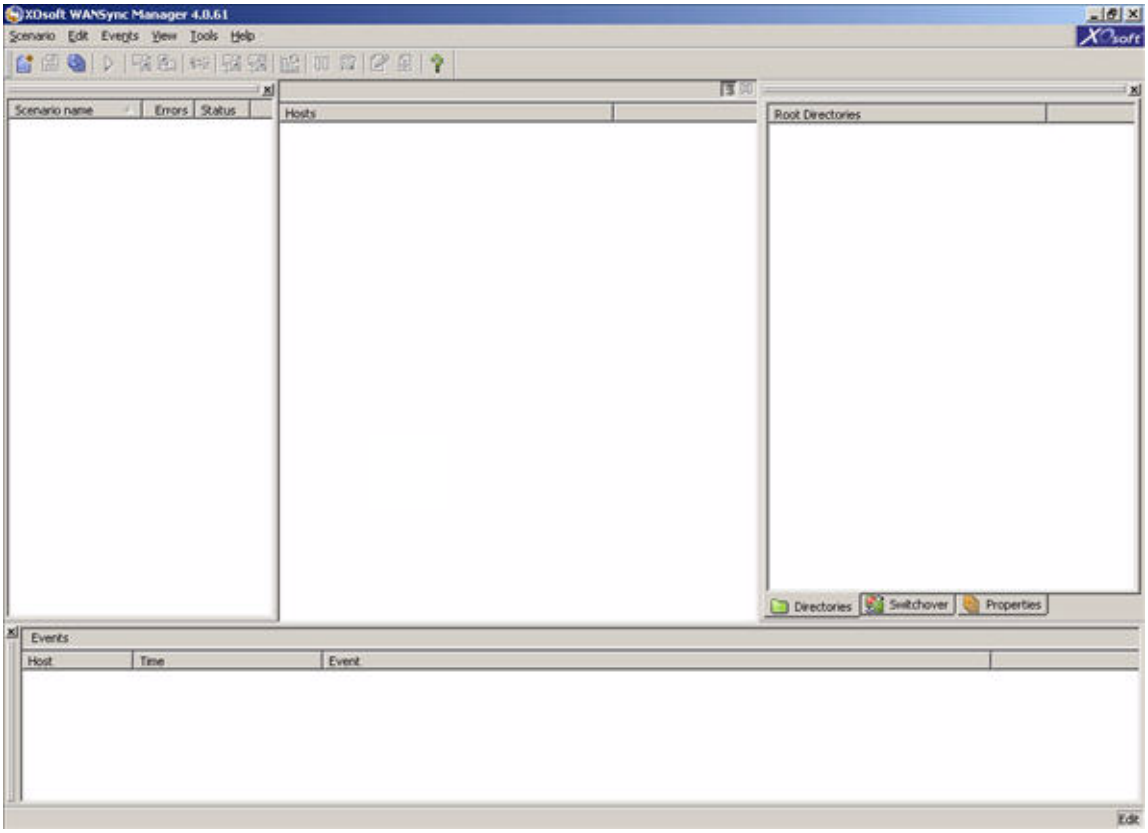
- **Report** - in this last step you can view the full installation report and, optionally, save a copy (the XOsoft Engine now is installed on all selected servers or cluster nodes).



WANSync Manager Screen

When the application is first run, the WANSync screen is called up. Unless a scenario exists, most of the user areas are blank.

Note: The Switchover tab in the window on the right is visible only with a High Availability (WANSyncHA) product license.



The screen is divided into several areas:

1. The application's name (WANSync Manager <version#>); the menu line, and the toolbar appear on the screen's top line.
2. Scenarios appear on the far left window pane.
3. The Replication Tree appears in the middle window pane.
4. The Framework window is the far right window pane.
5. The Events window is below the screen's dividing line.
6. The bottommost line is the Status bar.

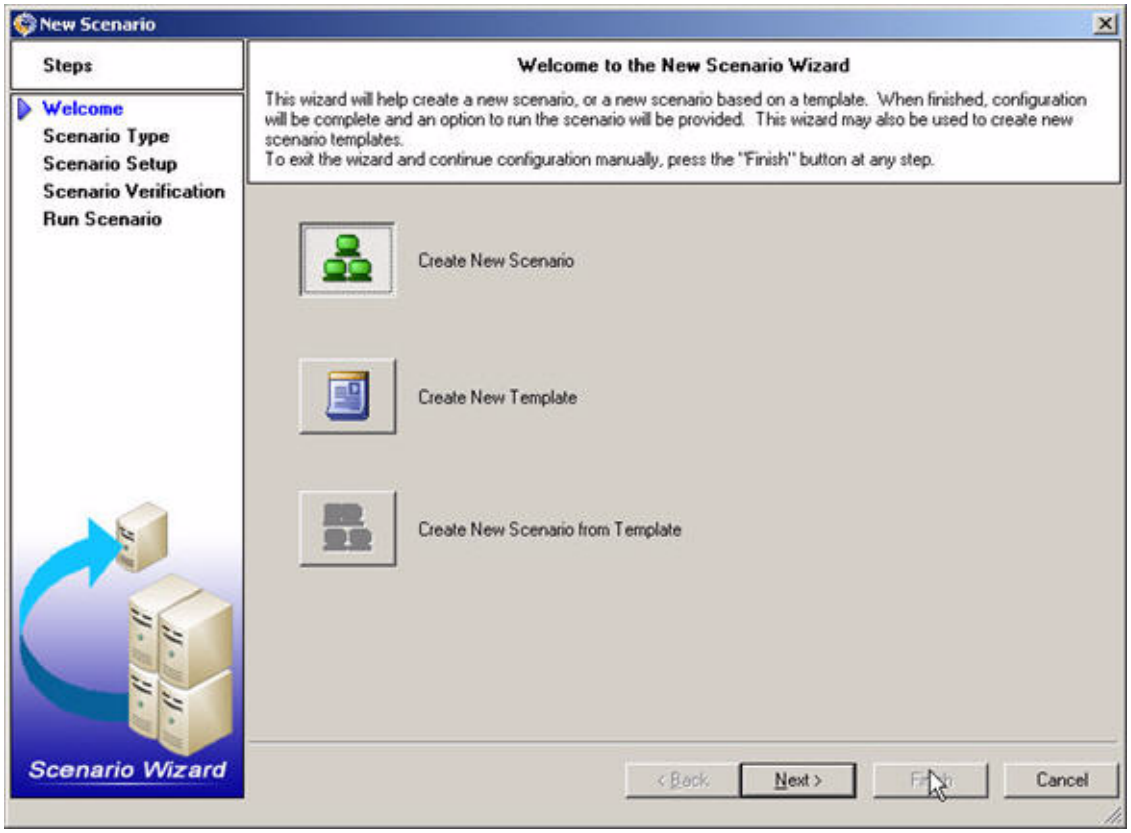
Note: The Framework window may show two or three tabs. The actual placement of the windows can vary because they can be moved and resized. Also, the windows, including the toolbar and status bar, can be made invisible according to the selections in the View menu.

The New Scenario Wizard

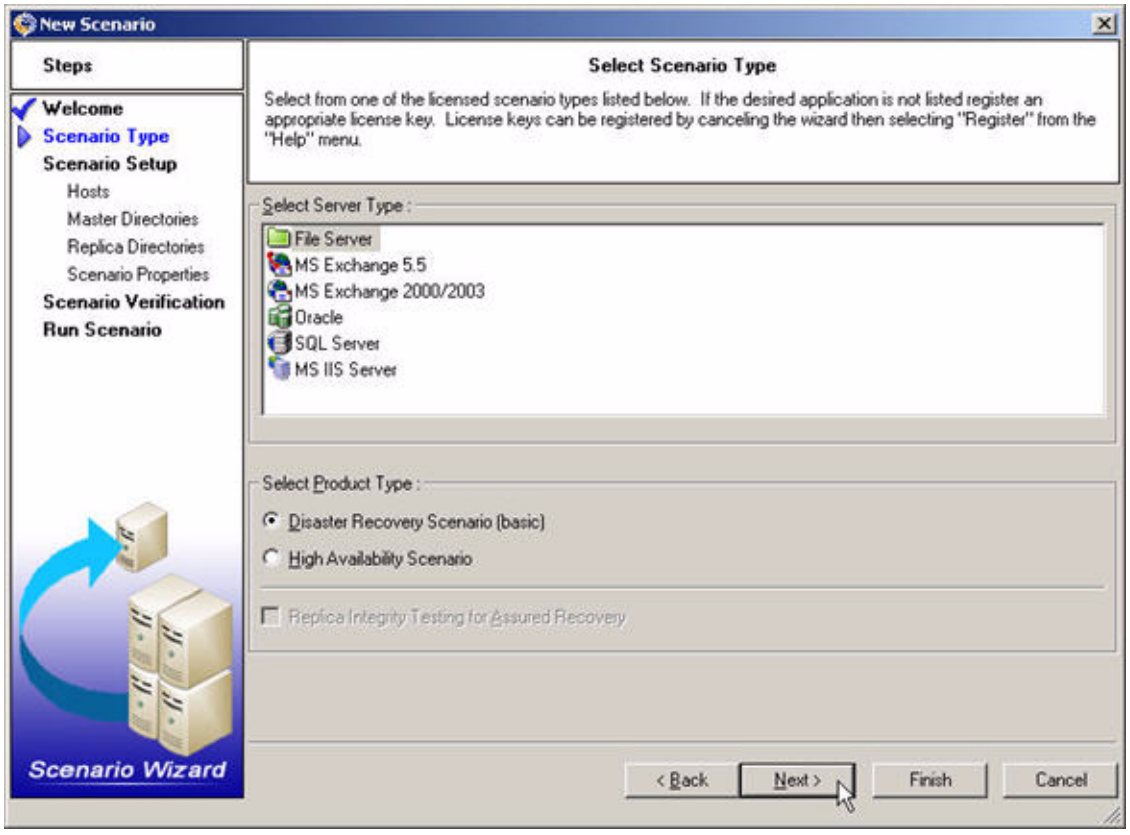
To use the new scenario wizard:

1. Open the WANSync Manager
2. Click the New icon on the toolbar (or type ctrl+N, or from the menu, select Scenario > New, or place the mouse cursor in the Scenario window and press the keyboard's Insert key, or right-click and select *New*).

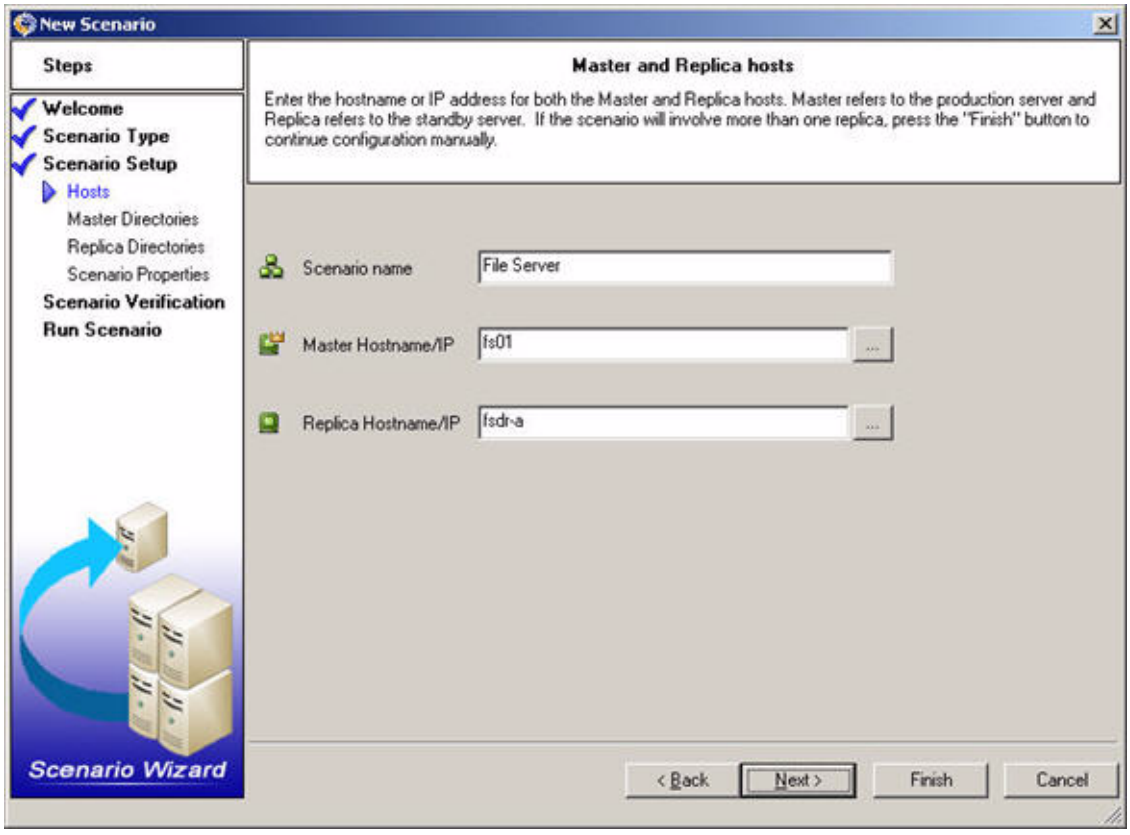
   Important! This section demonstrates configuration of a File Server disaster recovery scenario. For more detailed instructions involving High Availability scenarios or tailored to specific applications, such as Exchange or SQL, please reference the appropriate operations guide.
3. Click Next to create a new scenario.



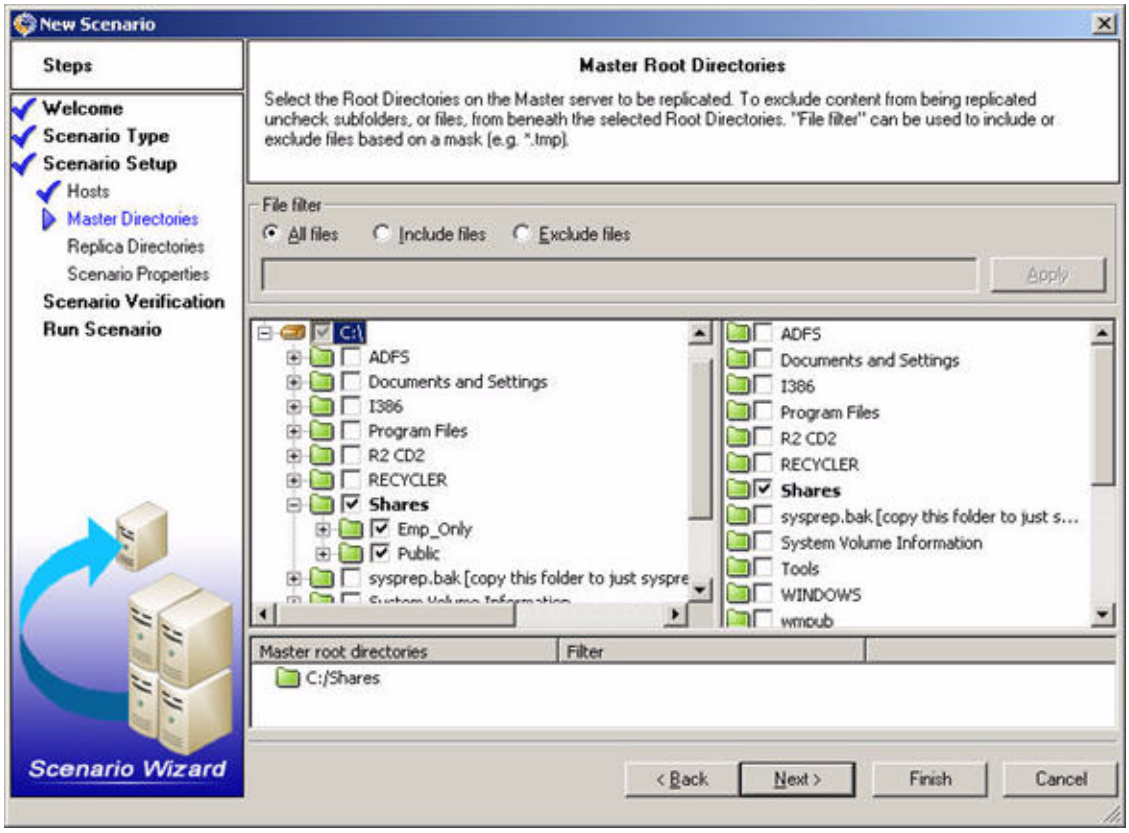
4. Select the Server Type, Product Type and Assured Recovery (if available).



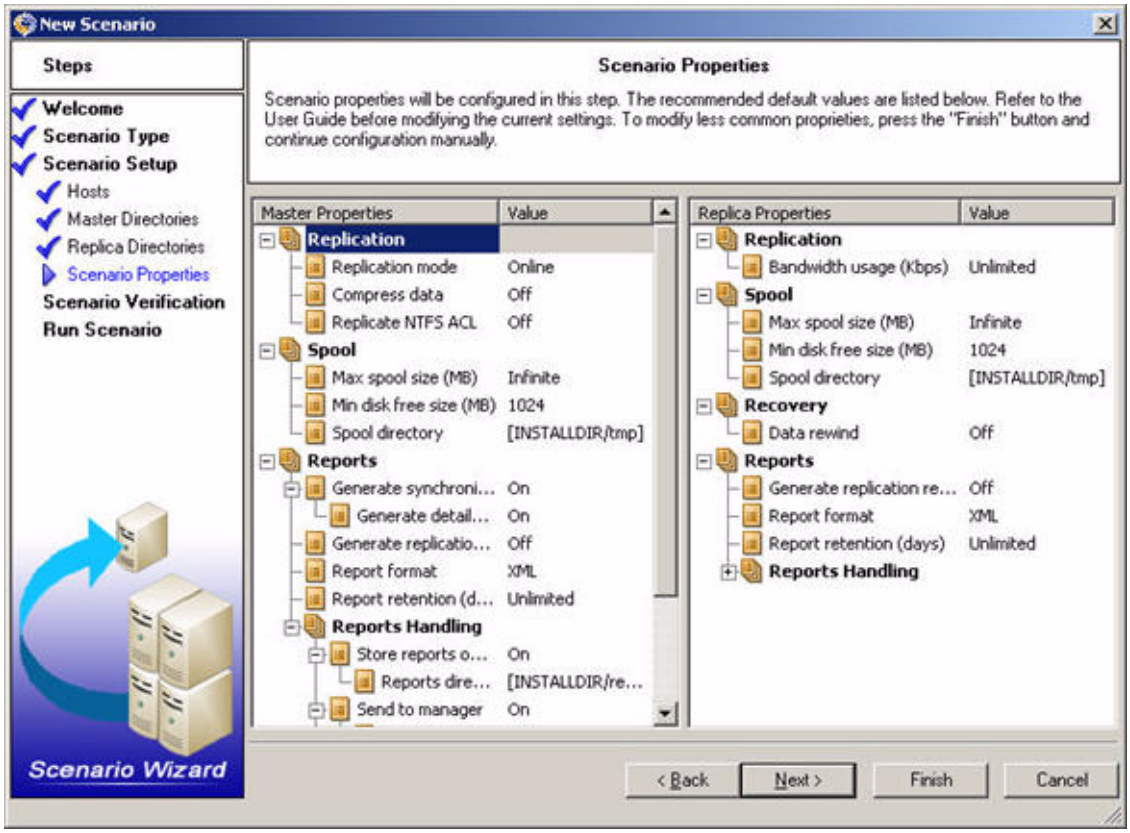
5. Input the hostname or IP address of the master and replica servers.



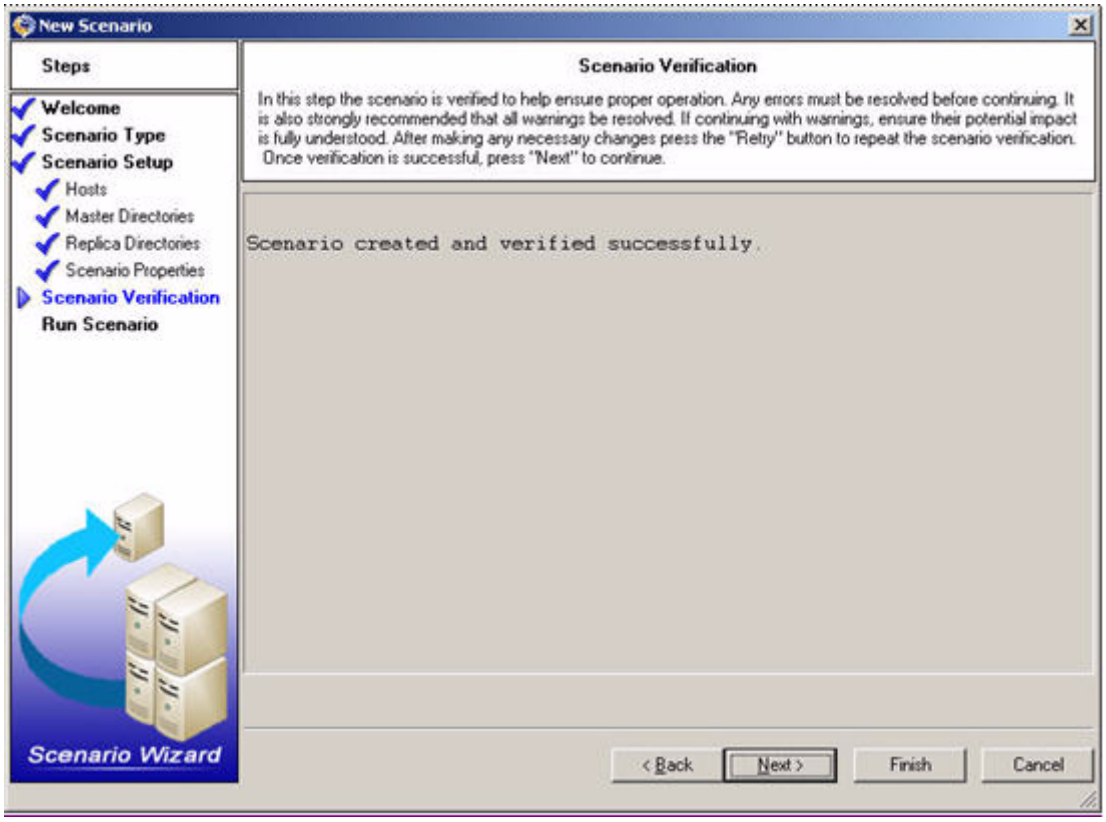
6. Select the master data to be replicated.



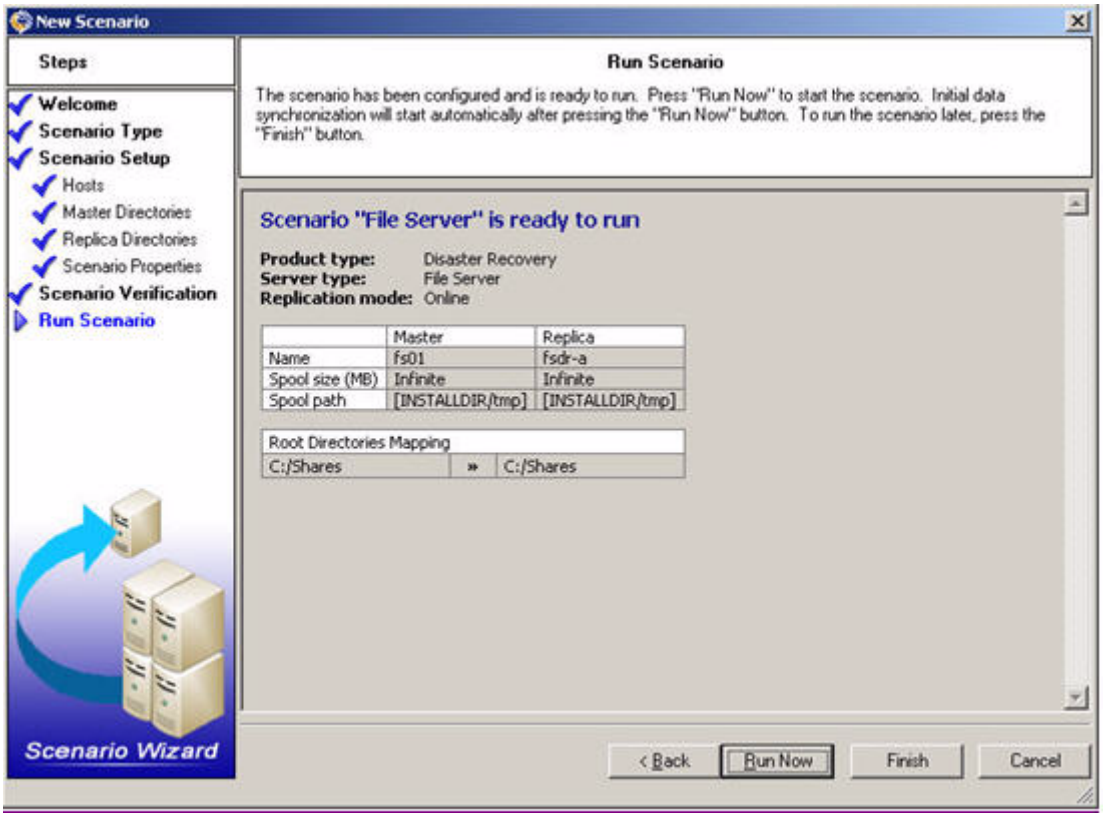
7. At this point, you can modify scenario properties. Typically, the default settings are sufficient. For more details, please see the appropriate master and replica properties sections later in this guide.



8. Scenario creation is now complete. Any configuration issues detected by WANSync are displayed here.



9. Now you can run the scenario. Running the scenario starts the data synchronization process. Alternatively, you can click the Finish button to run the scenario later.



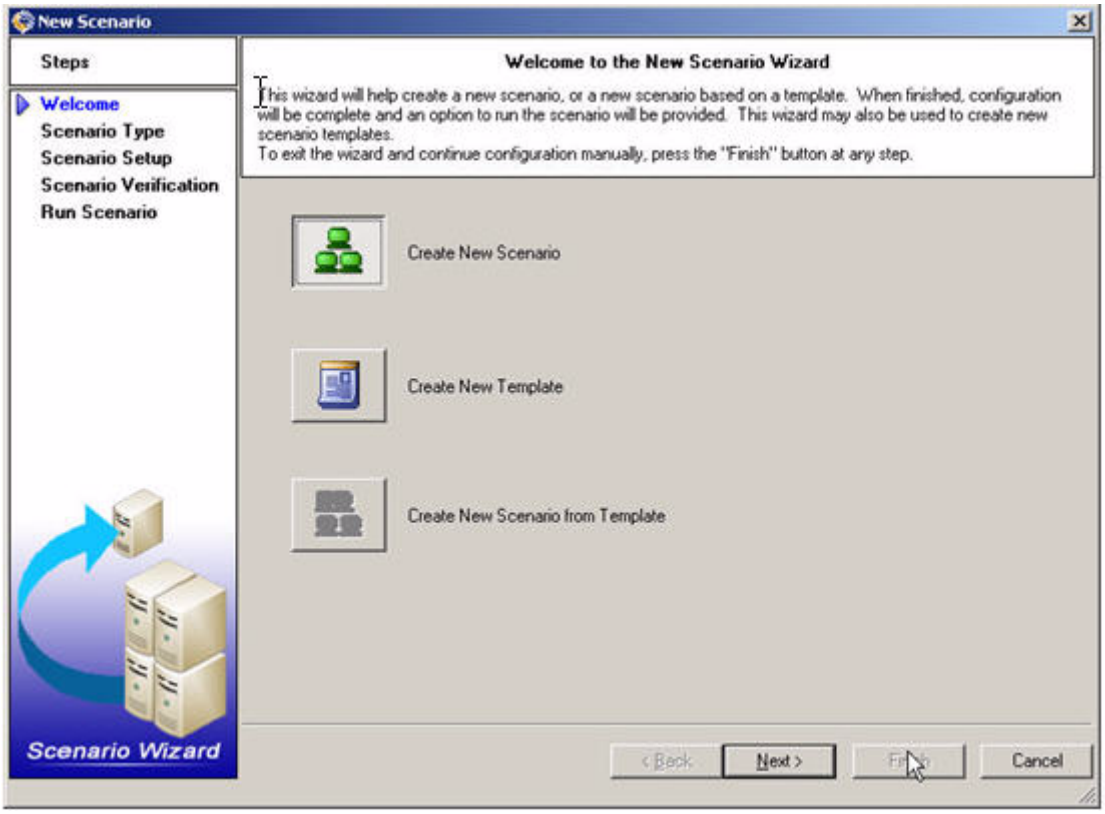
Create a Scenario Manually

This section demonstrates the configuration of a generic scenario. For more detailed instructions involving High Availability scenarios or scenarios tailored to specific applications such as Exchange or SQL, please see the appropriate operations guide.

To create the scenario:

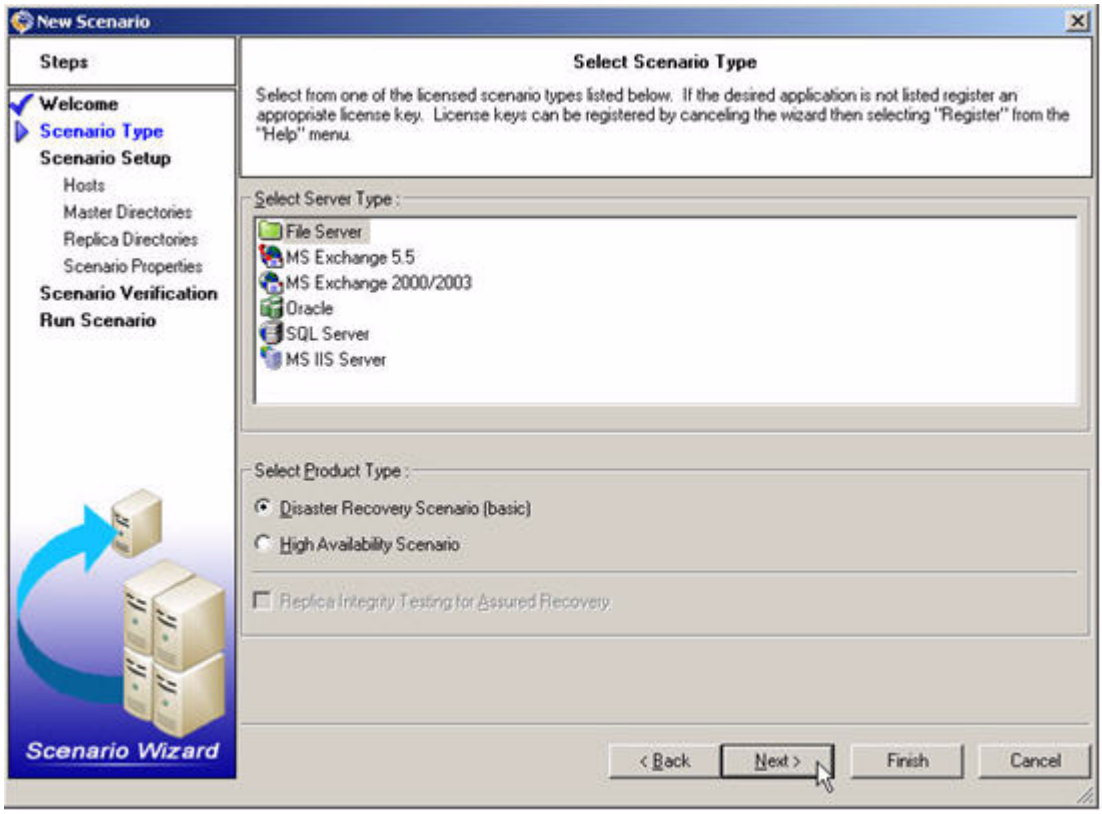
1. Open the WANSync Manager.
2. Click the New icon on the toolbar (or type ctrl+N, or from the menu select Scenario > New, or place the mouse cursor in the Scenario window and press the keyboard's Insert key, or right-click and select *New*).

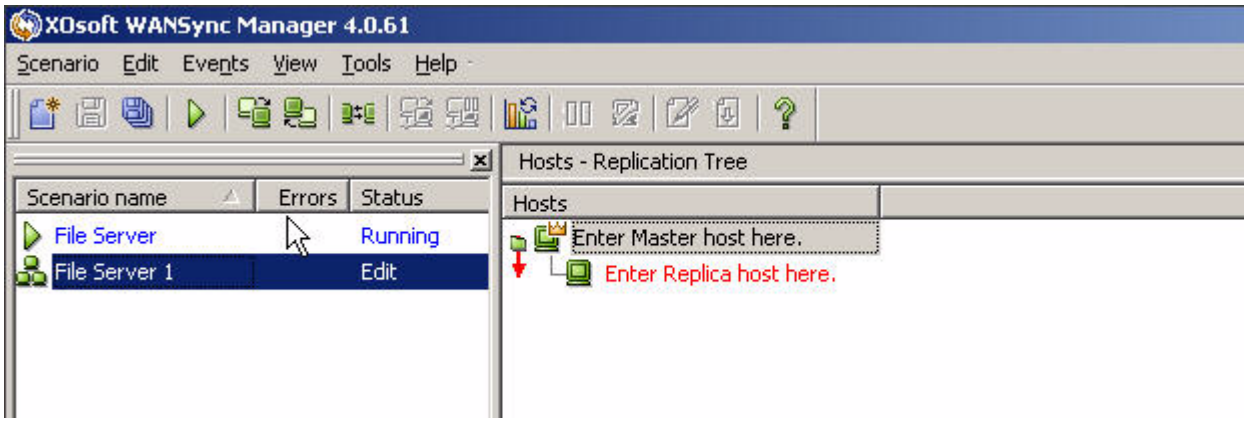
   The New Scenario Wizard opens.



3. After clicking Next a list of available applications and scenario types are presented (the list of available applications depends on the licenses applied). Make your selections and then click Finish to create the scenario manually.

   Note: If Assured Recovery (AR) is not licensed on a given machine, the Replica integrity testing for Assured Recovery box is grayed out. If you are licensed to use AR, check the box when creating a scenario (see *License Registration*). AR will also be grayed out if a File Server scenario is selected, this scenario type does not offer AR.



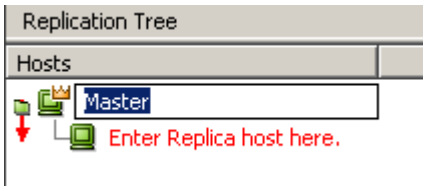


Define the Master Server

To define the host computer:

1. Right-click on the *Enter master host here* text and select *Rename*.

2. Type in the server name or IP address of the host.
3. Press <enter> on your keyboard, or click anywhere outside of the text field. WANSync immediately attempts to locate the computer with that name. If it cannot be located, an error message appears: *Cannot resolve host name*. Try again, or ask your system administrator for assistance in locating the proper computer.



Note: You can enter an IP address instead of a hostname.

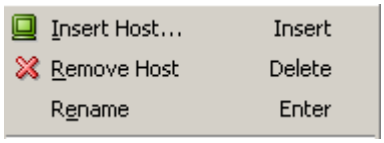
Define the Replica Server

Every scenario is created with an empty master and one empty Replica. To define the replica server, go to the Replication tree window, select the line reading: *Enter replica host here* and proceed as you did for the master server.

Rename the Server

To rename the replica:

1. Right-click the name field. A pop-up menu appears.
2. Select *Rename*.

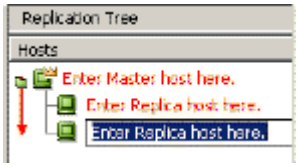


Add Additional Replica Servers

To add additional replica servers:

1. Select a host (master or replica) under which you want to add a server. Right-click and select *Insert host* from the pop-up menu or select Edit > Insert host.

2. A new replica server entry appears. Define it as you defined the master host, and set its properties.



Select Master Directories and Their Contents

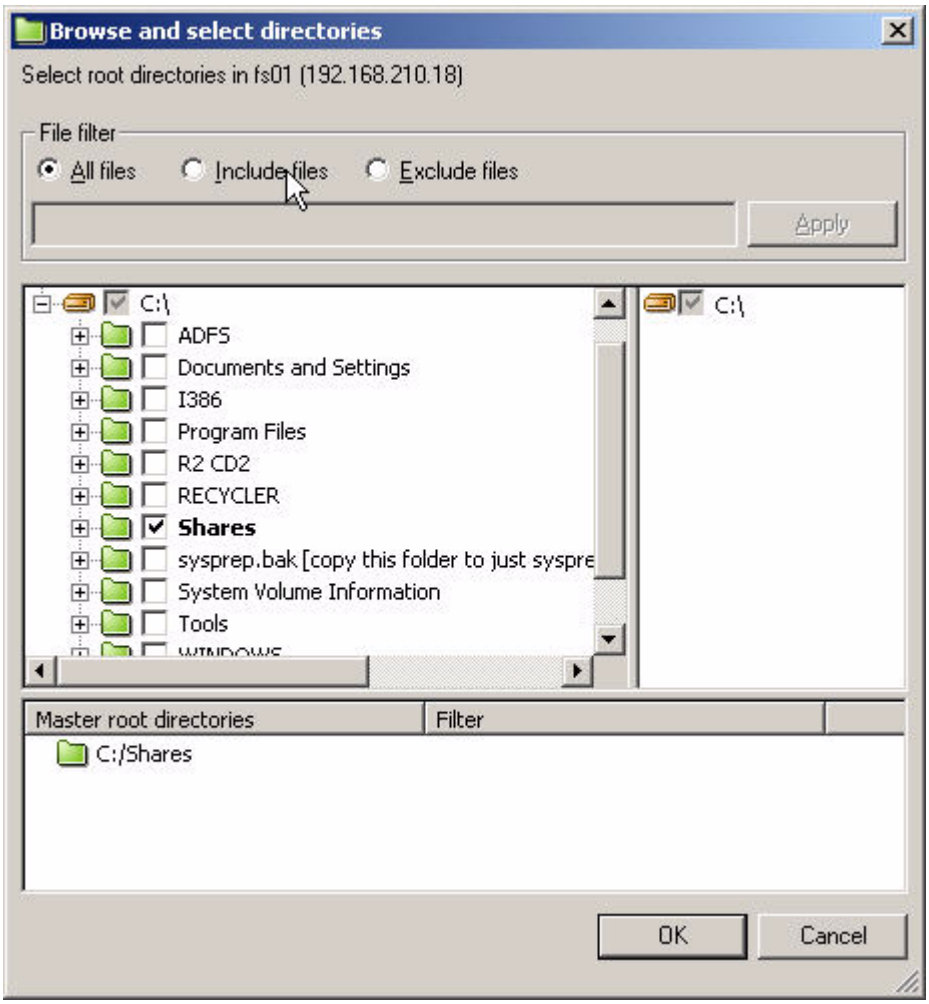
This section explains how to select directories and files for replication. Note that for certain applications like Exchange, SQL, etc., you can use the WANSync autodiscovery feature may be used to select files automatically. See the appropriate sections below.

Important! Special limitations apply to mapped drives or UNC paths (\\server\share). These path types are not supported as a source for real-time replication. However, they can be the target for data replicated in real-time, in which case, they can even support ACL replication. If these path types are used as the source, you are limited to scheduled synchronization only and open files are not synchronized.

To select master directories and their contents:

1. Select the master server in the Replication Tree window.
2. In the Framework window, click the Directories tab at the bottom. The directory information appears in the window.
3. Double-click the master root directory named *Directories*. The Browse and select directories window appears. Alternatively, right-click anywhere in the window, and select *Browse and select directories*.

   Note: Working with *Browse and select directories* is possible only if the WANSync Engine is installed and running on the host.



Mark and Unmark Directories and Files

To mark and unmark a directory or file:

1. The Browse and select directories window has two areas. The left-hand area shows only directories (and sub-directories). The right-hand area shows both directories (and sub-directories), and files in those directories. The checkboxes are for you to mark or unmark. When marked, those directories or files are selected. Those not marked are ignored.

2. In the window's left-hand area, mark the directories that are to participate in the master's replication scenario, by clicking on the relevant checkboxes. These are the master root directories. The checkbox is marked, and the directory name is bold.
3. If a root directory is a sub-directory, it remains bold and marked, and its parent directory is marked with a grayed checkmark.
4. All files and sub-directories belonging to the directory that is highlighted in the left-hand area are displayed in the right-hand area.
5. You can unmark right-hand area sub-directories and specific files. They are then ignored.
6. If you unmark any of the right-hand area sub-directories and files, they are ignored, but the root directory is still marked. However, it is marked with a grayed checkmark.
7. Click OK, when you have finished choosing all your directories and files.
8. The directories selected now appear in the WANSync Manager's Framework window under the master root directories column.

Edit Directory Names

To edit a directory name:

1. Select the directory and enter a new name using Windows conventions;
2. Or, right-click and select *Rename* from the pop-up menu;
3. Or, select Edit > Rename from the menu bar.

Remove Master Root Directories

To remove a master root directory:

Right-click a directory entry and select *Remove directory* from the pop-up menu, or select Edit > Remove directory.

Filter Master Directories

The filtering options do not mark (or unmark) items in the window. That has to be done manually. Instead they provide several key functions:

- All, Include, and Exclude provide a visual interface for you to view items
- Anything which is not visible (has been filtered out), whether it has previously been marked or not, is ignored as if it is unmarked

  Note: Replication ignores any files that have been filtered out (Exclude).

WANSync filters use standard wildcards:

- An asterisk (*) selects any number of characters/digits of all types
- A question mark (?) selects any single character or numeric digit
- A pound sign (#) selects any numeric digit
- An ampersand (@) selects any single character
- Entering other characters (one or many) selects for those specific characters

A given filter selection applies to all files in all directories in the scenario.

1. Double-click on any of the selected directories to re-open the Browse and select directories window.
2. Select the desired directories.
3. In the Figures below, the directories, subdirectories and files belonging to the object highlighted in the left-hand area are displayed in the right-hand area.
4. Choose the appropriate file filter (All files, Include files, Exclude files) and follow the directions in the following pages to select the desired files and subdirectories:
   - Click All files to select all files in the selected directories. This is the default. Instructions are as per *Mark and Unmark Directories and Files*.
   - Click Include files to include *only* the selected files or file-types. The filter text entry box is enabled. Enter the appropriate filtering characters (characters, strings, wildcards, file names or extensions, etc.). Instructions are as per *Include Files*.
   - Click Exclude files to exclude *only* the selected files or file-types and to include all others. The filter text entry box is enabled. Enter the appropriate filtering characters (characters, strings, wildcards, file names or extensions, etc.). Instructions are as per *Exclude Files*.

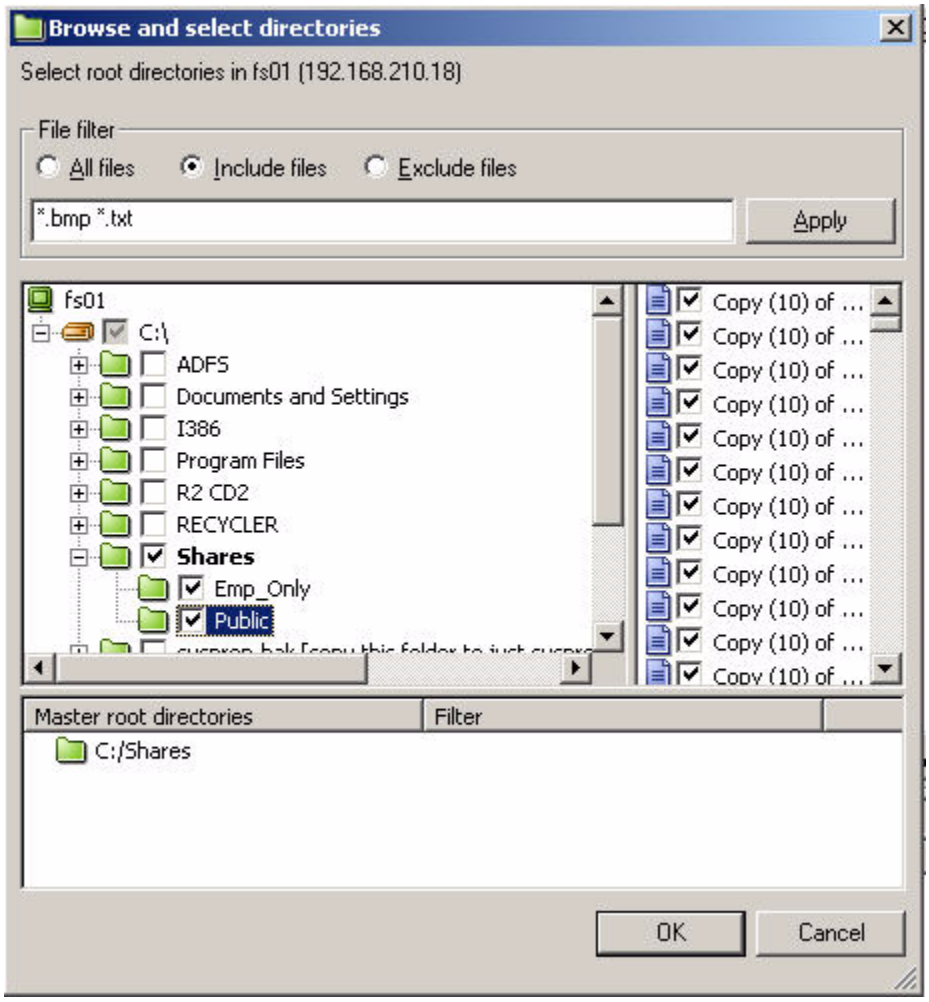
   Note: Filtering is possible only if there is a TCP connection between the master server and the manager.

Include Files

When using Include files, only the files or file-types entered into the include text entry field are included in the replication scenario, and only if marked (checked). Manually unmarking a file overrides All files and Include files.

To include files:

1. Click the Include files radio button at the top of the Browse and select directories window. This enables the text entry field (the text entry box is enabled with an asterisk (*) wildcard).



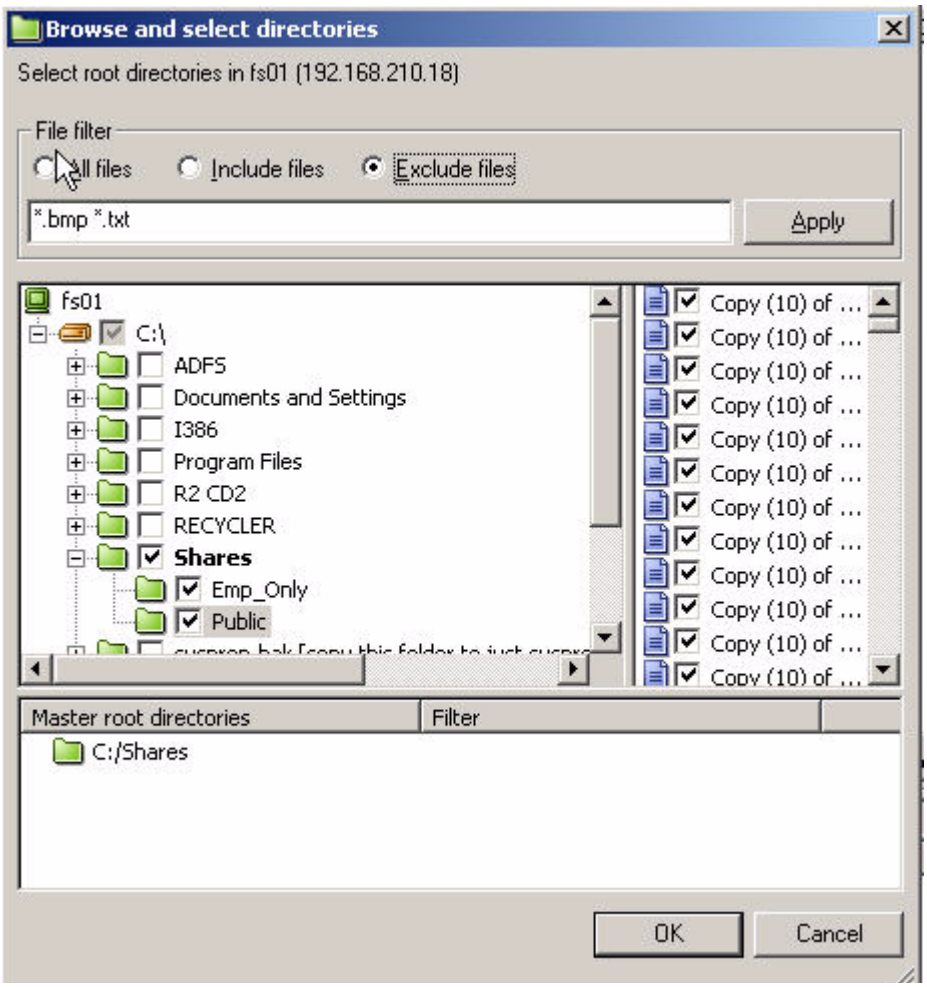
2. In the previous example, *.bmp and *.txt were entered as the Include files parameters. Clicking the Apply button carries out the filtering. Here, the only files displayed on the right-hand side are those that have the BMP or TXT extensions.

   You can enter more than one wildcard pattern into the text entry field. Use a *blank space* to separate the names. Do NOT use a comma or semi-colon, etc. If a file name includes blanks, enclose the complete file name between quotation marks ("").

Exclude Files

To exclude files:

1. Select the Exclude files radio button and enter a value; for example, exclude all files ending in the extensions *.xls , *.doc , *.ppt. Separate the extensions using a comma or a space: make sure there is a space between the file extension and the separator (e.g., *.xls<space><comma>).
2. Marking the root directory on the left side also marks all the right side sub-directories and the files matching the exclude criteria.
3. You can unmark any number of individual files or sub-directories by removing the checkmark next to their names. When a file is unmarked, the checkmark next to its path is grayed-out.



Autodiscover Database Files for all Databases

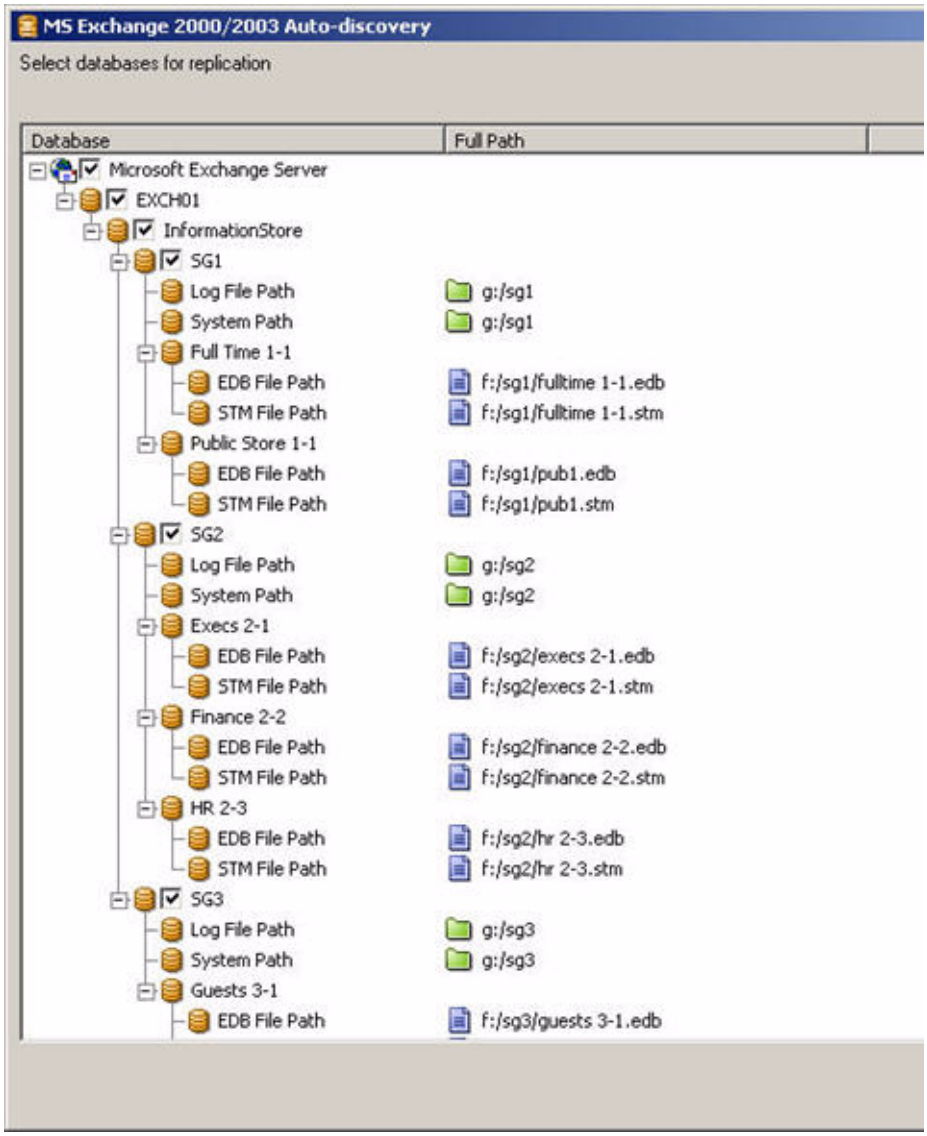
To facilitate easy directory selection for standard databases supported by WANSync, database directories and files are identified in the scenario host by using database APIs. Thus, WANSync displays the structure of the database and makes the appropriate selections, which may then be easily modified if necessary.

The WANSync auto-discovery function automatically discovers all database objects, related files and directories on your database or mail server — whether local or on a network. This function is currently available for all supported applications.

When using autodiscovery with all databases:

1. When creating a new scenario, the autodiscovered database files icon appears in the master root directories column of the Framework window. Its exact name is an amalgam of the text autodiscovered, and the specific server type name. For example: Autodiscovered Exchange 2000/2003 files.
2. To start autodiscovery, double-click the Auto-discovered icon in the master root directories column of the Framework window.

4. The Autodiscovery screen displays all database directories and files. From this screen you can deselect any selected items from replication.



5. Click OK.

Note: Autodiscovery is possible only if the WANSync Engine is installed and running on the selected server.

Select Replica Root Directories

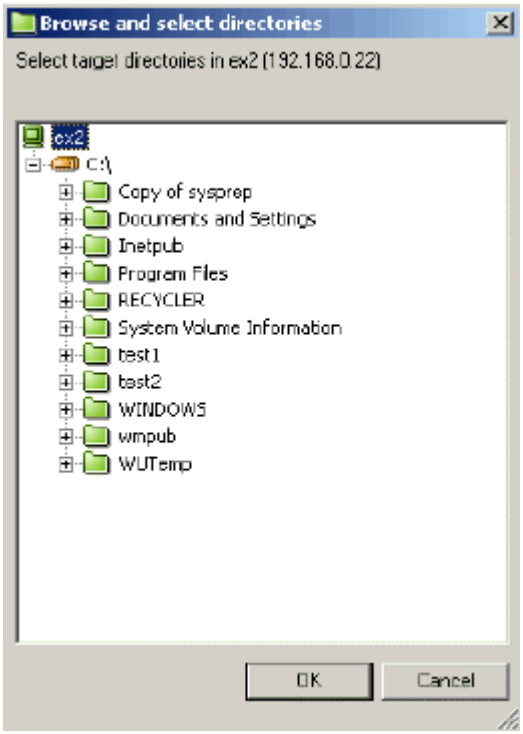
You must select the master directories before this function becomes available. For each master root directory you must define a replica root directory on each related replica.

Important! Special limitations apply to mapped drives or UNC paths (\\server\share). These path types are not supported as a source for real-time replication. However, they can be the target for data replicated in real-time, in which case, they can even support ACL replication. If these path types are used as the source, you are limited to scheduled synchronization only and open files are not synchronized.

To select replica root directories:

1. Click the replica server and then select the Directories tab. The selected master directories screen is displayed.

2. To replicate the master root directories to the same location in the replica as in the master, click on the rewind (left-facing double arrow) icon.
3. To select a different directory in the replica, double-click *Enter directory here.* WANSync connects to the replica server and opens the Browse for Directory window which displays the replica server's directory (Browsing for a directory is possible only if the WANSync Engine is installed and running on the selected server).



4. Select a replica directory to hold the corresponding master directory. Repeat this for each master directory.
5. In order for the replication process to succeed, verify that the user under which the WANSync Engine is running has permission for each replication root directory.

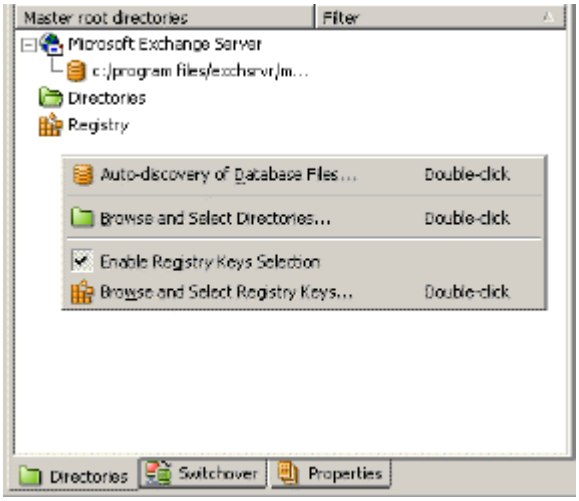
   Note: The replica root directory does not have to actually exist. You can enter the directory name by selecting the entry using the standard Windows conventions and WANSync creates it when the replication starts.

Select a Master Registry Key (Windows)

To enable replication of Windows system settings (the registry keys):

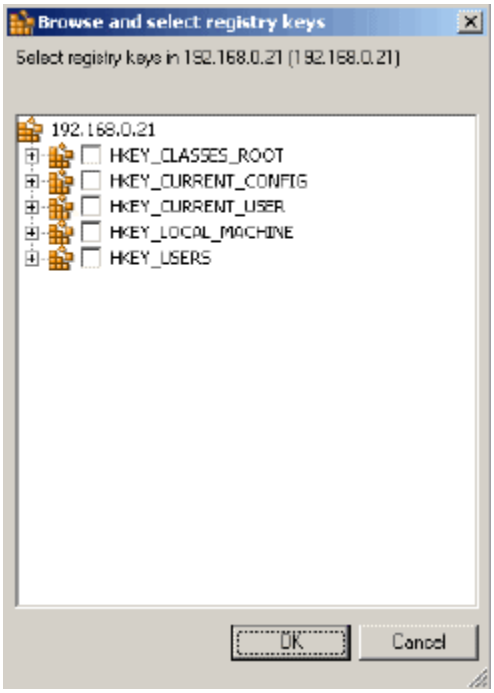
1. Select the desired scenario.

2. Select Edit > Enable Registry Keys Selection (or right-click in a blank area of the master root directories window (do not mark a directory) and select *Enable Registry Keys Selection*). A Registry entry icon appears in the master root directories section of the window. WANSync now replicates the Windows registry in addition to the selected files.



To select a master registry key:

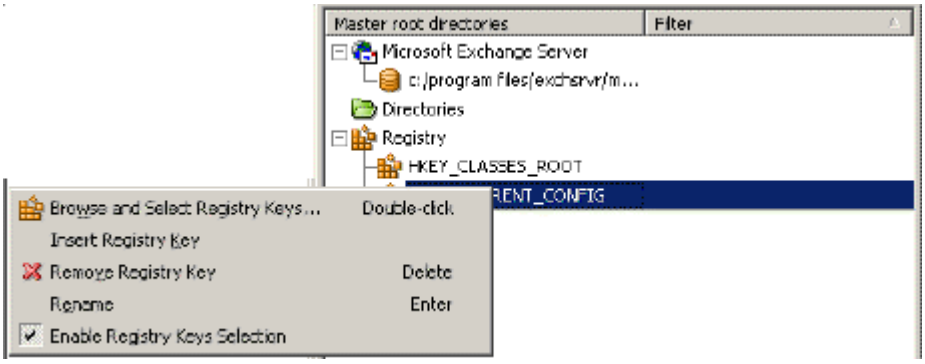
1. Right-click the registry icon and select *Browse and Select Registry Keys* (or select Edit > Browse and Select Registry Keys). WANSync Manager connects to the master server and displays its local registry structure.



2. Select the master registry keys that you want to replicate (browsing for registry is possible only if WANSync Engine is installed and running and WANSync Manager has a TCP connection to the selected server).

To remove a registry key:

Select a registry key in the root directories window. Right-click and select *Remove Registry Key* (or press the Delete key on the keyboard): the registry key is removed from the display.



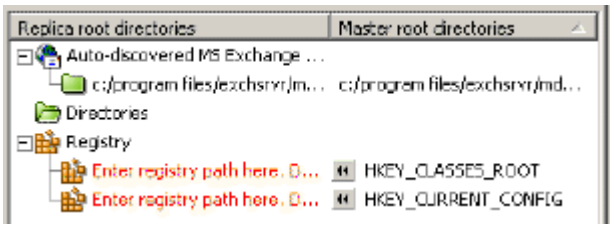
Specify a Replica Registry Key (Windows)

The number of keys defined for the master server determines the registry keys for each Replica.

You must assign a name to the replica registry key, but this key does not have to exist. You can create the registry key on the fly, along with any sub-keys that are required. You can also browse for an existing registry key.

Use Same Key Names as Master Registry

To use the same key name as the master registry, click the rewind (double arrow pointing left) icon in the master root directories area.

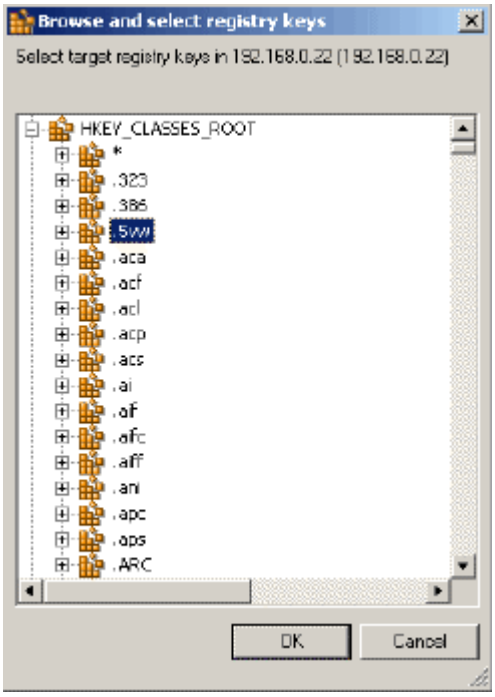


Browse for the Replica Server's Registry Keys

To browse for the replica server's registry keys:

1. Double-click the registry icon to open the *Browse and Select Registry Keys* form.
2. Select the desired replica registry keys or values and then click OK.

   Note: Browsing for registry is possible only if WANSync Engine is installed and running and WANSync Manager has a TCP connection to the selected server.



Set Master Server Properties

The property values determine the replication and synchronization settings for the scenario. They determine the entire scenario's default behavior concerning spool directories, transfer rate, synchronization method, reporting, etc.

Each scenario is identified by its specific Product type, Server type and unique Scenario ID. The values of these items cannot be modified.

Note: The Framework window and its tabs (Statistics, Directories, Properties) are context sensitive and change whenever you highlight a different replication tree.

A running scenario has a gray background, and scenarios that are not running have a white background.

To set master server properties:

1. Select the master server and click the Properties tab at the bottom of the Framework window. The Properties tab open.
2. Select or enter the appropriate values. Some values can be manually entered in an edit box field, while other values can be selected from a combo box or IP control by clicking the default value.

Note: For HA File Server, the Synchronize Shares option is not present. The issue is handled under the Switchover tab.

Replication Data Values Table

This table lists the master properties, corresponding values, and brief explanations.

Property	Values			Explanation
Replication Mode	Online			Triggers real-time replication. Changes are replicated continuously, in real-time, using the XOFS driver.
	Assessment mode			Allows accurate bandwidth usage and compression ratio benchmarking, without actually replicating data. No replication occurs but statistics are gathered. A report is provided after the specific report interval is reached.
	Scheduling	Schedule:		Servers are synchronized at a scheduled, fixed time.
		By User Request		Synchronization is triggered by a user running synchronization from WANSync Manager, or CLI.
		Weekly Activity	Hours	A dialog box opens for setting the synchronization timetable. After setting the scheduler, a short representation of the set hours are displayed. For a more detailed look at the mechanism for setting the scheduling timetable, see *Set Advanced Schedules*.
	On-file-close (content distribution scenario only)			Continuous replication using the XOFS driver, but changes to individual files appear on the replica server only after the file is closed.
		Synchron-ization with file re-placement	On/Off	Apply on-file-close algorithm during initial synchronization as well.

Property	Values		Explanation
Automatic run/ synchronization	On/Off		Synchronizes any replica that has lost communication with the master for too long a time, and in the following cases (if the option is chosen): If the master is rebooted, WANSync automatically re-synchronizes the master and the replica after the reboot. If the spool overflows, WANSync automatically re-synchronizes the servers upon resumption of the connection. Auto synchronization is never carried out if a scenario runs in a scheduling mode.
Automatic synchronization type	File Synchronization (Continual) Block Synchronization (Continual)	Ignore same size/time files	See *Replication Data Values Table* for a detailed explanation of these values.
Run script before synchronization	On Off	Script name Arguments	Selecting this triggers a script to run before each synchronization. Synchronization does not wait for this script to execute. The full path to the script. Arguments to pass to the script specified in the previous property. Arguments are static values.
Run script after synchronization	On Off	Script name Arguments	Selecting this triggers a script to run after each synchronization. The full path to the script. Arguments to pass to the script specified in the previous property. Arguments are static values.
Stop database on run	On Off		When set to On, if a database scenario (Exchange, SQL, Oracle) is running and the database is running on the replica server, WANSync stops the database services before running the scenario (does not apply to HA scenarios).
		Script name	The full path to the script.

Property	Values		Explanation
		Arguments	Arguments to pass to the script specified in the previous property. Arguments are static values.
Compress data	On Off		Compresses data before sending to Replica. Optimizes bandwidth and transfer time.

1. Compress data is resource consuming, and impacts server performance. If the typical file format being transferred does not compress much, this option is a waste of processing power and time. Although the transmission bandwidth can be lessened, the overall replication time is a function of compressibility and available processing power.
2. Already compressed files such as .zip, .rar, .gz, .jpeg, etc., and any small file whose size is less than 512 bytes, are not compressed.
3. To reduce impact on master server performance — activate this feature on the first level replica (not on the master).

Maintain write order	On Off	Ensures data integrity in the replica at any moment. This is absolutely required for database and mail servers. If you are unsure — keep it on. Default is On.
Attach to open files on run	On Off	Soft activation allows WANSync to start synchronization and replication of always-open files (like databases or mail servers) that were open before WANSync was started. If you are unsure — keep it on. Default is On.
Replicate NTFS compress attribute	On Off	Replicates compress attribute of files or directories. Windows only.
Replicate NTFS ACL	On Off	Transfers ACLs for files and directories during synchronization and replication. Windows only.
Synchronize Shares	On Off	If a directory has been set to allow sharing, then setting this option to On duplicates the property in the replicated directory. Windows only.

Connection Values Table

This table lists the master properties, corresponding values, and brief explanations.

Property	Value	Explanation
IP address	IP Control	Displays the IP address for the selected host. If the host name is changed, the IP address is updated. The host can also be changed by entering another IP address in this field.
Port number	<#>	25000 by default. This is the incoming port used for TCP communications. It can be changed to any unused port.
Fully qualified name	Fully qualified name of the master host	This value is always synchronized with the value in the Switchover values pane, if a high availability scenario.

Spool Values Table

Data is kept in a spool directory on the host (master property) before it is transferred to the Replica. Normally, data is sent to the replica immediately. However, in some cases (depending on the server update rate and the bandwidth on the master-replica or Replica-Sub-replica link), data may remain in the spool awaiting transfer. If the spool size is limited then in some extreme cases, the spool might overflow. In this case, replication is stopped and resumed later. To avoid spool overflow, it is important to define a spool large enough to handle peaks in the update rate in the server, as well as network failures or leave it at the default value of Infinite. In addition, verify that the bandwidth is sufficiently large to handle the replication traffic.

Property	Value	Explanation
Max spool size	<#> or 0 for unlimited	If you wish to limit the maximum spool size, enter it here. Enter a 0 for unlimited spool size. Note that, if you do enter a value, this space is used only if needed – it is not preallocated.
Min disk free size	<#>	Enter the free disk space threshold at which the system issues an error and stop replication.
Spool directory	<text>	The directory that holds the spool. The default directory is /tmp on Solaris servers and [WANSync Installation directory]/tmp on Windows. The default Solaris spool directory /tmp is a swap directory located in memory. It provides better performance. DO NOT, however, use it for large spools!

Script on Trigger File Table

Normally, during continuous replication, changes made on the master server are simply mirrored to replica servers. In some cases in content distribution scenarios, it may be desirable for additional actions to be taken at the point that a certain file appears on the master server (an analogous function is available on the replica server as well). Such a file is called a trigger file since it triggers an action when it appears. The actual mechanism is to invoke a script immediately following the creation of the file on the Replica. Subsequent open or write events have no effect.

Property	Value		Explanation
Run script on trigger file	On Off		Specifies whether or not special actions should be triggered via a script when a specified trigger file appears. When set to On additional options appear.
		Trigger file	The name of the file that triggers the script specified by the next property. The script is triggered at the point that the file creation event occurs.
		Script name	The full pathname of the script that is invoked when a file with the name specified in the previous property appears on the system.
		Arguments	Arguments to be passed to the script specified in the previous property. Arguments must be static values.

Reports Values Table

Property	Value			Explanation
Generate synchronization report	On Off	Generate detailed report	On Off	Specifies whether or not to generate a synchronization report. Specifies whether or not to generate a detailed synchronization report.
Generate replication report	On Off	Report timeout (min=1 hr) Generate detailed report	On Off	Specifies whether or not to generate a replication report. Since replication is continuous, specifies how often to generate the report. Specifies whether or not to generate a detailed replication report.

Property	Value	Explanation
Report format	HTML Text XML	Type of output format for the report. If XML or HTML, it is viewable in a Web browser; if Text, you can open it via a text editor such as Notepad. XML is the default.
Report retention (days)	Unlmtd	Specifies the number of days to retain replication reports.

Reports Handling Values Table

Property	Value		Explanation
Store reports on master	On		Specifies whether or not to store reports on the master server.
		Reports directory	Specifies path for the reports directory.
	Off		
Send to Manager	On		Reports can be displayed on screen in the default editor or browser. Destination reports directory can be set by the user.
	Off		
Notify by email	On	Mail Server	Specifies whether or not to send reports by email to the specified address.
		Email address To	Enter the mail server hostname or IP, destination email address, and source email address, to notify via email.
		Email address From	
	Off		
Execute script	On		Specify a script for WANSync to run whenever it sends a report.
	Off		
		Script Name + Full path of report file + Report type	Enter full path of script name to process notification via a script. WANSync runs the program with the first argument defining the full path of the generated report message file and the second defining the type of report (Replication or Synchronization).
		Arguments	Additional arguments to pass to the script specified in the previous property. Any arguments entered here follow the two arguments automatically sent by WANSync. Arguments entered here are static values.

Event Notification Source Table

When an event occurs, it is possible to set the system to run a script or send an email notification. In order for this to work, the correct notification source must be specified.

Property	Value	Explanation
Notification Source	None	Default
	Manager	The WANSync Manager notifies on events.
	Master	The master notifies on events.

Event Notification Values Table

If a notification source other than None has been selected in the *Event Notification Source Table*, you can set the properties defined in the following table to activate when an event occurs.

Property	Value		Explanation
Event Filter	Lost Connection		The TCP connection does not function, or a server went down, etc.
	Queue overflow		The quantity of data in the spool directory has exceeded its threshold value.
	Other		Any other error
	Significant info		Important information such as when synchronization is finished, etc.
Notify by email	On	Mail Server	Specifies whether or not to send reports by email to the specified address.
		Email address To	Enter the mail server hostname or IP, destination email address and source email address, to notify via email.
		Email address From	
	Off		
Execute script	On		Specify a script for WANSync to run whenever it sends a report.
	Off		
		Script Name + Full path of message file	Enter full path of script name to process notification via a script. WANSync runs the program with the first argument defining the full path of the generated message file.

Property	Value		Explanation
		Arguments	Additional arguments to pass to the script specified in the previous property. Any arguments entered here follow the argument sent automatically by WANSync. Arguments entered here are static values.
Write to event log/syslog			Writes the events to the Windows event log or to the UNIX system log.

XO System Event Types

Code	Description	Name
0	Informational	XO_INFO
1	Error conditions	XO_ERR
2	Action must be taken immediately	XO_ALERT
3	Critical conditions	XO_CRIT
4	Warning conditions	XO_WARNING
5	Normal but significant condition	XO_SIGNF_INFO
6	Debug-level events	XO_DEBUG

XO System Event IDs

Code	Description	Name
0	Informational	XO_EVENTID_INFO
1	Error conditions	XO_EVENTID_ERROR
2	Connection lost	XO_EVENTID_LOST_CONNECTION
3	Reestablish connection	XO_EVENTID_REESTABLISH_CONNECTION
4	XOFS queue overflow due to excessive number of changes	XO_EVENTID_XOFS_QUEUE_OVERFLOW
5	XOFS queue normalized	XO_EVENTID_XOFS_QUEUE_OK
6	Unable to apply file change	XO_EVENTID_APPLY_FILE_CHANGE_FAILED
7	Synchronization/verification finished	XO_EVENTID_SYNC_FINISHED

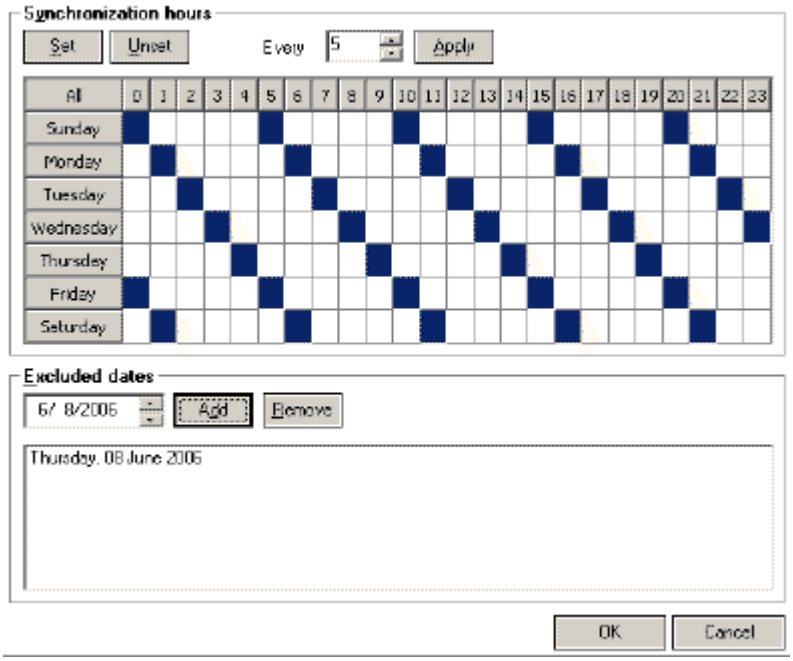
Code	Description	Name
8	All modifications during synchronization period are replicated	XO_EVENTID_SYNC_JOURNALS_FINISH
9	Previous synchronization/verification in progress	XO_EVENTID_SYNC_IN_PROG
10	Critical error that causes running scenario to stop	XO_EVENTID_RUNNING_ABORTED

Schedule Synchronization

WANSync master Server properties offer the following flexible scheduling capabilities:

- Synchronization on selected days of the week and for specific hours in a 24 hour cycle
- Synchronization over selected periods (e.g., once every 36 hours) in a 7 day cycle
- Exclusion of specific dates

To access the schedule, select Replication > Replication mode > Scheduling > Hours. The following figure shows a sample scheduling screen in which the solid blue rectangles indicate the days and hours scheduled for synchronization. The excluded dates area lists the specific dates on which synchronization is not performed.



Synchronize Hours

Selecting hours and days is done in the following manner:

1. Select a single rectangle (for a specific hour/specific day). Click the Set button to actually mark and enable that hour.
2. Select a column to set that hour for each day in the week. Click the Set button to actually mark and enable those hours.
3. Select a row to set each hour of that day in the week to synchronize. Click the Set button to actually mark and enable those hours.
4. Enter a valid number of hours in the field Every to mark a repetitive cycle. Click the Apply button to actually mark and enable those hours.
5. More than one rectangle can be simultaneously set by clicking and dragging the mouse.
6. To unmark, use the same technique of marking, and click the Unset button.
7. Click OK to accept the settings, or Cancel to ignore any changes.

   Important! If synchronization is running, and the next scheduled synchronization hour comes up, the new synchronization stops the current one and starts again from the beginning.

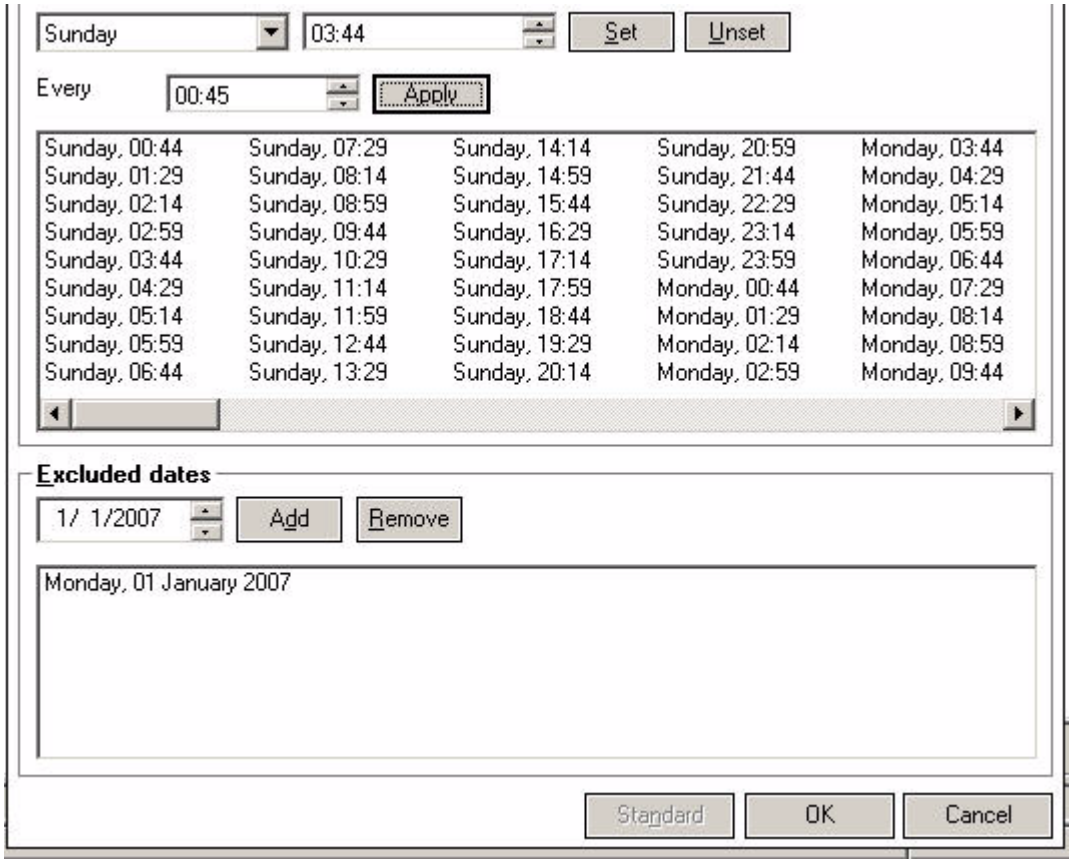
Exclude Dates

Specific dates can be set for exclusion from synchronization:

1. Enter the date into the Excluded dates field, and click the Add button.
2. To remove a date, select the entry, and click the Remove button. Multiple entries can also be selected by dragging the mouse over them.
3. Click OK to accept the excluded dates or Cancel to ignore any changes.

Set Advanced Schedules

Advanced properties allows you to set times that are not on the hour. You can also configure schedule intervals in units of minutes vs. hours in the main schedules screen.



Set Replica Server Properties

To set replica server properties:

1. Click a replica name from the Replication Tree window.
2. Click the Properties tab. The Replica Properties window opens and displays the configurable properties and available values.
3. All available property values can be accessed via a mouse click or by moving the mouse over the value field. Select or enter the appropriate values.

   Note: The windows and tabs (Property, Directories) are context sensitive and change whenever you highlight a different host in the replication tree (Master, Replica1, Replica2...).

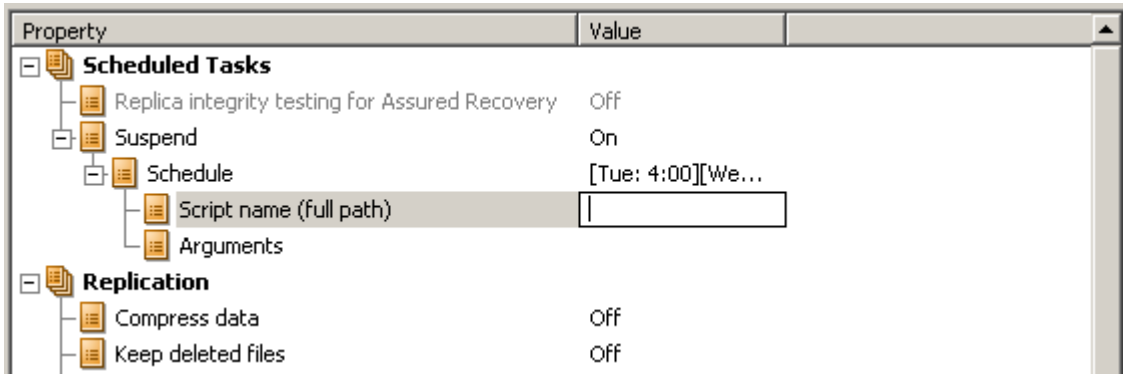
Scheduled Tasks

Currently, the scheduled tasks available to you are Replica Integrity Testing for Assured Recovery and Suspend. For a general discussion of suspending replication, see *Suspend Replication*; for a discussion of Replica Integrity Testing for Assured Recovery, see *About Assured Recovery*.

You can automatically suspend replication to the replica server temporarily according to a schedule and a script; the script performs maintenance or some form of processing that does not modify the replicated data on the replica server. After the script completes its run, synchronization and replication are resumed. By default, scheduled suspension is Off. Note that stopping replication terminates a running script.

When Suspend is turned on, a Schedule property appears. Initially it displays as Not Set. Click on this value to set the schedule (see *Set Advanced Schedules*). Once a schedule is set, an additional parameter for the script to run appears. Enter the full pathname for the script.

Note: You cannot suspend replication during synchronization. You can only suspend Replication temporarily since changes are accumulated in the spool directory of the master or upstream Replica. Make sure that sufficient disk space is available to hold the changes while the replica is suspended.



Replication Values Table

Property		Explanation
Compress		Compress data between this replica and the next replica. Use to off-load resource-consuming compression task from the master server. If the compression option is active for either the master or a replica higher up on the tree hierarchy, this option is non-functional
Keep deleted files		During synchronization, do not remove files that were deleted from the master server. During replication, do not notify the replica when files are deleted in the server.
Bandwidth Usage		The allowed incoming bandwidth. Default is unlimited.
Run script after synchronization	On	Specify whether a script should be run immediately after the synchronization ends. If set to On, additional properties appear.
	Off	
	Script name	Specify full pathname of script to run.
	Arguments	Specify any arguments to pass to the script in the previous property. Argument values must be static.
Run script before synchronization	On	Specify whether a script should be run immediately before synchronization starts
	Off	
	Script name	Specify full pathname of script to run.
	Arguments	Specify any arguments to pass to the script in the previous property. Argument values must be static.
Stop database on run	On	When set to On, if a database scenario (Exchange, SQL, Oracle) is running and the database is running on the replica server, WANSync stops the database services before running the scenario (does not apply to WANSyncHA scenarios).
	Off	

Connection Values Table

Property	Explanation
IP address	Displays the IP address for the selected host. If host name is changed, the IP address is updated. Host can also be changed by entering another IP address in this field.
Port number	Enter the TCP port number to use. The default used by WANSync is 25000.

Spool Values Table

Property	Explanation
Max spool size	Enter the maximum spool size allowed. This space is used only if needed – it is not preallocated. The default is Unlimited. To enter a value of Unlimited, enter a zero.
Min disk free size	Enter the free disk space threshold at which the system issues an error and stops replication.
Spool directory	The directory to be used to hold the spool. The default directory is /tmp on Solaris servers and [WANSync Installation directory]/tmp on Windows. The default Solaris spool directory /tmp is a swap directory located in the memory. It provides better performance, however DO NOT use it for large spools!

Recovery Values Table

Property	Explanation
Delay	Replication data can be delayed in the parent server (master or Replica) spool before sending it to this Replica. This is useful against data corruption or viruses.It enables stopping replication before corrupted or infected data is written to the replica data.
Delay replication for (min)	Delay time (min).
Data rewind	Keeps undo information needed to rewind data in case of data corruption. Note that data rewind is enabled only for online replication (journaling).
Store for last (min)	I/O operations are recorded in the rewind journal for this number of minutes, and then discarded in FIFO order (default is Infinite).
Max disk size (MB)	The maximum disk space allocated for the rewind journal. Once this size is reached, old records are discarded in FIFO order.

Attempted Replacement Table

Property	Explanation
Number of attempts	Enter the number of attempts to be made for replacing a modified file that is busy, and the timeout between attempts. These options are relevant only for Windows servers. If changes were received for a busy file (opened as non-shared for read) these options define how many times and at what interval to attempt replacing this file with the one that has the changes. If the file is not released before the last attempt is made, the change is lost and an error message is initiated.
Timeout (msec)	The time between an unsuccessful attempt and the next attempt.

Script on Trigger File Table

Typically, during continuous replication, changes made on the master server are mirrored to replica servers. In some content distribution scenarios, you may want additional actions taken at the point when a certain file has been replicated from the master server to the replica server. Such a file is termed a trigger file since it triggers an action when it appears. The actual mechanism is to invoke a script immediately following the creation of the file on the Replica. Subsequent open or write events have no effect.

Property	Value		Explanation
Run script on trigger file	On Off		Specifies whether or not special actions should be triggered via a script when a specified trigger file appears on the Replica. When set to On additional options appear.
		Trigger file	The name of the file that triggers the script specified by the next property. The script is triggered by the create event for the file on the replica server.
		Script name	The full pathname of the script that is invoked when a file with the name specified in the previous property appears on the system.
		Arguments	Arguments to pass to the script specified in the previous property. Arguments are static values.

Reports Values Table

Property	Value			Explanation
Generate replication report	On	Report timeout (min=1 hr)		Specifies whether or not to generate a replication report. Since replication is continuous, specifies how often to generate the report.
	Off			
		Generate detailed report		Specifies whether or not to generate a detailed replication report.
			On	
			Off	
Report format	HTML			Type of output format for the report. If XML or HTML, it is viewable in a Web browser; if Text, it is viewable via a text editor such as Notepad. XML is the default.
	Text			
	XML			

Reports Handling Values Table

Property	Value		Explanation
Store reports on this host	On		Specifies whether or not to store reports on the replica server being configured.
		Reports directory	Specifies path for the reports directory.
	Off		
Delegate to master	On		Reports can be sent to the master server of the current scenario, where it is handled according to the Reports Handling properties of the master. This is the default behavior if replication reporting is turned On for the Replica.
	Off		
Notify by email	On	- Mail Server	Specifies whether or not to send reports by email to the specified address.
		- Email address To	Enter the mail server hostname or IP, destination email address, and source email address, to notify via email.
		- Email address From	
	Off		

Execute script	On		Specify a script for WANSync to run whenever it sends a report.
	Off		
		Script Name + Full path of report file + Report type	Enter full path of script name to process notification via a script. WANSync runs the program with the first argument defining the full path of the generated report message file and the second defining the type of report (Replication or Synchronization).
		Arguments	Additional arguments to pass to the script specified in the previous property. Any arguments entered here follow the two arguments sent automatically by WANSync. Arguments entered here are static values.

Scenario Operations

The following subsections describe scenario operations.

Save Scenarios

There are two methods of saving, either per scenario or a global save of all scenarios:

1. Click the Save icon or select Scenario > Save.
2. Click the Save All icon or select Scenario > Save All, to save all scenarios on the WANSync Manager.

Export Scenarios

To export a scenario:

1. Select Scenario > Export. This opens a standard Save As window. Name and save the desired scenario.
2. The scenario is saved as a *.xmc file.

Import Scenarios

To import a scenario:

1. Select Scenario > Import. This opens a standard Open browse window. Locate the desired scenario and click Open.

2. The manager imports the scenario to the WANSync scenarios directory and opens it.

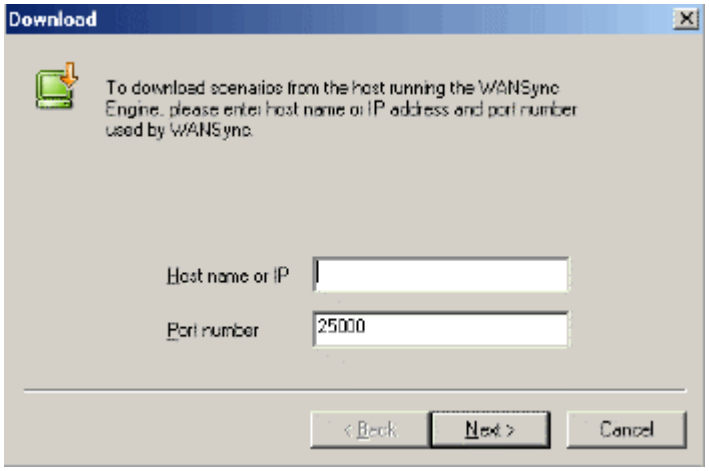
Download Scenarios

WANSync Manager can download existing scenarios from any server running the WANSync Engine. This option is useful when installing WANSync Manager on a new machine, or when scenario files on the WANSync Manager machine have been lost.

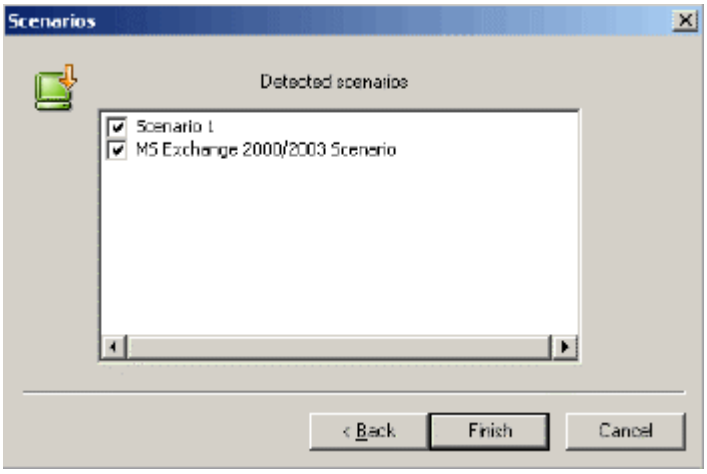
When recording is initiated for the first time on machines running the WANSync Engine, they receive a copy of the scenario in which they participate. These scenarios can then be downloaded.

1. Select Scenario > Download.

   The Download window opens.



2. Enter the host name or the IP address of the server to which you want to connect and then click Next.
3. WANSync Manager attaches to that machine and locates any scenarios that are there.
4. WANSync detects all scenarios and lists them in the Scenarios window.
5. Select the desired scenario and click Finish. The scenario downloads to the WANSync Manager.

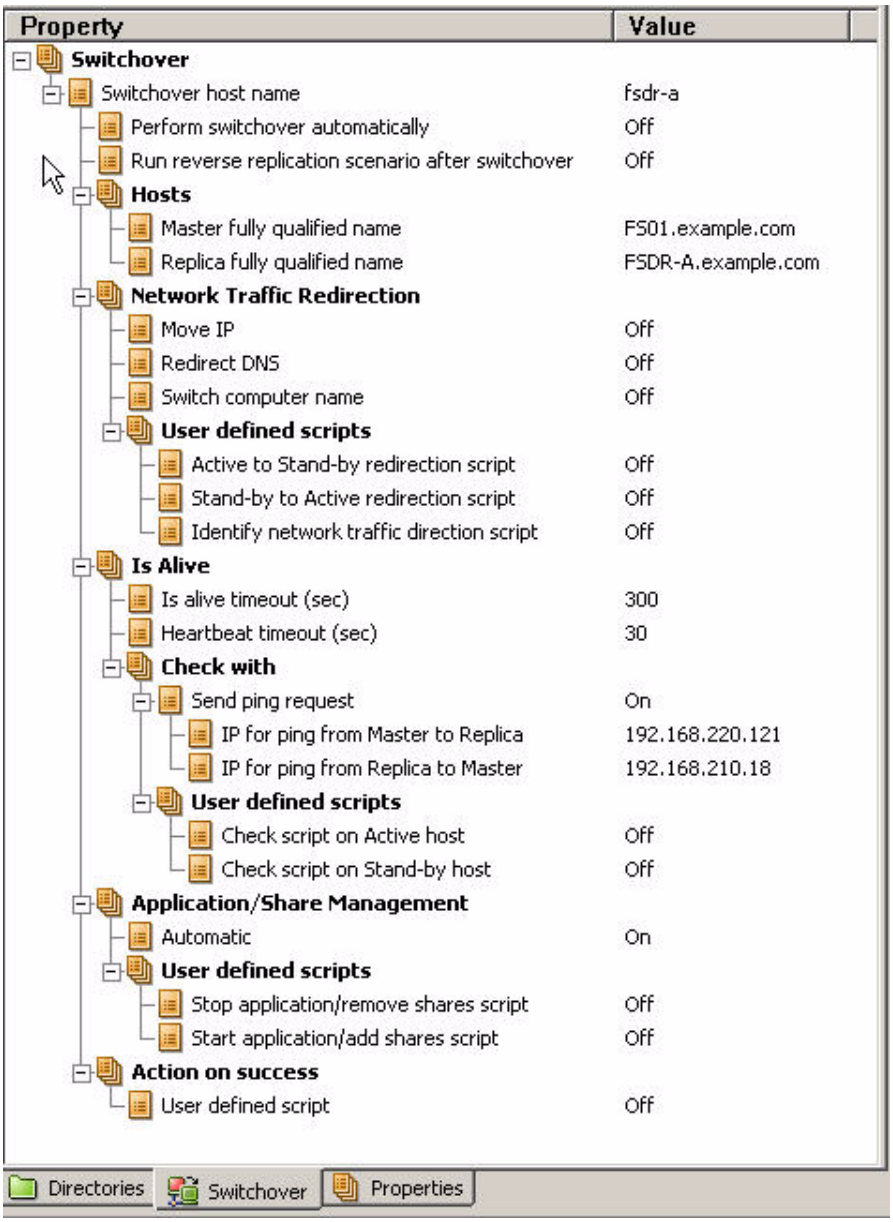


6. If you have a scenario named *scen1* and try to download another scenario having the same name, WANSync prompts you to confirm the replacement: *Replace scenario scen1?*
7. Click OK to replace the existing scenario or click Cancel to cancel the download.

Set Switchover Properties (WANSyncHA Only)

This section shows the properties under the Switchover tab. It is available only to those who are licensed for High Availability.

Some properties apply only to certain server types (e.g., Exchange, SQL, etc.). For more information, please consult the specific operations guide. These guides are located in the doc directory of the WANSync installation directory.



Active Standby vs. Master Replica

In an initial scenario, the master is the active computer, and the replica is the standby computer. The standby computer is continuously checking the state of the active one, in order to decide if to take over from the active computer.

The first time the switchover happens, the replica that was on standby becomes the active computer, and the master reverts to a standby mode (assuming it is still operational). When the master (now the 'standby') is ready, a switchback process can be initiated where the master again becomes active, and the replica returns to its previous standby and monitoring role.

Switchover Table

The system continuously checks for a switchover situation (see *Is Alive Table*) and informs the user according to the defined notification possibilities. In case of a switchover situation, the Perform switchover automatically flag is checked to determine if there should be an automatic switchover, or only a notification of the situation. In the latter case, automated switchover may be triggered with the Perform Switchover menu command or toolbar button.

Property	Explanation
Switchover host name	Name/IP of the replica host to which the master switches. You can choose only one Replica. Any time this Name/IP, or master's Name/IP, is changed, all the switchover properties are reset to their default values.
Perform switchover automatically	When this flag is checked, switchover is initiated automatically if the master server is down.
Run reverse replication scenario after switchover	After a switchover, this flag is checked to see if replication in the reverse direction should begin automatically. If set to Yes, after a switchover, replication begins automatically in the reverse direction, but it starts in a suspended state. It is unsuspended only after the database on the current primary server has passed all tests typically performed in the *Check DB* properties in the *Is Alive Table*.

Hosts Table

Property	Explanation
Master fully qualified name	Fully qualified name of the master host.
Replica fully qualified name	Fully qualified name of the replica host.

Redirection Table

Property		Explanation
Move IP		This redirection is applicable only when both the master computer and the replica computer are located in the same network segment. Choosing Off or On affects the available options in the Check with for a Send ping request. See *Is Alive Table*.
	Add IP/Mask…	IPs on the active computer that are moved to the standby computer during switchover are listed here. To set up: Click the tree entry: **`Click here to add new IP/Mask`** A window appears: *Enter relevant IP/Mask data*. A new entry is added to the list. Click for as many entries as you require. Note that: 1) The master IP address in the WANSync scenario must not be one of the IPs included in this list. 2) On a Windows platform, if the Move IP or the Redirect DNS property is set to On, WANSync turns off the dynamic DNS registration for the master (the flag in the checkbox Register this connection's addresses in DNS in the Advanced TCP/IP Settings window is disabled).
Redirect DNS		This redirection option is applicable when the master and the replica are located in different network segments or on the same segment. On a Windows platform, if the Move IP or the Redirect DNS property is set to On, WANSync turns off the dynamic DNS registration for the master (the flag in the checkbox Register this connection's addresses in DNS in the Advanced TCP/IP Settings window is disabled).
	DNS Server IPs	List of IPs of DNS servers to update. WANSyncHA tries to update all servers listed, however, switchover is considered successful if any update is successful. To enter the value, click the tree entry: *Click here to add new IP.*

Property		Explanation
	DNS TTL	Time To Live The value is changed in the DNS Server for A-record that is updated.
	AD integrated	Specifies if it is an Active Directory Integrated zone type. If the master DNS is on a Windows platform and integrated with Active Directory, set this flag to On.
	DNS key filename (full path)	Full path of the file containing the DNS secure key This field appears only when AD Integrated is Off.
	Master IPs in DNS	List of master IPs in its DNS server. The master's DNS record is updated during every switchover: In the switchover from master to Replica, the addresses in the master's DNS record are replaced by the addresses of the replica (see property Replica IPs in DNS, just below). In the switchover from replica to master, the addresses are restored after reverting the master back to the active host. To enter the value, click the tree entry: **Click here to add new IP**
	Replica IPs in DNS	List of replica IPs in its DNS server. The master's DNS record is updated during every switchover: In the switchover from master to Replica, the addresses in the master's DNS record are replaced by these addresses (see property master IPs in DNS, just above). In the switchover back from replica to master, the addresses of the master are restored after reverting the master back to the active host. To enter the value, click the tree entry: **Click here to add new IP**

Property				Explanation
Switch computer name				This redirection option is applicable when clients use NetBIOS name resolution for their connections with the master. During the switchover, the replica computer is renamed to the master computer's name and the master computer is renamed to a temporary name (if the master is alive). After switchback the names are restored. Both host name and the NetBIOS name are changed. If the host name and the NetBIOS name are not the same, this option cannot be used.
	Master computer name			NetBIOS name of the master computer.
	Replica computer name			NetBIOS name of the replica computer.
	With Reboot			After a switchover, if the flag is set to On, both the master and the replica computers are rebooted. We strongly recommend that you set this flag to On.
Identify network traffic direction script				Required to fully support custom, or customized, redirection methods. Custom scripts or batch files are used to identify the active server. This script determines if the forward or backward scenario is run when the scenario is started. The script runs on both master and replica: the one that returns zero is active. If both return zero, a conflict is reported.
User-defined scripts				Allow the standard redirection methods to be augmented or replaced by user-defined actions in scripts.
	Active to stand-by redirection script	On Off		
			Script name	Full pathname of script to be run on the active (master) machine, if it is alive, in order to redirect clients to the recipient (replica) machine.
			Arguments	Arguments to be passed to the script specified in the previous property. Argument values must be static.
	Stand-by to active redirection script	On Off		

Property		Explanation
	Script name	Full pathname of script to be run on the passive (replica) machine in order to redirect clients to it before making it active.
	Arguments	Arguments to be passed to the script specified in the previous property. Argument values must be static.

Is Alive Table

WANSync continuously checks to see that the active host is up (according to *Send ping request*, *Connect to DB*, *Execute Script*, see below). These checks are made in scheduled intervals according to the Heartbeat timeout.

Each script must reside in the same path and with the same name on both the master and the replica. Checking the status is interpreted as follows:

- If there is an indication that the active computer is OK (alive), no new action is taken, and the system continues to check according to the scheduled intervals of the Heartbeat timeout.
- If there is an indication that the active computer is not OK (is not alive), the active computer is checked again at the next Heartbeat timeout for a maximum period of Is alive timeout. If no indication of the active host being alive is found within the allotted time, WANSync executes event notification (send email, etc. as per *Reports Handling Values Table*). Simultaneously, it checks whether or not to perform a switchover, as defined by the *Perform switchover automatically* value (see *Switchover Table*).

Property		Explanation
Is alive timeout (sec)		If the Standby host does not receive indication that the master host is alive during this interval (in seconds), switchover is initiated. The checks are performed at Heartbeat timeout intervals. Default is 300 seconds.
Heartbeat timeout (sec)		Interval (in seconds) for sending heartbeat requests (performing the checks below). Default is 30 seconds.
Check with		
	Send ping request	Default is On.

Property		Explanation
		If Move IP is On: In this case, during the switchover, the IP is moved from the active computer to the standby. Therefore, the standby computer must check this IP continuously. IP for ping: IP address to ping. An ICMP request is made from the standby computer to the active computer. If no reply is received within two seconds, the active computer is considered non-operational. If Move IP is Off: The IP is not moved from the active to the standby computer in case of a switchover. Therefore, define two IPs for ping. IP for ping from master to Replica IP address to ping. When the replica computer is the active host, an ICMP request is made from the master computer to the replica computer. If no reply is received within two seconds, the replica computer is considered non-operational. IP for ping from replica to master IP address to send ping to. When the master computer is the active host, an ICMP request is made from the replica computer to the master computer. If no reply is received within 2 seconds, then the master computer is considered to be non-operational.
This script allows the normal checks to be augmented or replaced by user-defined actions in a script.	Connect to Shares - or - Connect to DB	For File Server: When this property is set to On, WANSync connects to the active computer's file server each Heartbeat timeout, and checks to see if the shares are available. For others (SQL Server, Exchange, Oracle): When this property is set to On, WANSync connects to the active computer's database each Heartbeat timeout, and checks to see if the database services are running, and all databases are mounted.

Property			Explanation
	User defined script: Check script on active host and check script on stand-by host	On Off	These scripts allow the normal checks to be augmented or replaced by user-defined actions in a script. When set to On, WANSync connects to the computer once every Heartbeat timeout, and executes a pre-defined script. WANSync checks the return code to determine the result: If the return value equals zero, the active computer is OK (alive) If the return value is any value other than zero there is a problem
		Script name	Full pathname of script.
		Arguments	Arguments to be passed to the script specified in the previous property. Argument values must be static.

Actions Table

Each script must reside in the same path and have the same name on the master and the replica.

Property	Explanation
Application/Share Management - or - DB Management	

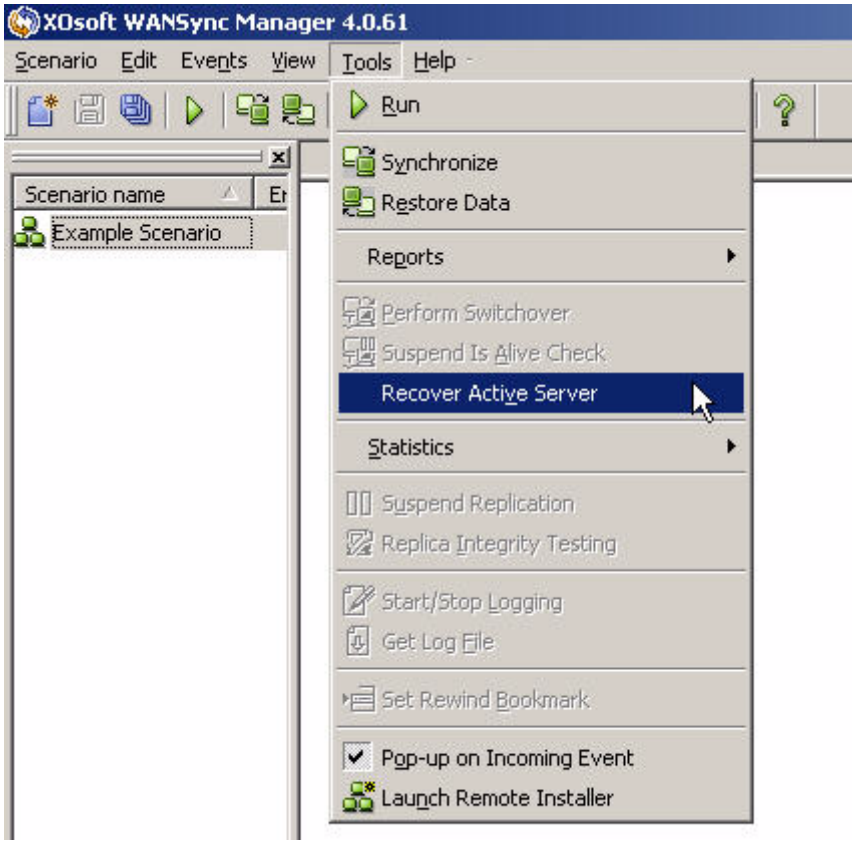
Property				Explanation
	Automatic			If you want WANSync to manage shares on your file server or services on your DB or other application server, set this flag to On (recommended). WANSync then: 1. Autodiscovers the list of application (DB) services that must be managed. 2. Starts DB services on the active host (if they are not already running) and stops them on the standby host (if they are running) when you start the WANSync scenario. 3. Stops DB services on the active host and starts them on the standby host during the switchover. 4. Run DB services on the active host after reboot if a WANSync scenario was running previously.
	Start Application/Add Shares script -or- Start DB script	On Off		If set to On, runs a script of user-defined actions to augment or replace the automatic actions above.
			Script name	Full pathname of script.
			Arguments	Arguments to be passed to the script specified in the previous property. Argument values are static.
	Stop Application/Remove Shares script -or- Stop DB script	On Off		If set to On, runs a script of user-defined actions to augment or replace the automatic actions above.
			Script name	Full pathname of script.
			Arguments	Arguments to be passed to the script specified in the previous property. Argument values are static.
Action on Success				

Property				Explanation
	User-defined script	On Off		If set to On, runs a script of user-defined actions following the completion of a successful switchover.
			Script name	Full pathname of script.
			Arguments	Arguments to be passed to the script specified in the previous property. Argument values are static.

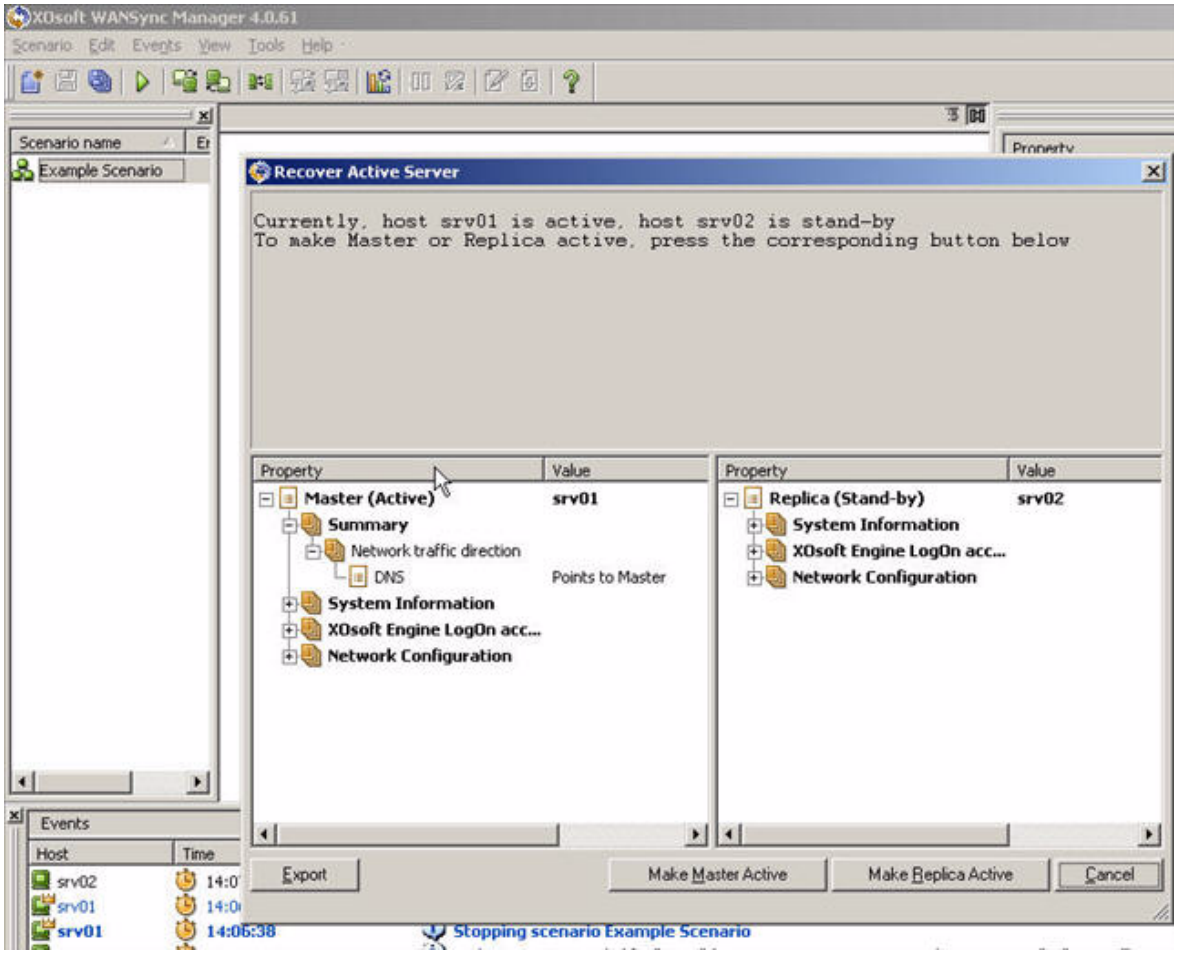
Recover Active Server

In certain circumstances, it may be necessary to forcibly make the master or replica server the active server without completing the data synchronization process. For example, if switchover occurred but no data was changed on the replica server. In this case you may even have newer data on the master server making it undesirable to synchronize data from the replica to the master server. WANSync allows for this option through a process called Recover Active Server. To use this option, ensure that the scenario is stopped, and select *Recover Active Server* from the Tools menu.

Important! While this option is the right choice in many situations, use it with caution. If used improperly data loss can occur. Normally WANSync will not allow switchover from one host to another until all data is synchronized. It is designed this way so users are not redirected to an out of date data set that then overwrites what may be a more current data set. When using Recover Active Server WANSync is forcing users to one server or the other with no regard as to which server has the correct data set. Thus, as an administrator, you must manually ensure that the server you are making active has the most up to date data set.



Note: Recover Active Server is not available if you are using the Switch Computer Name redirection method.



Select either *Make Master Active* or *Make Replica Active* depending onto which server you want to force the active role.

Important! If a legitimate switchover in a disaster situation occurs and users are redirected to the replica server for any period of time, it is important to replicate all changes on the replica back to the master before making the master server active. Using *Recover Active Server* in such a situation results in loss of data.

Templates

Templates are a powerful facility for customizing WANSync for your own environment. Many applications allow the default values of individual parameters to be modified. Examples might be the default font to be used in new documents in Microsoft Word, or the default signature for new messages in a mail client application. Templates take this idea one step further.

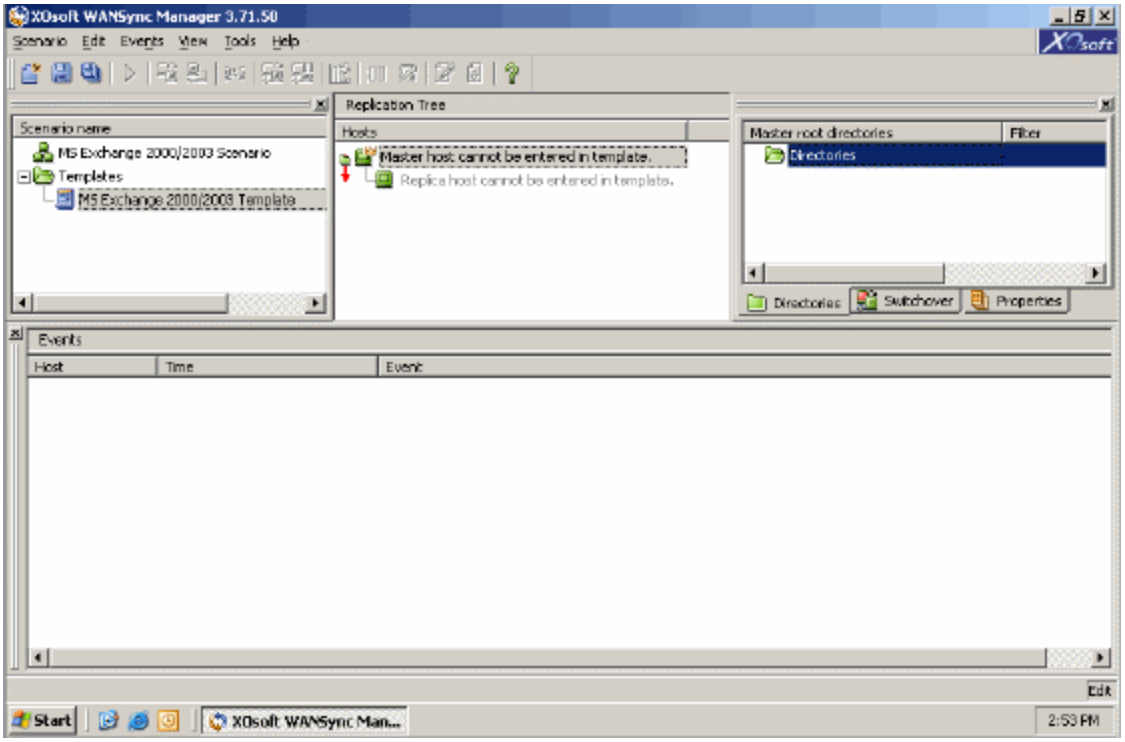
Rather than provide a method to modify a single, global default value, templates offer the ability to create an entire scenario that can be used as the starting point for new scenarios in the future. These special template scenarios contain all the parameters of an actual scenario and all of them may be modified except those that clearly apply to a concrete, individual scenario (such as the hostnames of the master and replica servers).

The second important advantage of templates over a set of global defaults is that they allow different sets of defaults to be created for different types of scenarios. For example, the default values appropriate for your high availability Exchange scenarios are not identical to those for your non-HA file server scenarios. With templates, you can create default settings and maintain them individually for each.

Create a Template

Templates are simple to create and use. To create a new template, select Scenario > New Template. A New Template window opens. Select the scenario type. The new scenario template appears in the scenarios area under a folder named Templates. This folder does not appear in the scenarios pane until at least one template is created.

Note: Scenarios cannot be created from a template until the template has been saved. Changing parameter values in a template will not change the values of those parameters in a scenario created from it previously.



As with any scenario, you have the opportunity to rename the template. This name is used as the base for generating default names of actual scenarios created using it.

Because a template is not associated with any actual servers, some values may not be changed, such as names of master and replica servers. Also, while default folder paths can be entered on the Directories tab, they must be typed explicitly rather than entered through a file browser. Almost all other parameters in the scenario, documented in the sections above, can be changed.

After creating the first scenario, the screen that appears when you create a new scenario changes to New Scenario. If you select the *New Scenario* icon, you can create a new scenario with the built-in default values. If you select the *From Template* icon, you can select one of the templates and a new scenario is created with all parameter values taken from that template. Alternatively, you can create a new scenario from a template in the templates folder by right-clicking on the template and selecting *New*.

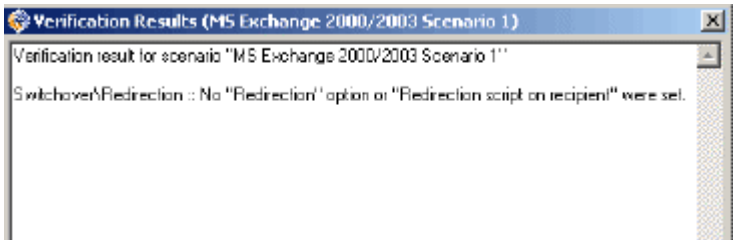
Chapter 6: Running the Replication Process

Replication continues after the servers have been synchronized. WANSync allows simultaneous synchronization and replication, i.e., synchronizing servers while files are in use and being updated, while simultaneously replicating any changes.

Initiate Replication

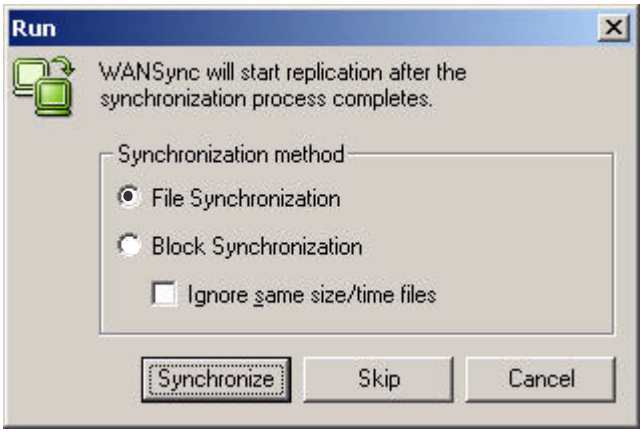
To initiate replication:

1. Click Run on the toolbar, or select Tools > Run. If the scenario was not set up correctly, the Verification results window opens, listing all the errors detected.



2. These errors must be corrected, and then Run can again be selected. WANSync then verifies that the configuration is compatible with your environment. The Run pane displays: *Are you sure you want to run scenario "MS Exchange 2000/2003 Scenario?"*
3. This pane displays warning and error messages resulting from its checks. It is important that you consider them carefully – even if they are warnings, rather than errors, they indicate conditions that are known to potentially cause problems with replication or switchover. If any errors are displayed, you cannot run the scenario. We strongly recommend that you contact support if you encounter either warning or fatal errors at this stage.
4. The Advanced button opens an additional pane with detailed information about the checks performed to help diagnose problems. It is intended primarily for use by support to help you resolve any issues encountered installing and running the software.

5. If the checks are passed or only warning messages are displayed, you are given the option to continue the run by clicking OK. The Run window opens with synchronization options.



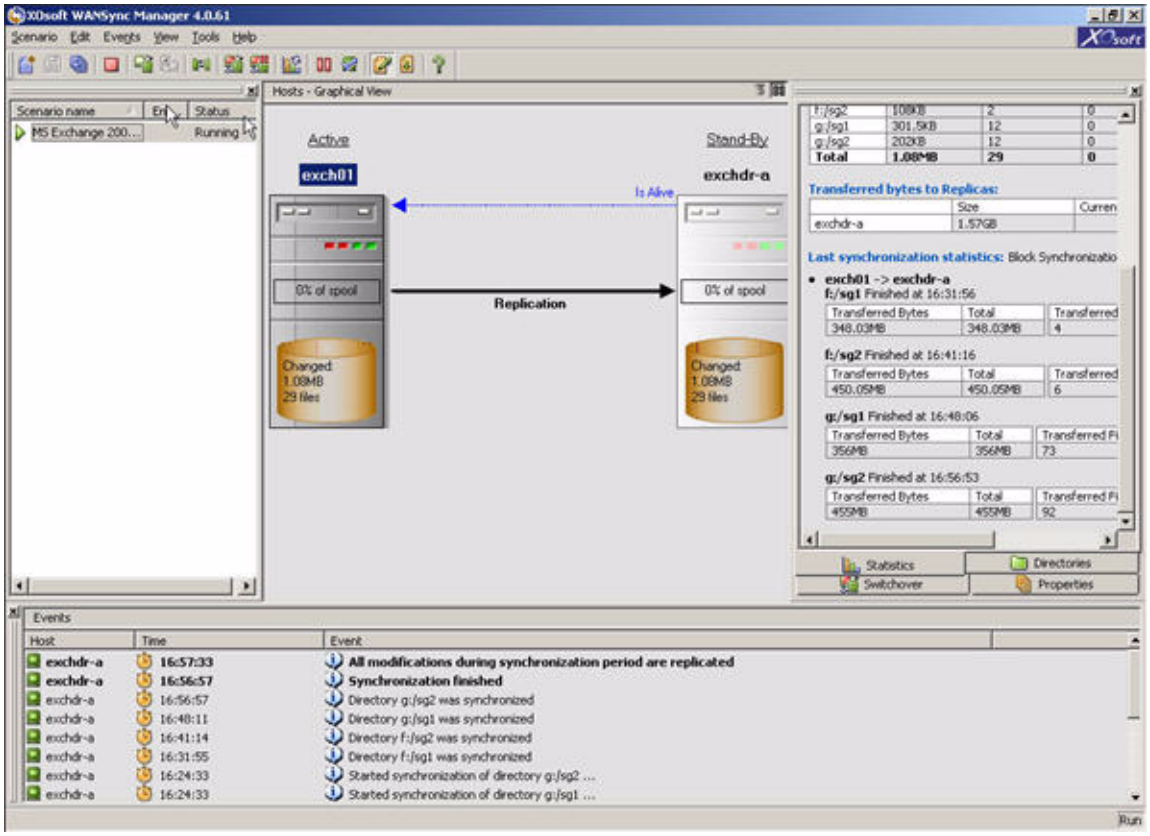
6. Choose the desired options (see *How Synchronization Works*). In general, the default value is the most appropriate choice.
7. - Click Synchronize to synchronize and start the replication.
   - Click Skip to start replication without synchronization.
   - Click Cancel to abort.

   Important! Do not skip synchronization unless you are absolutely certain that the master and Replicas are identical. Ignore same size/time files is valid only when either File Synchronization or Block Synchronization is selected. It should not be used in database scenarios.

Run Mode

While replication is running, the WANSync Manager screen becomes gray when the running scenario is selected. No configuration change or editing is possible at this time. Statistics are shown in the Framework window on the far right. Events are recorded in the Events window on the bottom.

Important! No configuration or directory changes are possible during a run.



Change Configuration during Replication

You cannot make changes to the scenario settings, files or directories while the scenario is running.

To make changes to the scenario files or directories:

1. Stop replication by clicking the Run icon. This releases it from its 'depressed' state. The WANSync Manager screen background returns to its normal color and the functions of the Properties and Directories tabs again become active.
2. Make all necessary changes, and click the Run icon again. Replication restarts.

Stop and Start WANSync Manager

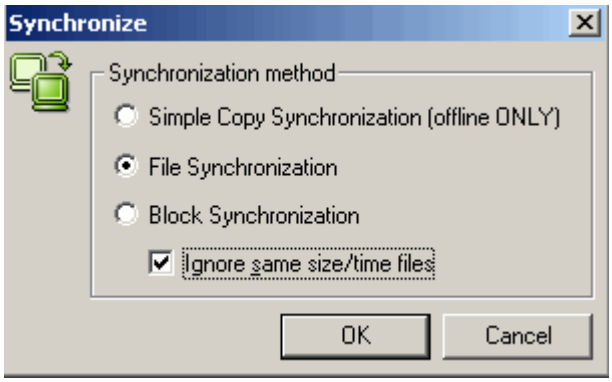
After the scenario has been defined, and replication has started, the WANSync Manager can be closed. It must remain open only for real-time monitoring of the replication process. Closing the Manager *does not* stop the running scenarios. When it is opened again, it automatically uploads all the saved scenarios and displays their status.

Important! Even when the WANSync Manager is closed, it is possible to get notifications by mail or run user-defined scripts when important events or errors occur (see *Event Notification Source Table* and *Event Notification Values Table*).

Synchronization

The synchronization process can be manually activated at any time (whether replication is running or not).

1. Click the Synchronize icon on the toolbar or select Tools > Synchronize. The Synchronize window opens with the synchronization options.



2. Choose the desired options (see *How Synchronization Works*).

Manual synchronization is recommended in the following situations:

- Before starting replication on servers with large amounts of data and a heavy update rate
- After a lengthy network failure if automatic synchronization is not activated
- After rebooting one of the participating servers if automatic synchronization is not activated

You can also set synchronization to run at pre-scheduled hours on specific days and excluded on specific dates.

Suspend Replication

At times it may be necessary to suspend updates on a replica machine in order to perform system maintenance or some other form of processing that does not modify the replicated data there. It is not desirable to stop replication since this requires a full resynchronization afterward. The replication suspension feature of WANSync makes this possible. Replication may be suspended either manually or on a scheduled basis.

During the period of the suspension all changes are spooled on the master or on the replica located upstream of the suspended Replica. In other words, changes continue to be recorded for update on the suspended replica, but are not actually transferred until replication is resumed. Once replication is resumed, the accumulated changes are transferred and applied without any need to perform a full resynchronization of the data.

Replication may be suspended manually or on a scheduled basis. To suspend replication to a particular replica server manually, select the scenario in the Scenarios pane and then select the replica to be suspended in the Replication Tree pane. Finally, select Tools > Suspend Replication or press the pause button.

When you are ready to resume, simply press the pause button again, or select Tools > Suspend Replication a second time (the icon is shown in both places as depressed).

While replication is suspended, you may perform maintenance on the replica server, including reboot. It is very important, however, not to modify the replicated data in any way or a full resynchronization with the master is required.

You can issue a synchronization command while a replica is suspended; however it is performed only after ending suspension.

For scheduled suspension of replication, see *Set Master Server Properties*.

Important! It is imperative that you do nothing on the replica that changes the data in any way, including starting an application such as Exchange, MS SQL, or Oracle.

Note: You cannot suspend Replication during synchronization: You can suspend Replication only temporarily since changes are accumulated in the spool directory of the master or upstream Replica. Make sure that sufficient disk space is available to hold the changes during the time the replica is suspended.

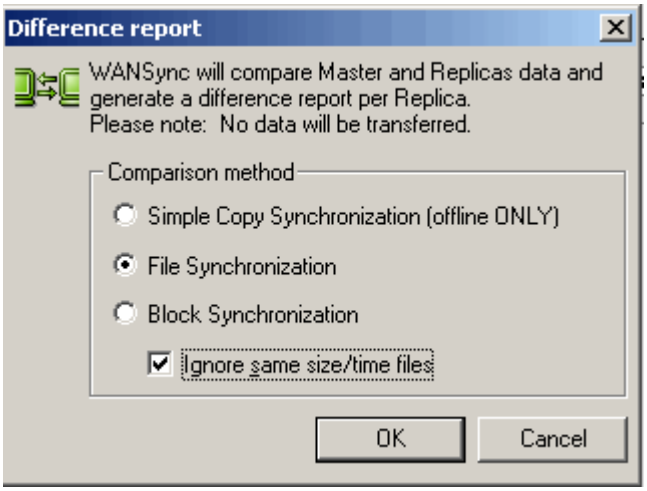
Difference Report

Sometimes, it is convenient to know the difference between a master and its Replica(s) at a certain point in time. The comparison is performed using the same algorithms that are used in the synchronization process, but no data is transferred. A difference report is generated for each replica and sent to the Manager at the end of the process. This can be produced at any time.

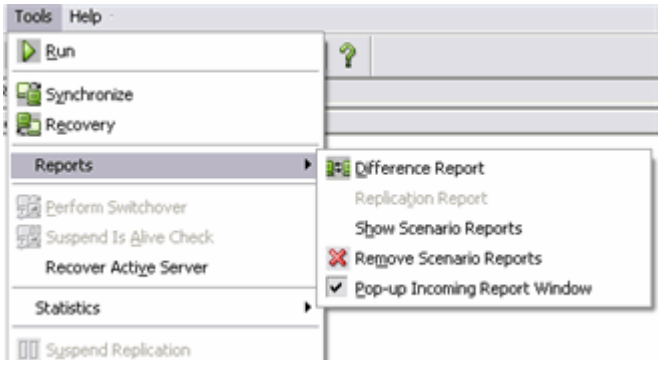
Important! It is not recommended to initiate the difference report as data is being updated on the master as even a minimal time-delay to the Replicas can affect the report results.

To create the difference report:

1. Click the Difference report icon on the toolbar, or select Tools > Difference report. The Difference report screen opens with the same comparison methods as in the Synchronization method screen.



2. Choose the desired options (see *How Synchronization Works*).



3. At the end of the process, a difference report is generated for each replica, and sent to the Manager.

Chapter 7: Monitoring Replication

Replication can be monitored from the WANSync Manager once a scenario is running. Monitoring enables viewing state information, statistics and events. Connection status appears beside each host in the Scenarios window.

The Statistics tab provides information about the total amount of data per root directory, recorded data per Replica, and synchronization information.

The Events window displays information about significant events, warnings, and errors received from the host. This information includes the host name, the event time, and a brief explanation.

The various monitoring tools of WANSync enable easy control and monitoring of events in real-time. In addition, WANSync can store all events in its log.

- Once a scenario is loaded and running, you can monitor:
- State information
- Live statistics
- Events
- Reports
- Server log files

In addition, some of the displays and reports feature the user names as Started by and Controlled by. These indicate, respectively, the user that initiated the Run for the specific scenario, and the current user that has control of the WANSync Manager, for that scenario.

Monitor Multiple Scenarios

The scenario pane shows the current status for all scenarios in one pane. You can customize the way the columns are displayed (View menu > Customize scenario view option) or right click in the scenario pane and choose the Customize scenario view option). By default, all columns except Current User's Rights and Started by are shown.

State Information

State information is displayed beside each scenario name and beside each server in the replication tree, whenever a synchronization process has been started or completed, and whenever a replication process is underway.

The state information includes:

- A graphic indication next to the scenario name indicating the scenario is running, performing manual synchronization, or is idle.
- The number of significant events and errors displayed next to each scenario.
- A graphic indication of whether or not the servers are connected (a gold crown over the master and a blue crown over the replica): if the connection to any of the participating servers is lost the server icon appears with a large red X marked over it. WANSync bypasses the problem and continues.

Live Statistics

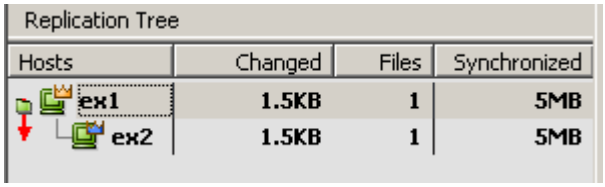
Live statistics are displayed in two areas:

- Replication Tree window
- Statistics window

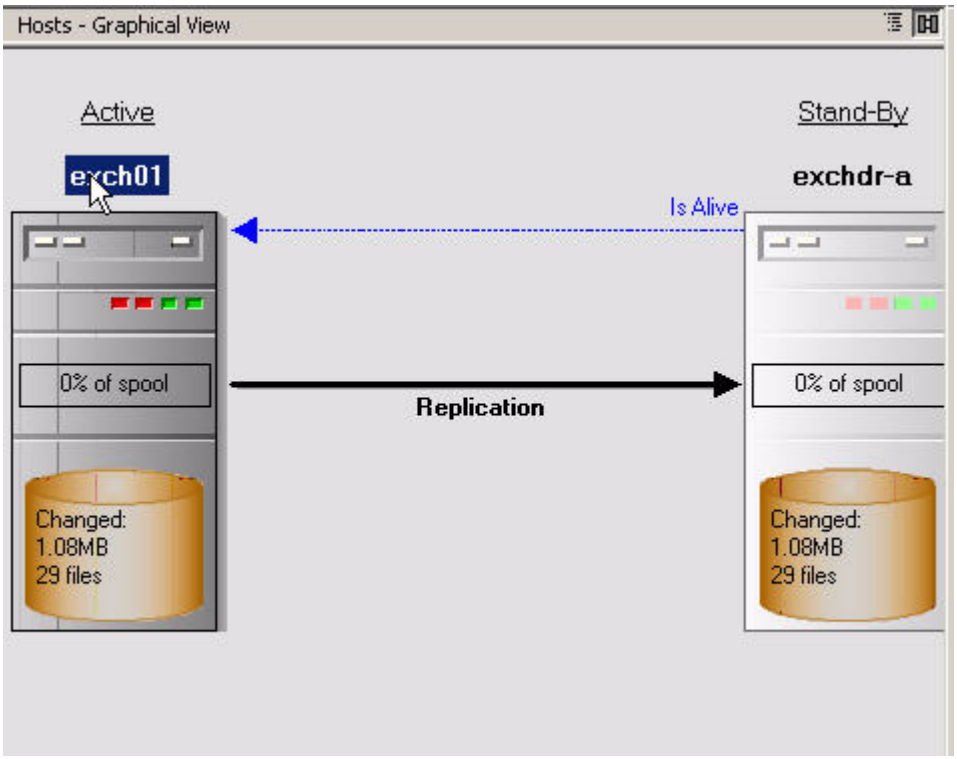
Replication Tree Window

The live statistics displayed in this area are:

- Total data replicated from this host
- Total number of files replicated from this host
- Total data synchronized from this host
- Total number of files synchronized from this host
- Total (current) amount of data contained in the spool



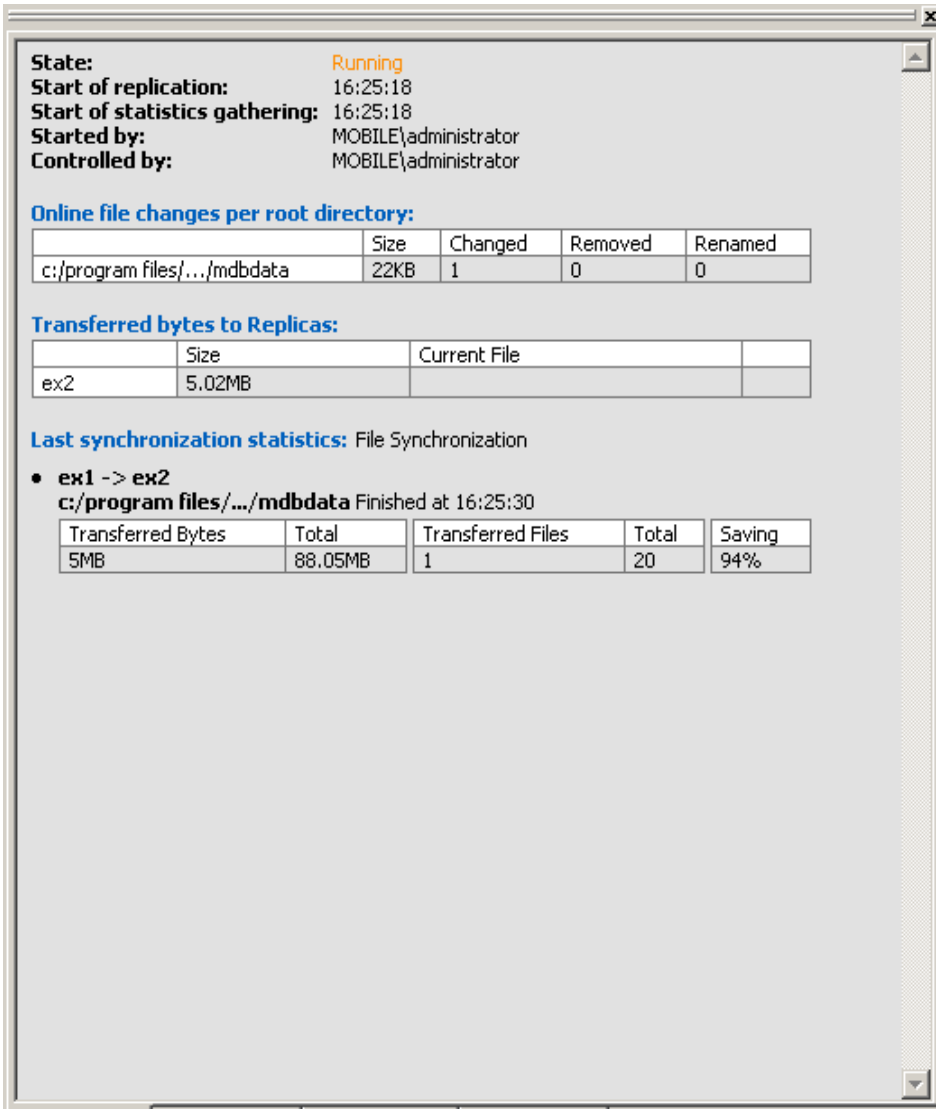
You can also view the replication tree in the graphical view.



Statistics Window

This area displays live statistics:

- **Per root directories** - total amount of data (in KB) changed in the root directories; the number of files changed, removed, renamed
- **Per replica** - amount of data received by the replica; progress information on the file currently being transferred to the replica
- Last synchronization statistics

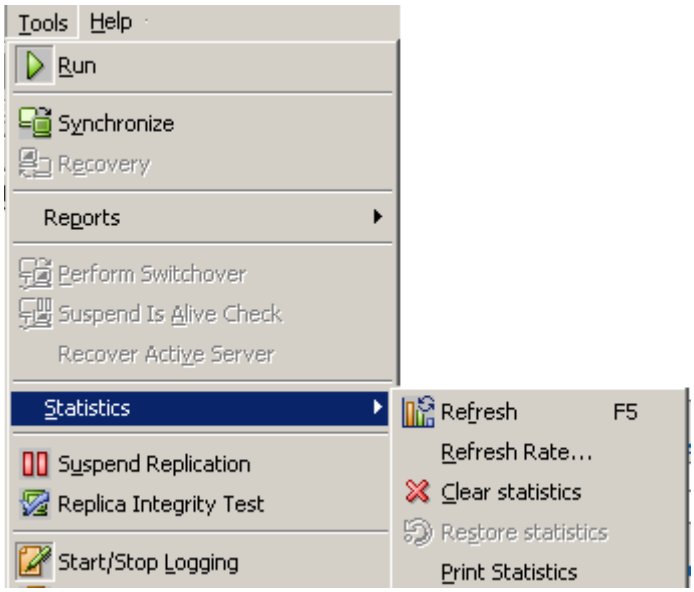


Refresh Statistics Display Automatically

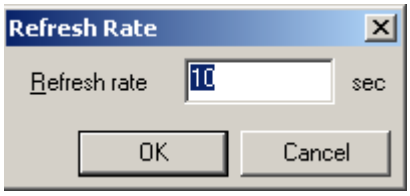
You can set a default frequency for automatically updating the state information and live statistics display.

Define the refresh rate:

1. Select Tools > Statistics > Refresh Rate to open the Refresh rate window.



2. Enter the desired refresh rate in seconds. The Scenarios window updates accordingly. WANSync Manager receives state information from all servers participating in the current scenario.



Refresh Statistics Display Manually

To manually initiate a refresh of the displayed information:

Select Tools > Statistics > Refresh, or the Refresh Statistics icon, or F5 (keyboard function key).

Performance Counters

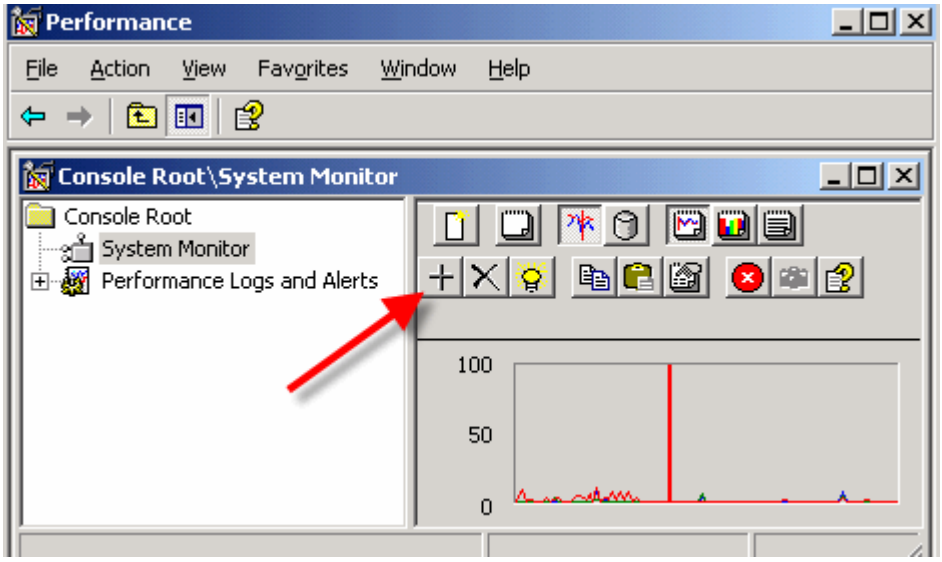
There are several performance counters added to the standard MS-Windows set.

To monitor these counters:

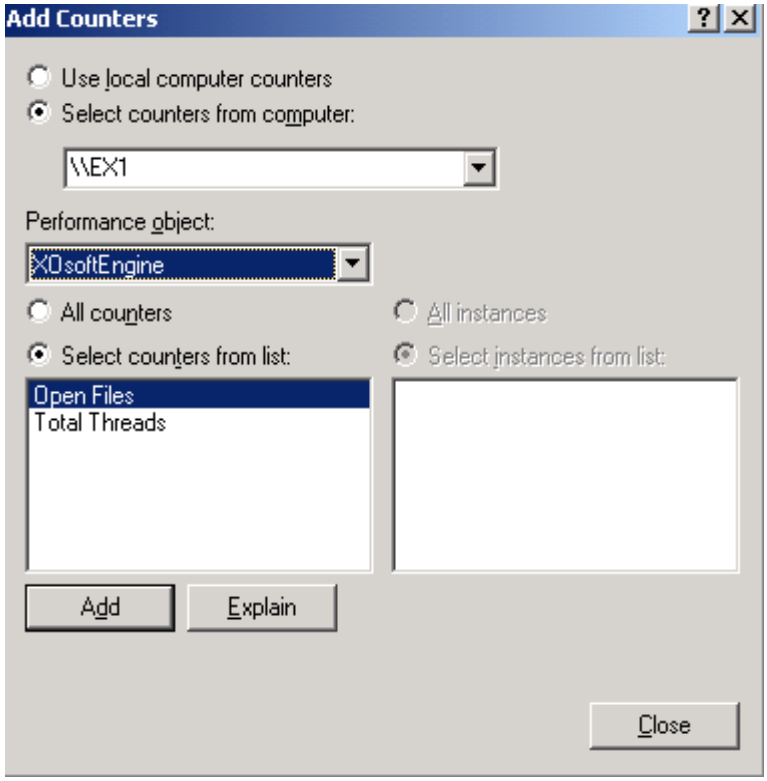
1. Select Start > Run > enter *perfmon*.

   The Performance window opens.

2. Click on the Add Counters icon (plus sign).

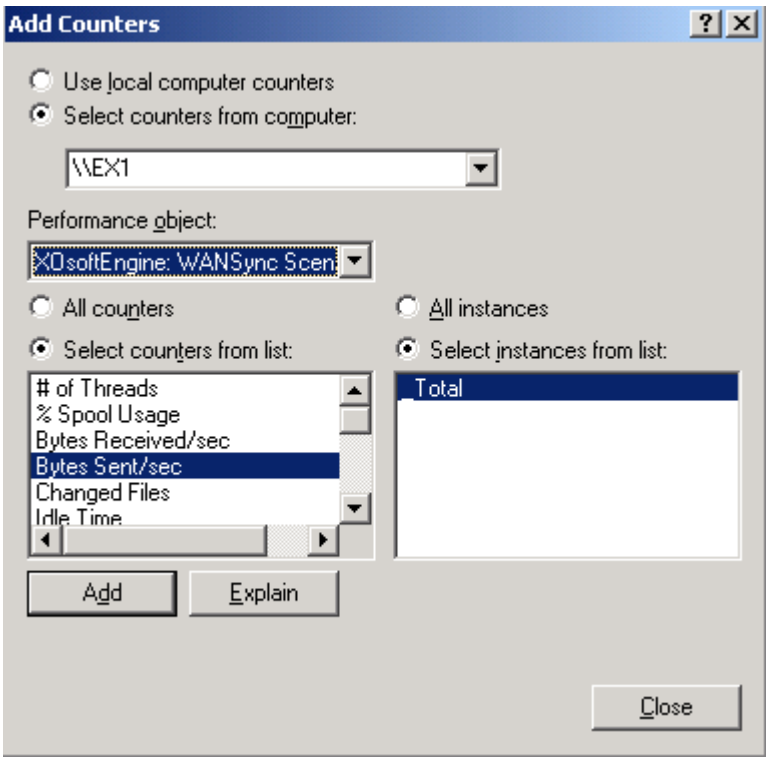


The Add Counters window opens.



3. Select XOsoftEngine from the Performance object dropdown menu and select Open Files from the Select counters from the list field.
4. Click Add and then click Close.
5. Select XOsoftEngine.

   WANSync Scenario from the Performance object dropdown menu and select Bytes Sent/sec from the Select counters from the list field.



The performance data is composed of two objects:

- *XOsoftEngine object*, which consists of counters that monitor the running XOsoftEngine service
- *XOsoftEngine: WANSync Scenario object*, which consists of counters that monitor WANSync scenario that is running on the XOsoftEngine service

The breakdown and descriptions are as follows:

Counter Name	Description	Counter Type
Open Files	Shows the number of files open by the XOsoftEngine service.	PERF_COUNTER_RAWCOUNT
Total Threads	Shows the number of threads used by the XOsoftEngine service.	PERF_COUNTER_RAWCOUNT

Counter Name	Description	Counter Type
Bytes Sent/sec	The rate at which bytes are sent from the specific scenario to its immediate children. It includes all replication and synchronization data.	PERF_COUNTER_BULK_COUNT
Bytes Received/sec	The rate of bytes coming into the specific scenario from its parent or from the application by which it is managed if the host is a master. It includes all replication and synchronization data.	PERF_COUNTER_BULK_COUNT
Replicated Bytes/sec	The rate at which the scenario is processing replication data bytes.	PERF_COUNTER_BULK_COUNT
Scenario Up Time	The elapsed time (in seconds) since the scenario was last started. This counter displays the difference between the start time of the scenario and the current time.	PERF_ELAPSED_TIME
Idle Time	The elapsed time (in seconds) since the last update. This counter displays the difference between the last update time and the current time.	PERF_ELAPSED_TIME
Spool Size	The current number of bytes that the specific scenario is using in its spool directory.	PERF_COUNTER_LARGE_ RAWCOUNT
% Spool Usage	The amount of the spool size the specific scenario is using (the ratio of Spool size to the Max Spool size).	PERF_RAW_FRACTION
Registry Changes	The number of online registry changes.	PERF_COUNTER_RAWCOUNT
Changed Files	The number of online changed file, including created files and folders and updated files.	PERF_COUNTER_RAWCOUNT

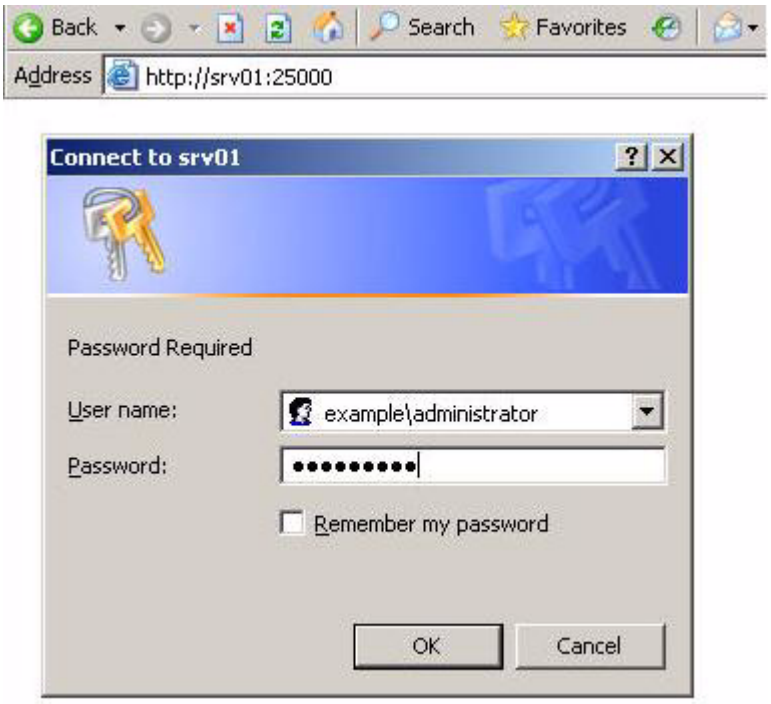
Counter Name	Description	Counter Type
Removed Files	The number of online removed files and folders.	PERF_COUNTER_RAWCOUNT
Renamed Files	The number of online renamed files and folders.	PERF_COUNTER_RAWCOUNT
Synchronized Bytes	The amount of bytes changed in synchronization process.	PERF_COUNTER_LARGE_ RAWCOUNT
Synchronized Files	The number of files changed in the synchronization process.	PERF_COUNTER_RAWCOUNT
Synchronized Registry Keys	The number of changes in the Registry due to the synchronization process.	PERF_COUNTER_RAWCOUNT
# of Threads	The number of threads currently used by the specific scenario.	PERF_COUNTER_RAWCOUNT

Read Only Web GUI

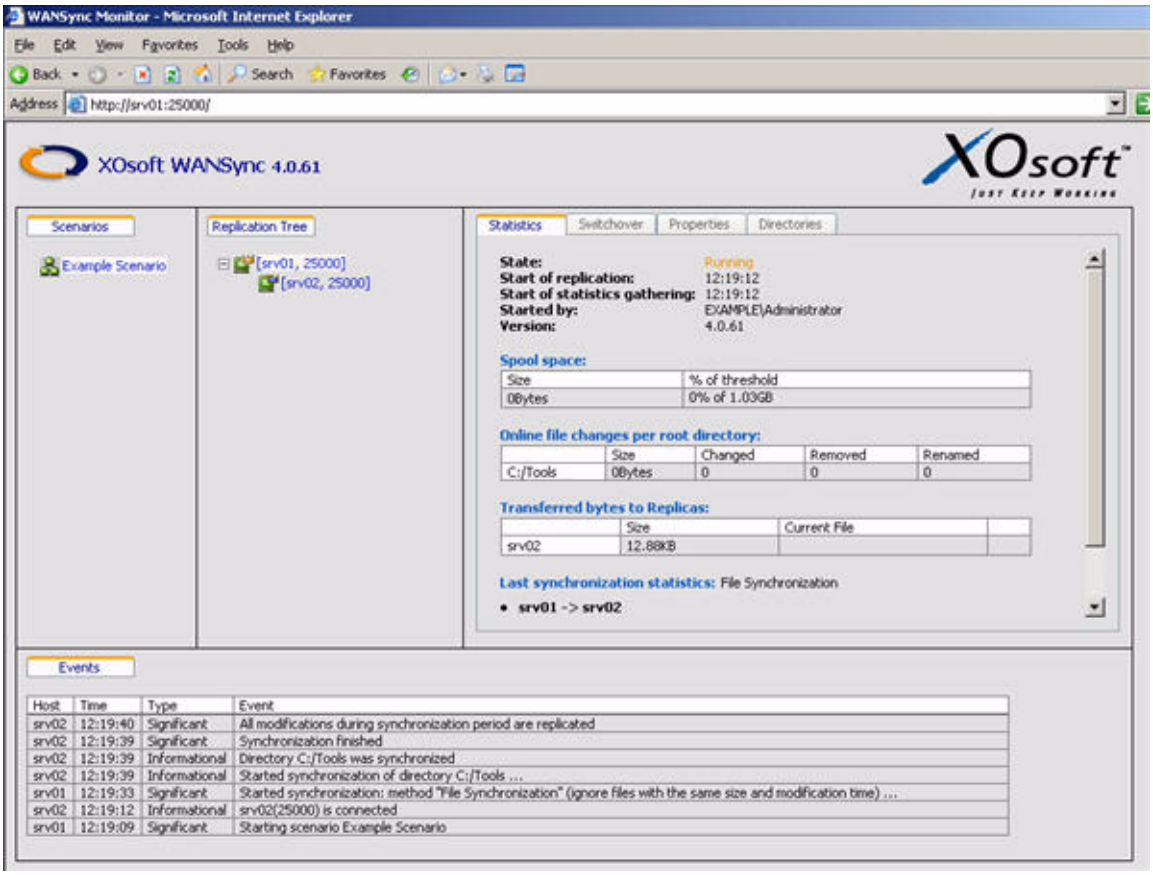
The primary WANSync Manager may only be used by one Administrator at a time. Opening the GUI locks it for the current user making simultaneous use impossible. This is required to prevent conflicts. To allow simultaneous monitoring by any number of administrators WANSync also offers a read only Web GUI.

To access the web GUI:

1. Open your browser to http://masterservername:25000.
2. Enter a user account and password with administrative permissions on the master server.

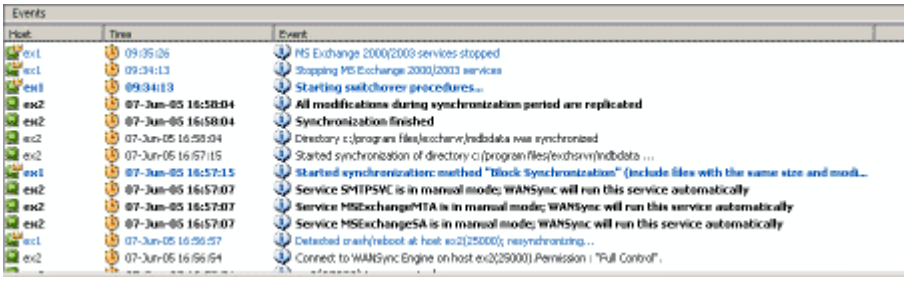


Note: There is no need to refresh the browser; the GUI refreshes automatically. You can monitor all parameters, statistics, and events from this window.



Events

The Events window displays messages and general information (for example, that a directory is synchronized, server is connected, synchronization started/finished, etc.). This information is received from the servers participating in the running replication scenario. The information includes the server name and time and shows important events or error messages in bold letters.



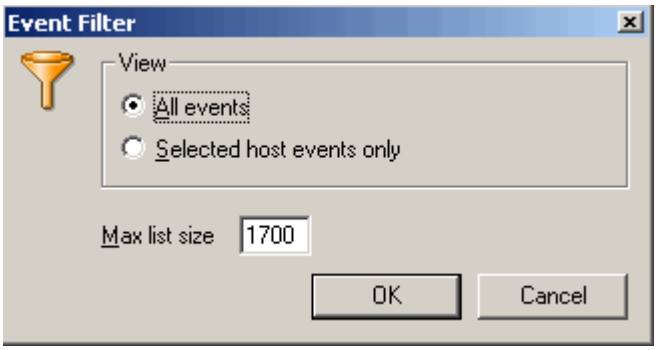
When you click on an event, you select the host from which the event was received — in the Replication tree window, the host appears highlighted and the right window shows its information (as per the Directories or Properties tab). This is the same effect as when selecting a host by clicking on it in the Replication tree window. All events received from the selected host are displayed in blue letters while all the other messages are displayed in black letters. When an event has been selected, it remains in black lettering with a grayed-out background, regardless if its host is selected or not.

Set the Events Filter

The displayable list of events can be defined in size (maximum list size), as well as the types of events that are to be displayed.

To set the event filter:

1. Select Events > Event Filter. The Event Filter screen appears.



2. Select the filtering options.
3. Enter maximum event list size. If the number of events received exceeds this size, old events are discarded every time a new event is received.
4. To cancel the event filter, click Events > Cancel Event Filter.

Freeze the Events List

The list of displayed events can be frozen to enable you to examine the list without being disturbed by new events arriving and shifting the events on the displayed screen. The events continue to be accumulated in the background. Once you unfreeze the list, all events received during the freezing period are immediately displayed.

- To freeze the event list, select Events > Freeze Event List.
- To unfreeze the event list, select Events > Freeze Event List.

Events History

The events that are displayed in the WANSync Manager's Events area (on-screen) are also stored with the WANSync Engine that is the master for the current scenario. These events are accessible via the Event History option. The oldest events get overwritten to allow storage of the most recent data. The Event History is especially useful in case events are deleted manually (see *Delete Events*) and you want to see the most current list of events, or if another WANSync Manager runs with this scenario. This is available only while the replication is running.

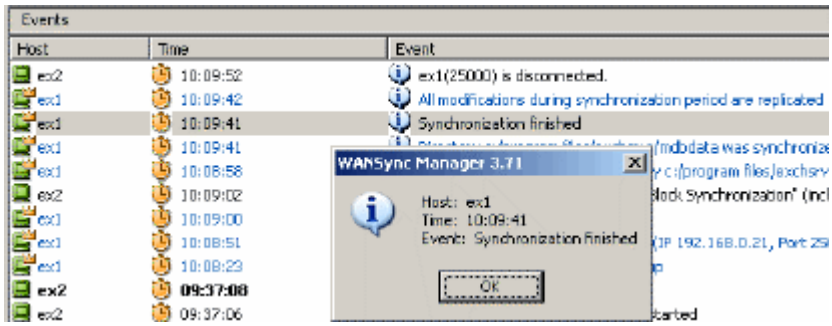
View Events in Separate Window

Sometimes, event messages are very long, exceed the Events area, and are cut off (visually).

To display a single event in a separate window:

1. Mark an event.
2. Double-click, or right-click the marked event and select View Event in other Window, or select Events > View Event in other Window.

   A pop-up window displays the full message text of the selected event.



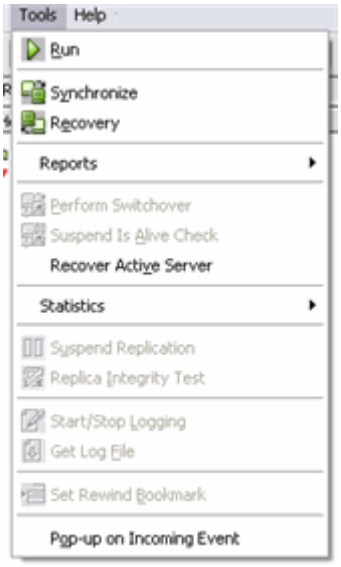
View Incoming Events

WANSync Manager can notify you when an incoming event occurs.

1. To view incoming events as they occur: Select Tools > Pop-up on Incoming Event.

   When an incoming event occurs, the WANSync icon in the task bar flashes.

2. If you turn this option off, the minimized application in the task bar does not flash during an incoming event.



Acknowledge Events as Read

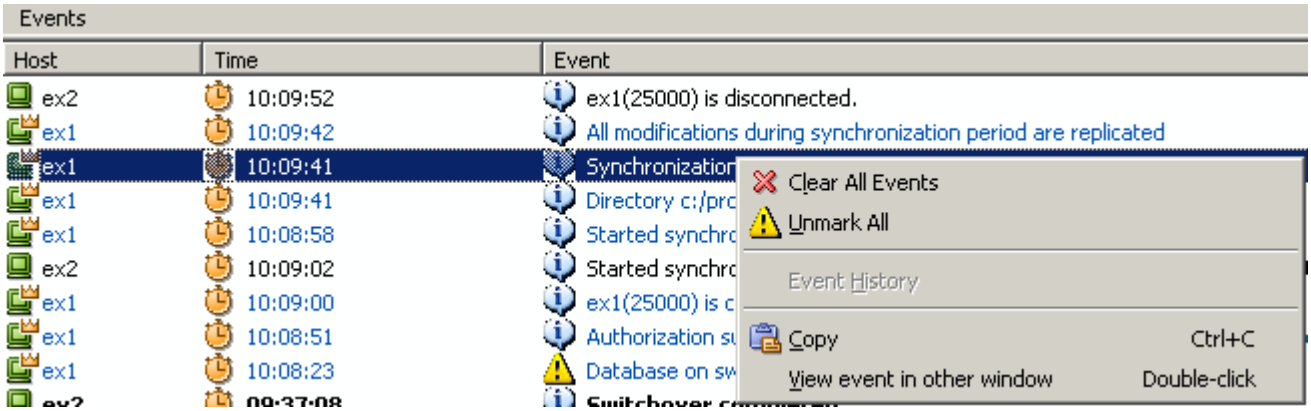
To acknowledge events as read:

1. Select an event by clicking on the appropriate line in the list (once it is marked, it is not displayed in bold).
2. Or, right-click the desired event.

   A pop-up menu appears.

3. Select *Unmark All*.

   The bold formatting for the current event disappears. This can help to distinguish new (unread) events from old ones.



Copy Events

To copy the text of the events for use in other programs:

1. Mark any number of events using Windows conventions.
2. Right-click in the Events area and select Copy, or select Events > Copy, or click ctrl+C.

   You can paste the copied event texts into any program you wish.

Delete Events

Select the events to be deleted and press the Delete key on your keyboard.

Purge All Events from List

Select *Clear All Events* from the Events area pop-up menu (from right-click), or from the Events menu. All currently displayed events are cleared.

Reports

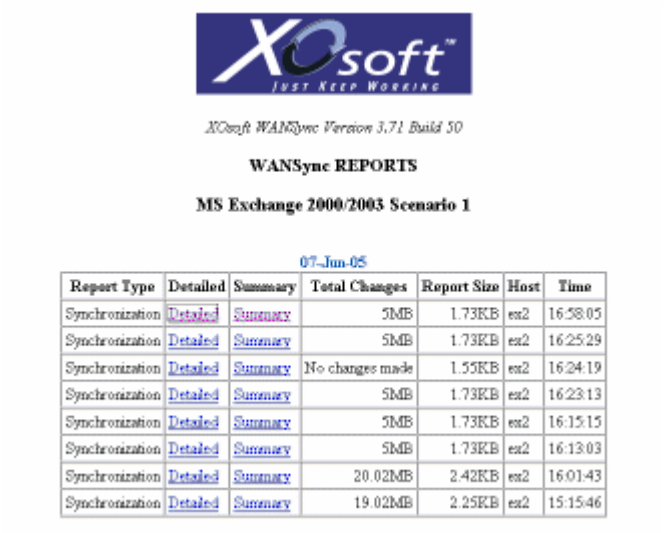
WANSync can generate reports on the replication and synchronization processes. These reports can be stored on the master, sent for display by the WANSync Manager, sent by email to a specified address, or they can trigger script execution. To set these options, see *Set Master Server Properties*.

The reports that are generated are collected chronologically in a table that is output, by default, in XML format. XSL is used to transform the XML output into HTML that can be viewed in a browser (the XSL file used, report.xsl, is provided in the xml subdirectory of the WANSync installation directory. When displayed in a browser the table displays with links for accessing the outputs. (The Reports section in the Properties tab allows you to select XML, text, or HTML formats for reports.)

Note: The XLS file report.xsl in the xml subdirectory is required to view reports that are in XML format. It may be necessary to install this file in order for reports to be viewed on machines that do not have the WANSync directory installed.

Scenario Reports

If you select Tools > Reports > Show Scenario Reports from the menu bar the WANSync Reports window opens.



XOsoft WANSync Version 3.71 Build 50

WANSync REPORTS

MS Exchange 2000/2003 Scenario 1

07-Jun-05

Report Type	Detailed	Summary	Total Changes	Report Size	Host	Time
Synchronization	Detailed	Summary	5MB	1.73KB	ex2	16:58:05
Synchronization	Detailed	Summary	5MB	1.73KB	ex2	16:25:29
Synchronization	Detailed	Summary	No changes made	1.55KB	ex2	16:24:19
Synchronization	Detailed	Summary	5MB	1.73KB	ex2	16:23:13
Synchronization	Detailed	Summary	5MB	1.73KB	ex2	16:15:15
Synchronization	Detailed	Summary	5MB	1.73KB	ex2	16:13:03
Synchronization	Detailed	Summary	20.02MB	2.42KB	ex2	16:01:43
Synchronization	Detailed	Summary	19.02MB	2.25KB	ex2	15:15:46

Synchronization Report

Following synchronization, WANSync creates and opens a report listing the files that have been transferred. The first few lines (at the top) include the names of the master and the Replica(s) and the synchronization date.

The summarized synchronization report includes a sum total of the removed and modified files as well as bytes transferred.

WANSync Version 3.71 Build 50

SYNCHRONIZATION REPORT

```
Synchronization mode:       Block Synchronization (include files with the same size and modification time)
Scenario:                   MS Exchange 2000/2003 Scenario 1
Started by:                 MOBILE\administrator
Controlled by:              MOBILE\administrator
Master host:                ex1
Replica host:               ex2
Scenario start time:        07-Jun-05 16:25:18
Report start time:          07-Jun-05 16:57:15
Report finish time:         07-Jun-05 16:58:05
```

Summary:

```
Total number of files modified: 1
Total number of bytes changed:  5MB
```

The detailed report presents the complete listing of the files: time, file-path, name, and size.

WANSync Version 3.71 Build 50

SYNCHRONIZATION REPORT

```
Synchronization mode:       Block Synchronization (include files with the same size and modification time)
Scenario:                   MS Exchange 2000/2003 Scenario 1
Started by:                 MOBILE\administrator
Controlled by:              MOBILE\administrator
Master host:                ex1
Replica host:               ex2
Scenario start time:        07-Jun-05 16:25:18
Report start time:          07-Jun-05 16:57:15
Report finish time:         07-Jun-05 16:58:05
```

Event	Bytes	Time Stamp	File Name
Change	5MB	07-Jun-05 05:12:45	c:/program files/exchsrvr/mdbdata/E00.log

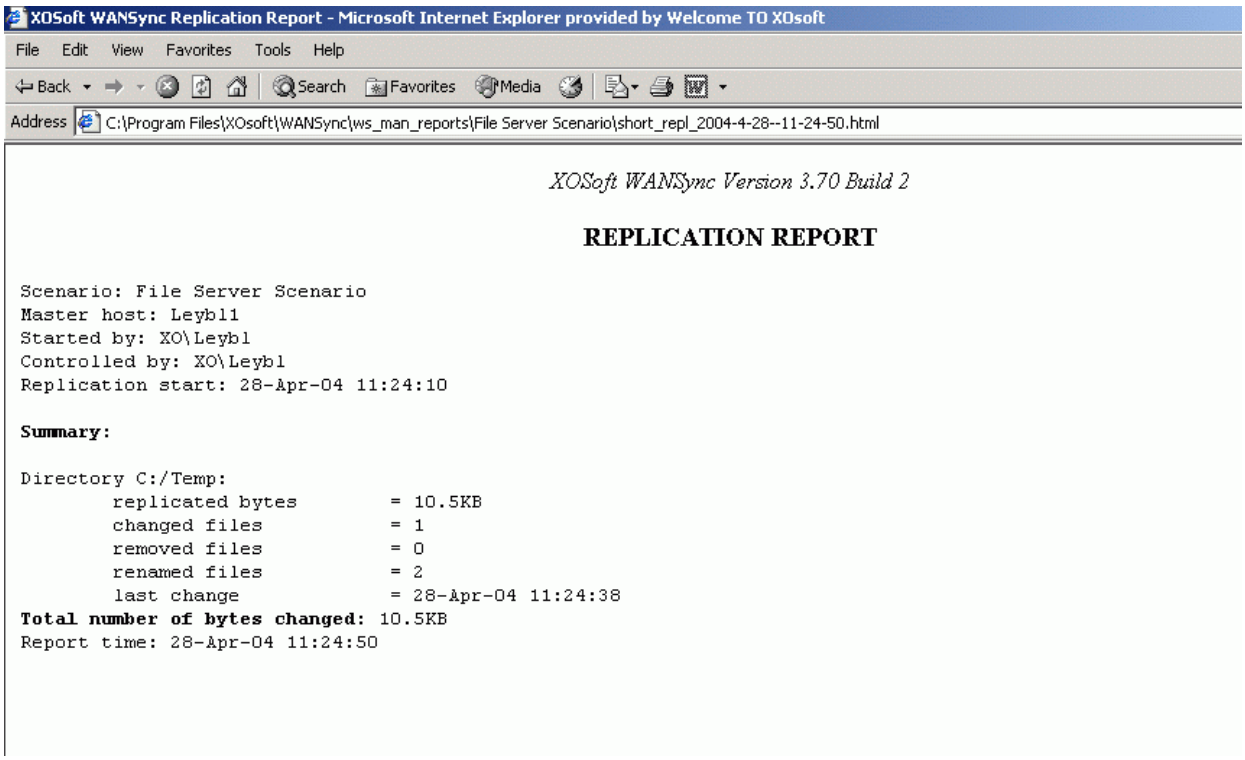
Summary:

```
Total number of files modified: 1
Total number of bytes changed:  5MB
```

Replication Report

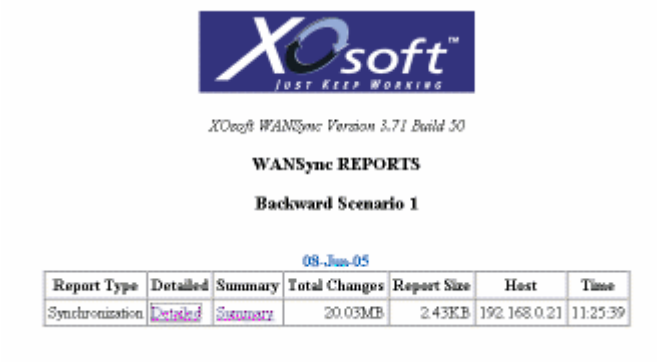
When this option is On (by default, it is Off), WANSync periodically creates replication reports (according to the set timeout). You can also view a report by selecting Tools > Reports > Replication Reports.

The reports include statistics on data replicated since the beginning of the replication process, as well as statistics on data replicated since the last report. The data includes the number of replicated bytes, number of files created/updated/removed/and renamed, and the number of errors. You can view either a summarized or detailed report. A summarized report looks like this:



Backward Scenario Report

A Backward Scenario report displays the information relative to that scenario:



XOsoft WANSync Version 3.71 Build 50

WANSync REPORTS

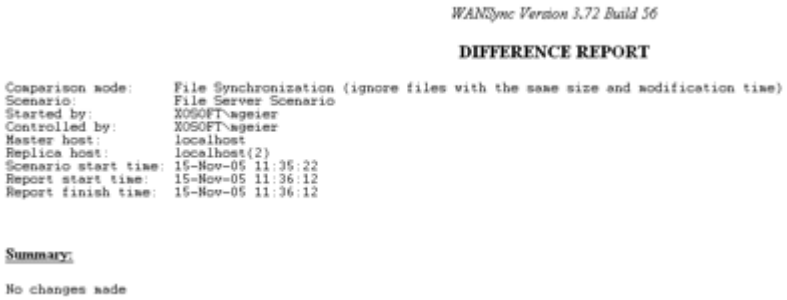
Backward Scenario 1

08-Jun-05

Report Type	Detailed	Summary	Total Changes	Report Size	Host	Time
Synchronization	Detailed	Summary	20.03MB	2.43KB	192.168.0.21	11:25:39

Difference Report

A Difference Report compares the difference between the master and the replica (see *Suspend Replication*).



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DIFFERENCE REPORT

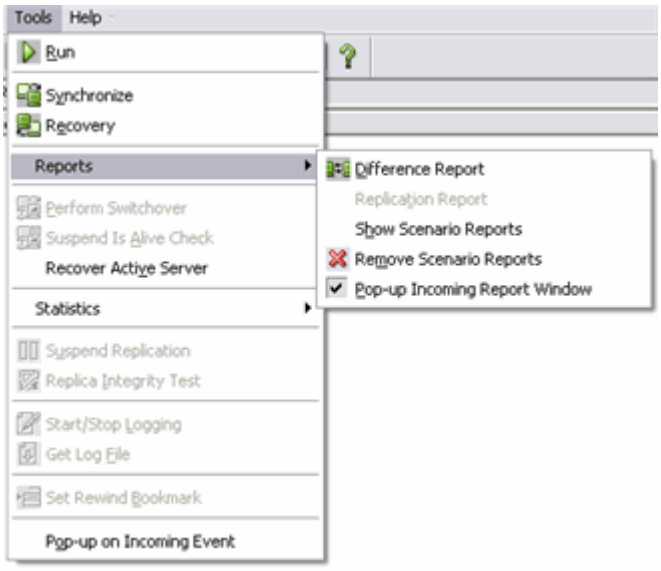
```
Comparison mode:      File Synchronization (ignore files with the same size and modification time)
Scenario:             File Server Scenario
Started by:           XOSOFT\ageier
Controlled by:        XOSOFT\ageier
Master host:          localhost
Replica host:         localhost(2)
Scenario start time:  15-Nov-05 11:35:22
Report start time:    15-Nov-05 11:36:12
Report finish time:   15-Nov-05 11:36:12
```

Summary:

No changes made

Incoming Reports

You can view a compilation of incoming reports (except for Backward Scenario) automatically following synchronization by selecting Tools > Reports > Pop-up Incoming Report Window.



Note: Deselect this option if you do not want to view incoming reports automatically.

The WANSync Reports window opens automatically.

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WANSync REPORTS

File Server Scenario

15-Nov-05

Report Type	Detailed	Summary	Total Changes	Report Size	Host	Time
Synchronization	Detailed	Summary	No changes made	1.52KB	localhost(2)	12:10:40
Synchronization	Detailed	Summary	No changes made	1.52KB	localhost(2)	11:36:42
Synchronization	Detailed	Summary	No changes made	1.52KB	localhost(2)	11:36:25
Difference	Detailed	Summary	No changes made	1.52KB	localhost(2)	11:36:12
Difference	Detailed	Summary	No changes made	1.52KB	localhost(2)	11:35:45
Synchronization	Detailed	Summary	No changes made	1.52KB	localhost(2)	11:35:23

WANSync Engine Server Log Files

Log files are generated as a debugging mechanism, in order to trace the recording and rewinding procedure on the scenario host. When required, the WANSync Engine logs its activities in detail, i.e., every file received and every executed rewinding event. The generated log file is for use only by technical support. Note that this may downgrade WANSync performance. Therefore, generate only when necessary.

Select the Appropriate Scenario.

To select the appropriate scenario, click the Start Logging icon on the toolbar or select Tools > Start Logging.

View Log Files

To view log files:

1. Select the appropriate scenario.
2. Select Tools > Get Log File or click the Get Log File icon. The latest log file opens in Notepad.

Chapter 8: Recovery

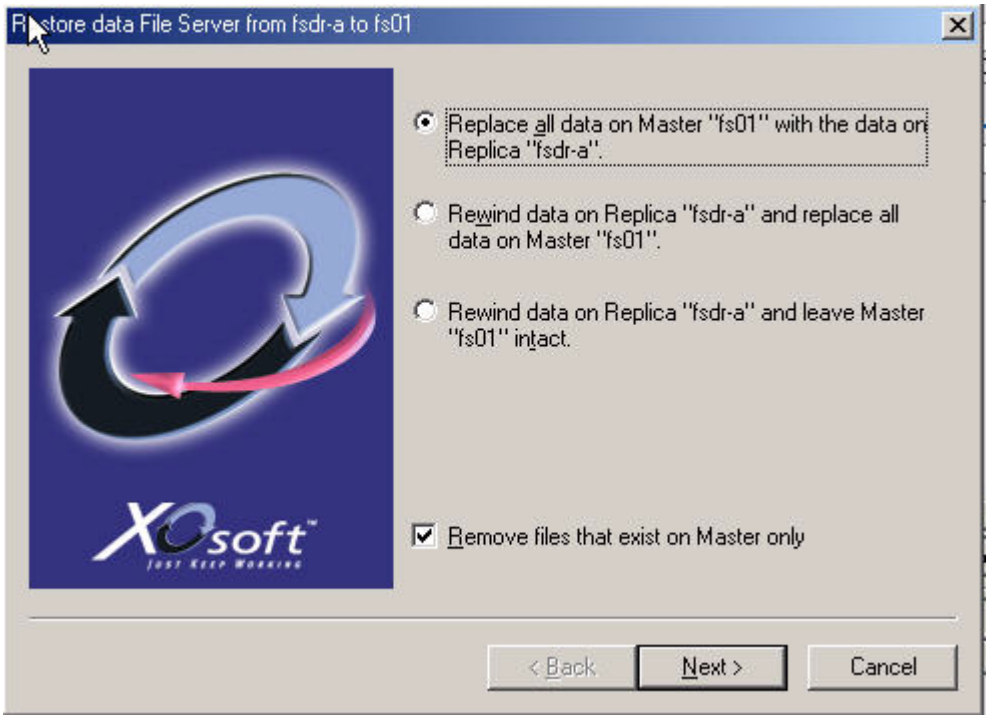
In case an event causes loss of master data, the data can be restored from any Replica. The recovery process is in fact a synchronization process in the reverse direction (from a replica to the master).

Important! You must stop replication in order to initiate recovery.

Recover Lost Data from Replica

To recover lost data:

1. Select the replica server to be used as source.
2. Select Tools > Restore Data or click the Restore Data icon. The Restore Data wizard appears.
3. Select the topmost option. If you want to remove files that exist only on the master, select *Remove files that exist on master only*.



4. Click Next.

   The Synchronization Method window is displayed.

5. Select the synchronization method and click Finish.

   WANSync Manager builds a temporary reverse tree using the selected replica as the root, and the master as the terminating node. After the master recovery process ends, the temporary scenario is deleted, and the replication process can be restarted on the original scenario.

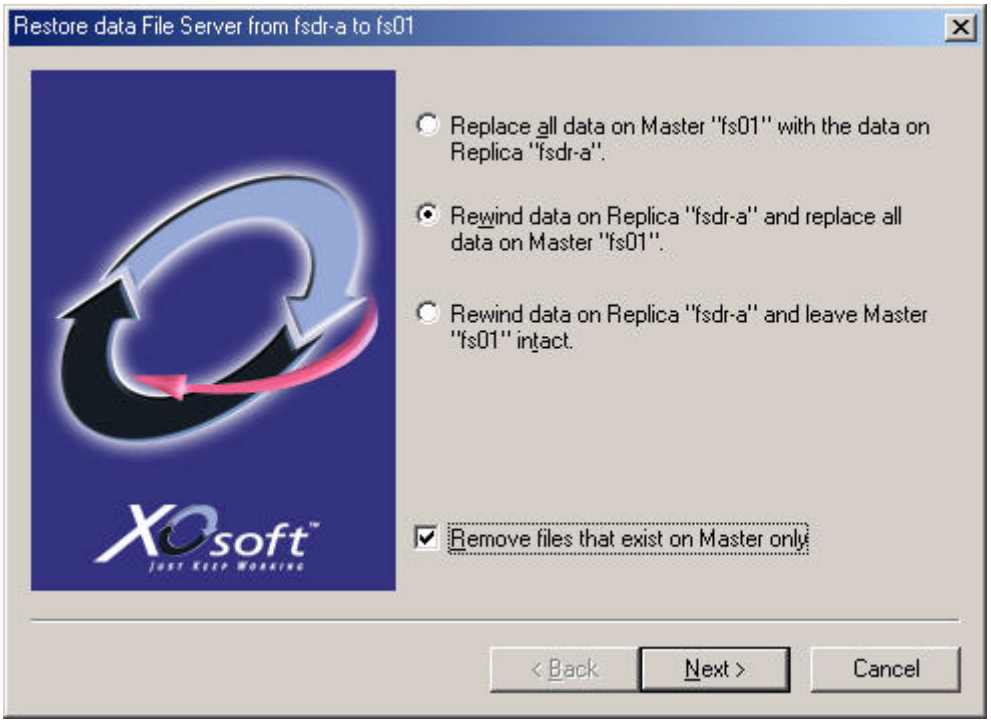
Data Rewind

This recovery method allows rewinding files to a point in time before they were corrupted. This process takes place on the replica server before the reverse synchronization process starts.

To activate this option, set Recovery/Data rewind to on (see *Set Replica Server Properties*).

1. Select the replica from which you want to recover and click the Restore Data icon. The Restore Data wizard screen opens (see *Recover Lost Data from Replica*).
2. Select one of the Rewind data options depending on whether you want the rewind data synchronized back to the master automatically or left on the replica only. If desired, select the *Remove files that exist on master only* option.

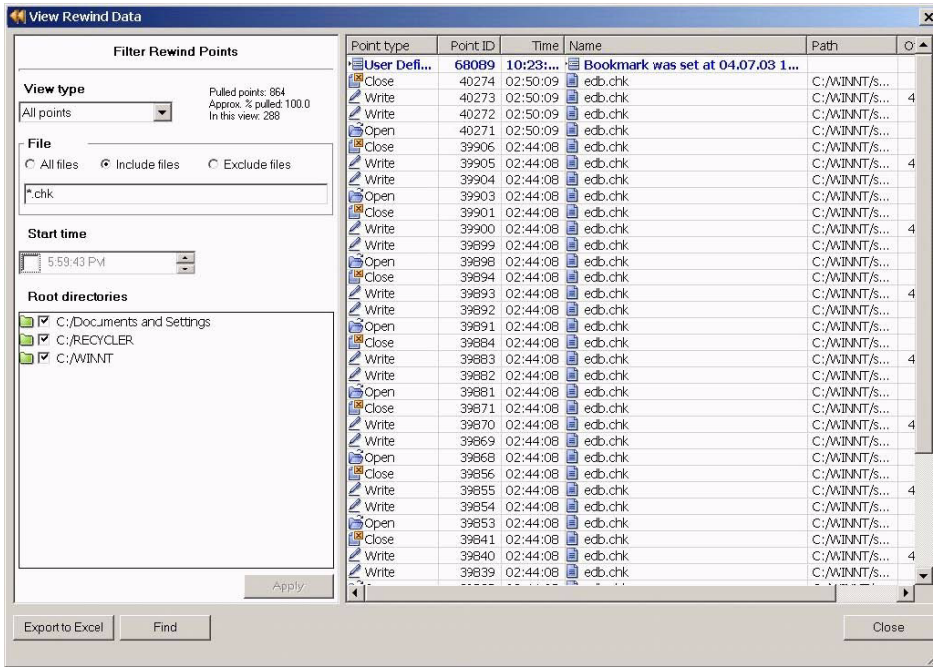
3. Click Next.



4. Click Select Rewind Point.

5. Click Next.

   The View Rewind Data window opens. This window contains a list of all undo points. These are files that have changed, been erased, been modified, etc., each time-stamped as a checkpoint, or point (in time). Additionally, the entire list can be exported to an Excel file by clicking the Export to Excel button.



6. Rewind points can be filtered by type: file events, database events or Exchange events (if it is a database or Exchange replication scenario), all types. In addition, file events can be filtered using the same conventions as for filtering files during master root directories selection (see *Filter Master Directories*). Click Apply to activate the filtering. Only filtered rewind points are displayed.
7. Select the rewind point and click OK.

   The Rewind Point Selection window opens.

8. Click Next.

   The Synchronization Method window opens.

9. Select the desired recovery option and then click Finish.

At this stage, WANSync recovers the files according to the synchronization method chosen, generates a standard synchronization report, and lists the statistics. Once the files are recovered, you can return to using WANSync normally.

Chapter 9: User Management

Windows manages all issues dealing with authentication (user identification), and authorization privileges, security levels, etc.

Hierarchy, User-Levels, and Communication Protocol

User privileges are for communication between the Manager and the master host, or between the Manager and the master and the Replicas on its replication tree.

- **Windows authentication**
  - If the WANSync Manager or the master or replica are installed on NT4, NTLM is used for authentication.
  - If the WANSync Manager, master and replica are installed in the same domain or are in different domains with trusted relationships, WANSync uses Kerberos authentication. The authenticated user must be a domain user (not a local computer user).
  - In any other case, NTLM authentication is used .
- **Solaris or AIX authentication**
  - If WANSync is installed on Solaris or AIX, PAM authentication with encrypted username and password are used.

The following rights are available: Read-only, or Read/Write, where:

- Read-only permits: viewing current status; viewing statistics; accessing and printing out synchronization and replication reports.
- Read/Write also permits the above, plus full control: ability to create, modify and delete scenarios; ability to start and stop scenarios.

The Manager uses the current Windows user rights. If an action is attempted, and the user logged into the Manager does not have the correct authorization level, a window opens and asks for a username and password.

Authentication

Every connection between the Manager and one of the hosts (Manager-Master, Manager-Replica, or Manager-Replica of a replica) is authenticated individually, with either a read/write or read-only privilege.

In determining the Manager's rights to a host, the user is not immediately prompted for a username and password.

Instead, one of the following scenarios takes place:

1. The Manager first attempts to authorize connection to a host using the current Windows user rights.
2. The connection is authorized with read/write rights, if:
   - The user has administrator rights on the computer where the master/replica has been set up and
   - Master/replica host has been set up under the user account.
3. The connection is authorized with read-only rights if:
   - The user is a known user in the domain where the master/replica has been set up and
   - The user is a known local user on the machine where the master/replica has been set up.
4. The connection is not authorized and the following occurs:
   - The authorization request icon appears on the left-hand side of the scenario, indicating that this is a master/replica for which the user does not have authorization.
   - If a scenario is selected, and it cannot be authorized with the current user, a window pops up and requests a username/password to be provided. When the new user and password is entered, the Manager again tries to authorize the connection with the master/replica.
   - The Manager maintains a stack of all user names/passwords entered during running and tries to authorize a connection by first trying each one of them. If the connection is still not authorized, a window pops up and requests authorization (enter the username as *domain**username*).
5. When the Manager starts or stops a scenario, it authorizes, based on the license, using the following two models:
   - With master host only, a single authorization is made, or
   - With master and all replica hosts, authorization is established for each host separately. This is done by stepping from one host to the next (through the tree hierarchy) and establishing authorized connections one at a time, meaning:
     - No direct connection to a replica is established, or
     - A connection to a replica is not established if the connection to the higher-level host is not authorized.

Chapter 10: Installing WANSync on Microsoft (MS) Windows

This chapter describes how to install the WANSync components on an MS-Windows platform.

Initial WANSync Installation

Note: See *Remote Installation Wizard* for the preferred method of deployment in a Windows environment.

Installing WANSync components the first time is very straightforward. The installation package that is provided on a CD-ROM contains a file called Setup.exe that runs a standard MSI wizard.

- This (non-intrusive) installation does not require reboot or application shutdown
- The required level of INSTMSI.EXE is 2.0.2600.2 or higher -- otherwise, WANSync installation upgrades the Windows installer (this upgrade requires a reboot)

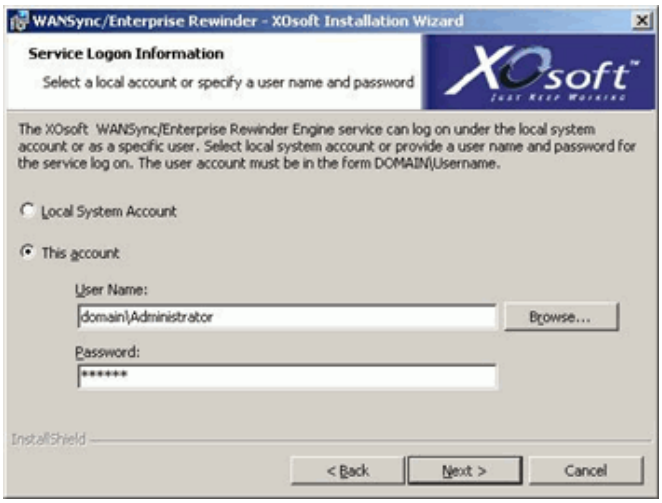
Standard prompts facilitate the installation. Your only major decision is on which servers to install the applications (WANSync Manager and WANSync CLI are installed together):

- Install WANSync engine on both the master and replica servers
- Install WANSync Manager on any computer that is used as a device to monitor and manage WANSync

The default installation directory (INSTALLDIR) is: *\Program Files\XOsoft\WANSync.* All executables, DLLs and configuration files are located in INSTALLDIR as is this manual and any other documentation included with the package.

- During installation on the master and replica servers, you are prompted to enter the account under which the WANSync service runs
- If you are running high availability scenarios, the account under which the WANSync service runs may require privileges in addition to those of the local system account (see the appropriate WANSyncHA operations guide for more information)

- A Windows user running the WANSync Manager requires Read-Write permission to the installation directory
- The service logon account of the executing WANSync Engine requires Read-Write permission to the installation directory



Upgrade an Installation

There is no major difference between a new installation and an update to an existing installation. The setup executable automates most of the work, and the MSI wizard carries out all the required tasks to upgrade the application.

Note: Beginning with WANSync version 3.71.50 a valid maintenance license key is required to upgrade a WANSync installation. If a maintenance license key is not found or the maintenance has expired, WANSync will not allow you to run scenarios after an upgrade. If you have a valid maintenance contract (either included with the purchase of WANSync or purchased separately after the first year), but do not have a maintenance license key, please contact technical support.

Uninstall WANSync

Uninstalling WANSync is performed by a simple and standard activity through the operating system's Add/Remove Programs in the Control Panel list.

- The un-install does not remove the default directory storing the user generated .xmc scenario files that have been set up by the WANSync Manager. The directory is: *INSTALLDIR\ ws_scenarios*.

- The un-install does not remove the master directory storing the user-generated reports. This directory is created if the Store Reports On master property is set to On. This target directory, located on the Properties tab, is user-definable. The default directory is: I*NSTALLDIR**reports*.
- Another property allows for storing user-generated reports on the Manager (if Send To Manager is set to On). It is not removed by an un-install. The directory is: *INSTALLDIR*\ *ws_man_reports*.

Reboot WANSync

After some upgrades or uninstalls you are prompted for a reboot: *You must restart your system configuration for changes made to WANSync to take effect*. Click Yes to restart now or No if you plan to restart later. We recommend that you click Yes to restart.

Chapter 11: Troubleshooting

All events reported by WANSync include the following data:

- Server producing the report
- Date and time of the report
- Event severity
- Message describing the event

Error Conditions

WANSyncHA does not support DHCP assigned addresses. Using assigned addresses on the master can cause resources to go offline during a High Availability Run.

Error Messages

The following table includes error messages reported by WANSync servers, and the recommended action required to resolve the problem.

Error Message	Action
Cannot compress file *filename*	Check that user under which the WANSync replicator runs has full permissions for the server spool directory Check that there is enough free space in the spool directory. Change location of spool directory if necessary.
Cannot compress log file *filename*	
Unable to compress journal file *filename*	
Cannot create map data file *tempfilename*	
Unable to create temporary file	
Cannot copy file *filename1* to *filename2*	
Cannot save job to file *filename*	
Server *servername* is dead – Cannot send email	Check status of mail server set for error notification
Cannot connect to mail server *servername*	
Failed sending mail to server *servername*	
Unable to move journal file *filename* to spool	
Error building snapshot for *dirname*	
Cannot create snapshot directory *dirname*	
Error building snapshot for *rootdirname*: Unable to open output snapshot file	
XOFS: Error mounting directory *dirname*	Check that the directory exists on server Check that the XOFS driver is installed
Error building snapshot for *rootdirname*: Unable to make file list of directory *subdirname*	Check that the directory exists on server. Check that the user under which the WANSync replicator runs has permission to open this directory.
Error building snapshot for *rootdirname*: Unable to build recursive directory list of directory *subdirname*	

Error Message	Action
Spool size limit exceeded. Current size: *N* Kb. *Once the problem is solved, the following message is received*: Spool size normalized. Current size: *N* Kb	If message is received from replica server increase spool size, clean disk and/or increase bandwidth available for the replication process. If message is received from master server: Case 1: Automatic synchronization is turned on. If all the replica servers are connected, then replication is stopped. Otherwise, spool is dropped and replication continues. Case 2: Automatic synchronization is turned off. Replication is stopped. Increase spool size, clean disk.
Disk almost out of space. Free space: *N* Mb	
Unable to open file *filename* for sending, error *errorno*	Check that the user has read permission on the file.
Unable to open file *filename*	
Unable to write to file *filename*	Check that the user has write permission on this file on the replica server.
Unable to execute event *eventname* for *filename*	Synchronize the affected replication tree.
Received fatal error from XOFS	Update rate is too high. WANSync replicator does not receive enough CPU time to process changes. Check spool configuration. Check */var/adm/messages* for errors. Solve existing problems (possibly there is no disk space) and restart replication process.
XORG: Error adding registry path *pathname*	Check indicated registry path exists. Check that user under which the WANSync replicator runs has full permissions for this registry path.
Server *servername* is dead – Cannot send email	Check status of mail server set for error notification.
Cannot connect to mail server *servername*	
Failed sending mail to server *servername*	
Executing script *scriptname* failed with error *errorno*	Check if the indicated script exists. Check that the user under which the WANSync replicator runs has full permissions to execute the script.

Error Message	Action
Server *servername* (IP *IPaddress*, Port *portnumber*). Authorization fail for user *username*	User is not authorized to control WANSync Replicator on this *servername* or the password is incorrect.
Cannot connect to *servername* (*port*)	Check network connectivity to the server

Performance Messages

The following table includes error and warning messages that announce performance degradation.

Performance Message	WANSync behavior
XOFS queue upper watermark is reached for *dir_name* due to excessive number of changes.	Update rate is very high. Changes in this directory are still queued, but in order to unload CPU transfer of data to replica is suspended.
XOFS queue second watermark is reached for *dir_name* due to excessive number of changes.	Update rate is very high. Changes in this directory are still queued, but in order to unload CPU transfer of data to replica is delayed.
XOFS queue lower watermark is reached for *dir_name.*	Replication is resumed for the directory.
Too many open files. *Once problem solved the following message is received*: Number of open files normalized.	Replication continues to work but it slows down.
Processing unmount while some files are open.	Cannot unload WANSync file system during process stop operation because some files are still open. Unloaded at first reboot.

Appendix A: Using the Command Line Interface (CLI)

This section provides a general introduction to the CLI tool, including a brief overview, descriptions of the hierarchic model, as well as basic workflow and launching instructions.

What is the Command Line Interface?

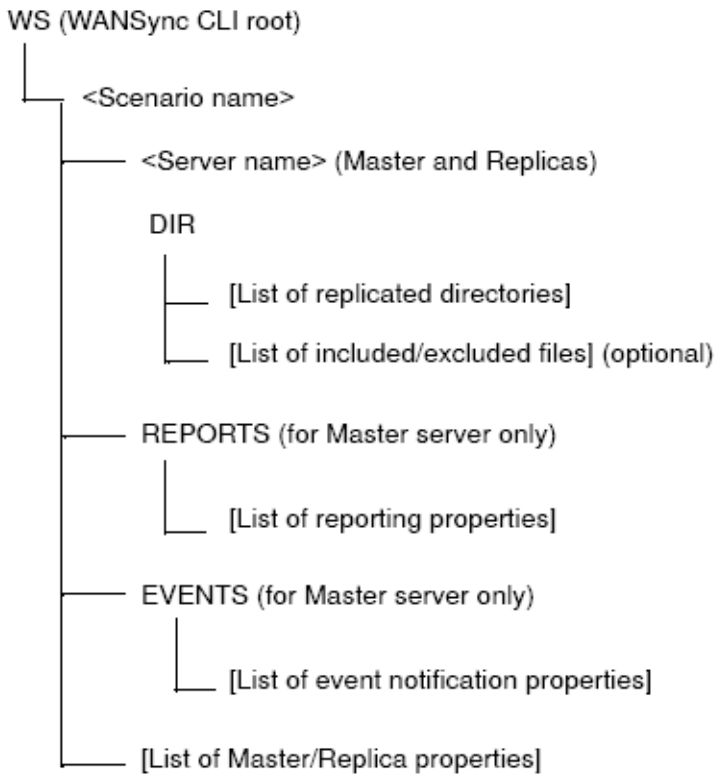
The Command Line Interface (CLI) is offered as an alternative to users that do not want to manage the replication process using the WANSync Manager graphic user interface (GUI). The CLI is an interactive shell that allows configuring a replication scenario and controlling and monitoring the replication process. All the scenarios that are managed by the CLI look and operate exactly as the ones that are managed by the Manager GUI, and they are saved automatically in the same default location: INSTALL_DIR/ws_scenarios.

The CLI runs in two modes:

- **Interactive mode** – this mode is similar to a UNIX shell, displaying a UNIX-like prompts. It enables you to perform all the functions that exist on the Manager GUI, besides generating and displaying reports (except for the Difference Report, which you can generate but not view).
- **Non-interactive mode** – this mode executes commands taken from the command line. It enables you to manage scenario using scripts or batch files.

Hierarchic Model

The CLI uses a hierarchic model to display the structure of replication scenarios. It uses a similar paradigm to a file system (each scenario can be thought of as a tree):



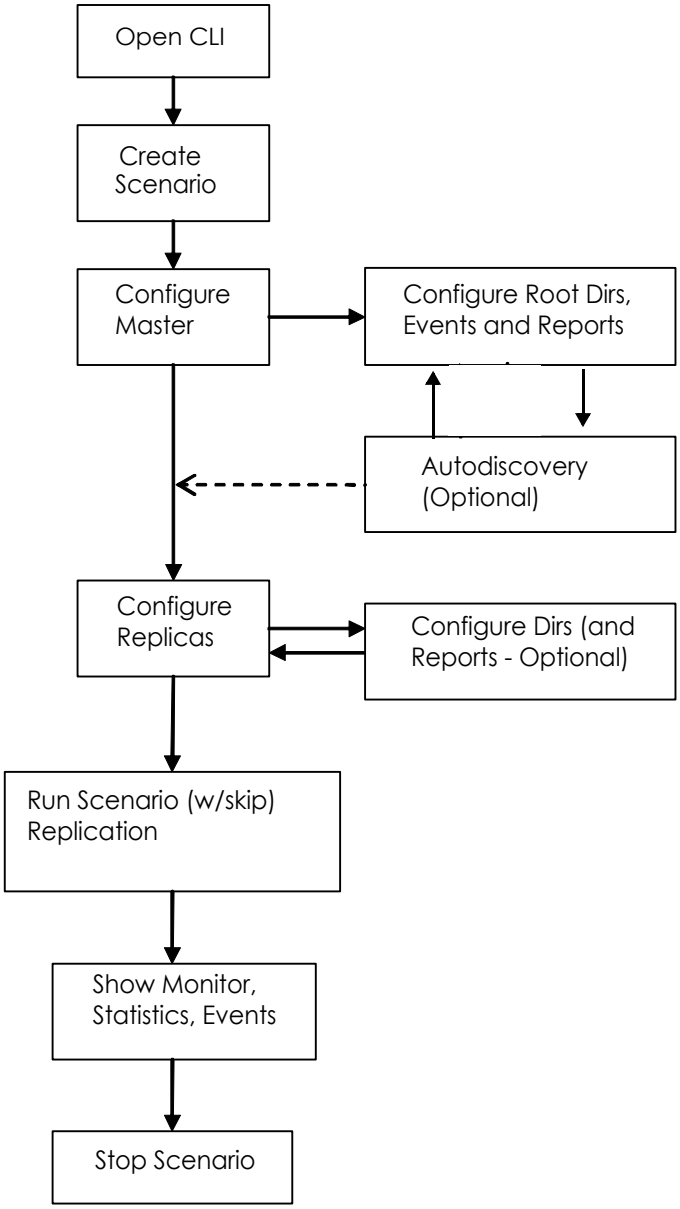
Key**:**

Component	**Description**
WS	This is the root of the tree. It contains the list of all available scenarios.
<Scenario name>	This is the root of the tree. It contains the list of all available scenarios.
<Server name>	Each scenario name contains a list of all servers participating in the replication scenario. Indentation is used to distinguish master servers from replica servers.
DIR	Each server name contains the DIR entry and the list of all server properties. Additionally, the master server contains the REPORTS and EVENTS entries.

Component	Description
REPORTS	Contains the list of all selected directories for a replication.
EVENTS	Contains a list of reporting properties — what reports to generate and where to store or send them; whether or not to run a script; the location of the script.

Workflow

The following workflow contains the main tasks that are preformed when creating and running a scenario using the CLI interactive mode:

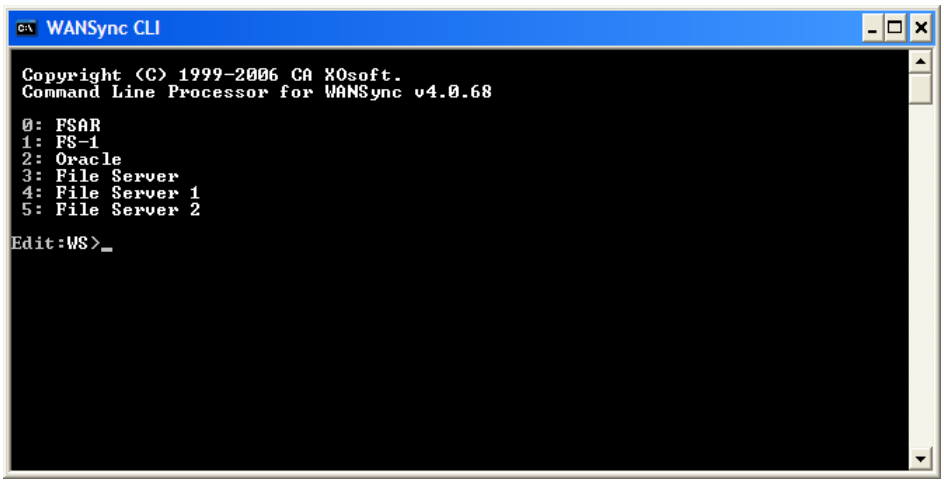

Open CLI
Create Scenario
Configure Master
Configure Root Dirs, Events and Reports
Autodiscovery (Optional)
Configure Replicas
Configure Dirs (and Reports - Optional)
Run Scenario (w/skip) Replication
Show Monitor, Statistics, Events
Stop Scenario

Launching the CLI

To launch WANSync CLI in interactive mode:

- Select *Start* > *Programs* > *XOsoft* > *WANSync CLI* or enter the following command from the Run command prompt: [full INSTALLDIR path]\ws_cli.exe.

  After opening the CLI, the following window is displayed:



To launch WANSync CLI in non-interactive mode:

- Open the command prompt and enter the desired commands.

Run the CLI in Interactive Mode

There are two sub-modes of the CLI running in interactive mode: edit mode and run mode.

- **Edit mode** - you can create and update replication scenarios. In this mode, the CLI promt looks like this:

  ```
  Edit:WS>
  ```

  Using edit mode, you can:

  - Create new replication scenarios
  - Specify servers (master and replica) either by their server name or by their IP address
  - Add directory/files to be replicated from master to replica(s)
  - Set appropriate directories on replicas
  - Set replication properties

  - Run recovery
  - Schedule synchronization to take place on specific dates and hours
  - Start replication (and move to run mode)
  - To work in edit mode, you need write permission in the CLI's working directory.
- **Run mode**- you can operate and monitor replication scenarios. In this mode, the CLI promt looks like this:

  ```
  Run:WS>
  ```

  Using run mode, you can:
  - Stop a replication (and move to edit mode) or suspend it
  - Synchronize servers
  - Monitor the replication process
  - Display events and error messages.
  - Generate statistics and Difference report
  - Set bookmarks

Interactive Mode Commands

The commands in the CLI interactive mode are divided into four groups:

- Browser
- Edit
- Manager
- Runtime

Browser Commands

In interactive mode, navigate the CLI structure using the shell-like commands such as **cd** and **ls**. For example, issuing ls at any level shows the entries at that level.

The **cd** command moves to another level. For example, typing **cd <path>** moves the prompt to the sub-level <path>, or **cd**, to move to the upper level. In addition, all entries are indexed starting from 0. The index can substitute for <path> when navigating. The **ls** command displays indexes. For example, issuing **cd 2** moves the prompt to the level with index 2.

Command Name	Description
ls or dir [path]	Lists all the entries at the current level, or at the level defined by the path.

cd <index>	Changes current location to the level defined by the index. Such levels are emphasized in bold font. (The index number can substitute for the path.)
cd [path]	Changes current location to the level defined by the path. Such levels are emphasized in bold font.
help or ?	Presents a list of all the available commands.
Help [*command_name*]	Presents a short description of the specified command. **Note:** The help command can be accessed from any tree level or mode in the CLI (meaning, both the Run and Edit mode).
history	Presents a list of all commands entered since the CLI session began.
history_save or hs	Saves commands history in a file history.txt (saved in the CLI INSTALLDIR).
quit or exit	Exits the command line interface.

Edit Commands

The CLI edit commands are:

Command Name	**Description**
add [path] <value>	Adds a new server or directory to the replication scenario. The level at which the command was executed determines the added entity type: - When used at the WS level, it creates a new scenario. Note: Each scenario is saved in a separate file with suffix xmc. - When used at the server level, it adds a new replica. - When used at the DIR level, it adds a new directory for replication.

Command Name	Description
set [path] <value>	Sets a replication property or directory name. **Note:** When setting a replication property, a series of options/prompts will appear according to the property's attributes. For example, the **set mode** command has three options: **OnLine**, **Scheduling**, and **FileClose** (i.e., Assessment mode). If you choose **Scheduling**, you're prompted to enter specific dates and times for the synchronization scheduler.
rm or del [path]	Removes server directory or scenario from the replication. The level at which the command was executed determines the type of removed entity.
save	Saves the changes to the scenario.

Manager Commands

The CLI Manager commands are:

Command Name	Description
run	Starts a replication for the current scenario.
stop	Stops a replication for the current scenario.
sync	Synchronizes the data on the replica servers with that on the master server. Usually you have to synchronize data before you start the replication process. Select the relevant synchronization method from the available options. For Run mode only.
recovery or rec	Performs a recovery from the replica. You must be located in the relevant replica host for this command to work.
import [path]	Imports a scenario from a specified location.
export [path]	Exports a scenario to a specified location.
autodiscovery	Automatically discovers all database objects, related files and directories on the current master host. This procedure facilitates the directory selection for standard databases.

Command Name	Description
synconly	Synchronizes data on the replica hosts with the master server, without running a scenario. For Edit mode only.
difference or diff	Generates a Difference Report that presents the differences between the master and the replica.
propagate_dirs	Propagates the master root directories to specific replica hosts that are selected from a list. If the replica list is omitted, all existing replica hosts will be updated.
server_type	Displays a list of existing scenarios with their server types.
timeout (in sec)	Sets a time frame for the duration of a certain task, such as recovery. If the task is not completed by the scheduled time, an error message will be sent. This command can be applied only to the following functions: suspend; resume; dbproc_start; dbproc_stop; recovery; difference report. The time frame is set in seconds: **timeout** <*number of seconds*> **Note:** After you use the timeout command once, the system saves the number of seconds you defined for it. When you next use the timeout command, the system applies the previous number of seconds automatically (unless you enter a different number). However, the system doesn't save the timeout value across sessions.

Runtime Commands

The CLI runtime commands are:

Command Name	Description
monitor	Displays the replication activity in real-time.

Command Name	Description
events [all|clear|get|save] or msg [all|clear|get|save]	Shows the list of replication events, including informational, warning and error events. **All** - Shows history (up to 1000 events)**.** **Clear** - Clears the events list. **Get** - Downloads and shows all events stored on the master host**.** **Save** - Saves all stored events to the specified file.
switchuser [domain\username]	Changes the active user.
statistics or stat	Displays scenario statistic per host during a run.
suspend [path]	Suspends the replication process for a specified replica host (or for the current replica if no path is specified).
resume	Resumes a replication for the currently suspended host.
dbproc_start [path]	Starts a replica integrity testing for assured recovery.
dbproc_stop	Stops a replica integrity testing for assured recovery.
bookmark	Sets a bookmark during a run. You are prompted to enter the bookmark type – regular or backup.
show_bookmarks	Displays the bookmarks that are on the replica. **Important!** This command works only if the scenario is stopped. **Note:** When using the **show_bookmarks** option from the Manager GUI, the displayed list contains both the user-defined bookmarks and the rewind points that were created automatically by WANSync. However, when using the **show_bookmarks** command from the CLI, the displayed list contains only user-defined bookmarks.

Use the CLI in Interactive Mode

The following example demonstrates how to define a replication scenario between hosts.

Define a Replication Scenario

The following procedure describes how to replicate all files from directory /dir/myrootdir on master myserver0 to directory /dir/ mybackupdir on replica myserver1.

Perform the following steps:

1. Add a new replication scenario called *demo*.

   ```
   Edit:WS> add demo
   ```

2. [Optional] Depending on your license, you may be asked to *Select Server Type Number*.

   According to the displayed server list, enter the desired server number.

3. Change location to the scenario level.

   ```
   Edit:WS> cd demo
   ```

   When a new scenario is added, a default master host and a replica host are created automatically.

4. Rename the default master by using a valid host name or IP address.

   ```
   Edit:WS/demo> cd MasterHost

   Edit:WS/demo/MasterHost> set Host myserver0
   ```

5. Rename the default replica by using a valid host name or IP address.

   ```
   Edit:WS/demo/myserver0> cd ../ReplicaHost
   Edit:WS/demo/ReplicaHost> set Host myserver1
   Edit:WS/demo/ReplicaHost> cd ..
   ```

6. Add an additional replica host using the host name or IP address.

   - Add a new replica under the master:

     ```
     Edit:WS/demo> add myserver0 myserver2
     ```

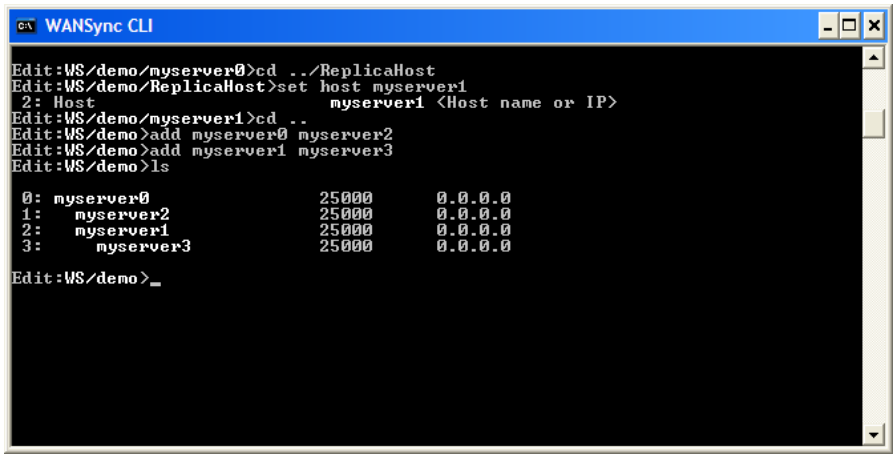
   - Add a new replica under the original (default) replica:

     ```
     Edit:WS/demo> add myserver1 myserver3
     ```

7. Display a list of servers defined in this replication scenario.

   ```
   Edit:WS/demo> ls
   ```

   You should see the following list:



8. Change the current location to the master server level.

   ```
   Edit:WS/demo> cd myserver0
   ```

9. Display a list of replication properties of the master host.

   ```
   Edit:WS/demo/myserver0> ls
   ```

10. Set the spool directory on the master (by default it is /tmp in UNIX, and Installation_Directory/WANSync/tmp in Windows).

    ```
    Edit:WS/demo/myserver0> set SpoolDirectory /opt/xohome
    ```

11. Display an updated list of the master properties.

    ```
    Edit:WS/demo/myserver0> ls
    ```

12. Specify the master directories and files to replicate.

    ```
    Edit:WS/demo/myserver0> cd DIR
    Edit:WS/demo/myserver0/DIR> add /dir/myrootdir
    ```

    A message appears allowing you to exclude directories and files from the replica – You can specify the full paths to exclude.

13. Exclude files from the replication process.

    ```
    Exclude full path [<enter> to cancel]: /dir/myrootdir/excl1
    Exclude full path [<enter> to cancel]: /dir/myrootdir/excl2
    ```

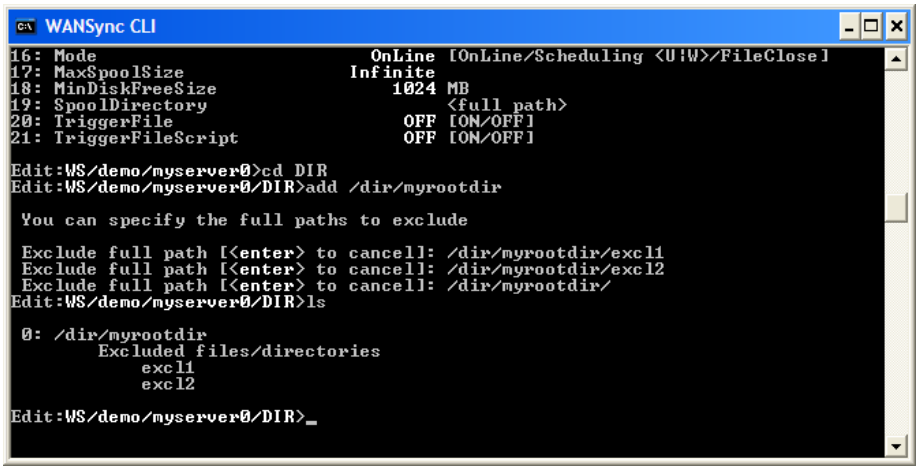
14. Finish the definition of the excluded files.

    ```
    Exclude full path [<enter> to cancel]: [click ENTER]
    ```

15. Display the list of files that are excluded from the replica.

    ```
    Edit:WS/demo/myserver0/DIR>ls
    ```

    You should see the following list:



16. Change current location to the reports directory.

    Edit:WS/demo/myserver0/dir> **cd ../Reports**

17. Display the list of reporting properties of the master host.

    Edit:WS/demo/myserver0/Reports> **ls**

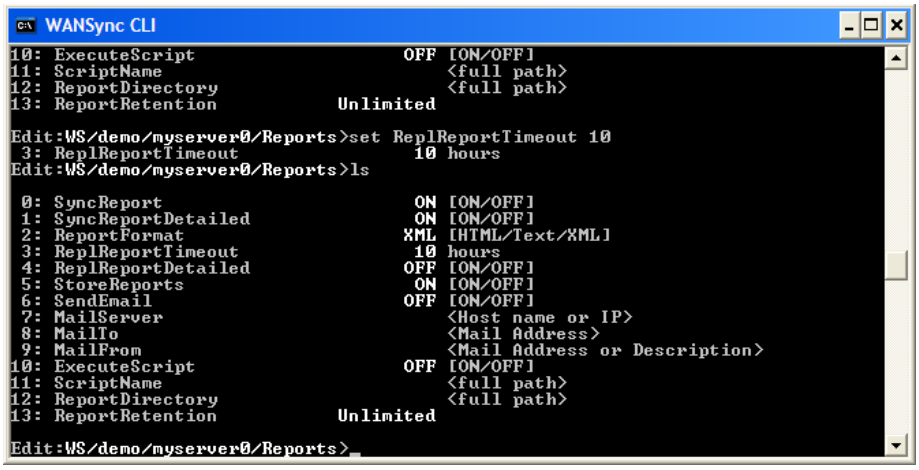
18. Set the timeout for sending reports to 10 hours.

    Edit:WS/demo/myserver0/Reports> **set ReplReportTimeout 10**

19. Display an updated list of reporting properties of the master host.

    Edit:WS/demo/myserver0/Reports> **ls**

    You should see the following list:



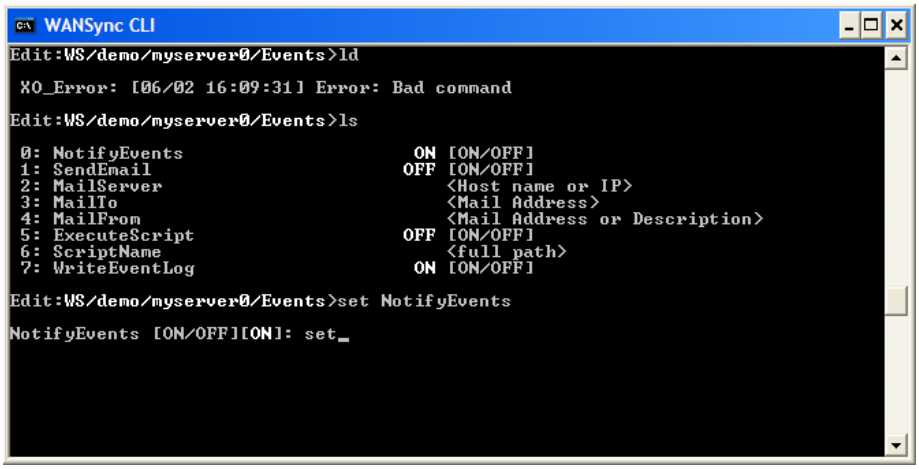
20. Change the current location to the event notification.

    Edit:WS/demo/myserver0> **cd ../Events**

21. Display a list of events notification properties of the master host.

    Edit:WS/demo/myserver0/Events> **ls**

You should see the following list:



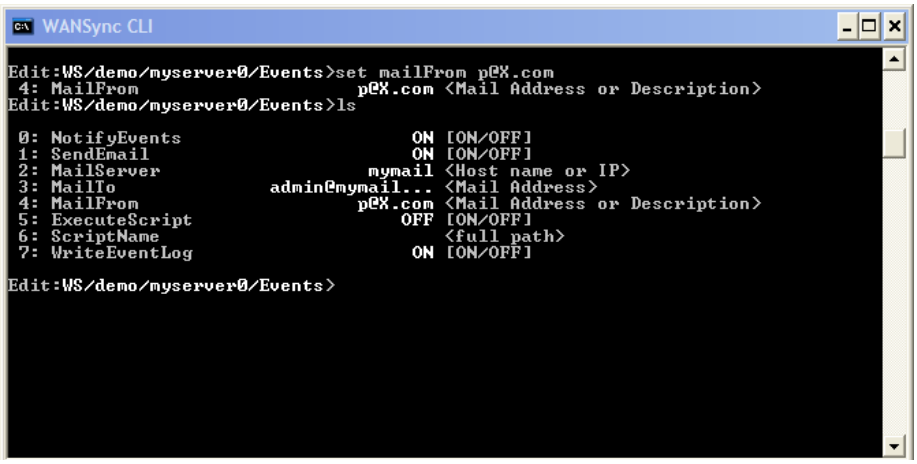
22. Set the master to notify events via email.

    ```
    Edit:WS/demo/myserver0/Events> set NotifyEvents ON
    Edit:WS/demo/myserver0/Events> set SendEmail ON
    Edit:WS/demo/myserver0/Events> set MailServer mymail
    Edit:WS/demo/myserver0/Events> set MailTo admin@mymail;a@G.com
    Edit:WS/demo/myserver0/Events> set MailFrom p@X.com
    ```

23. Display an updated list of events notification properties of the master host.

    ```
    Edit:WS/demo/myserver0/Events> ls
    ```

    You should see the following list:



24. Change current location to the replica server level.

    ```
    Edit:WS/demo/myserver0/Events > cd ../../myserver1
    ```

25. Set the spool directory on the replica.

    ```
    Edit:WS/demo/myserver1> set SpoolDirectory /opt/xohome
    ```

26. Specify target directories on the replica server.

    ```
    Edit:WS/demo/myserver1> cd DIR
    Edit:WS/demo/myserver1/DIR> set 0 /dir/mybackupdir1
    ```

27. Set the other two replicas as well (created in step 5).

    ```
    Edit:WS/demo/myserver1/DIR> cd ../../myserver2
    Edit:WS/demo/myserver2> cd DIR
    Edit:WS/demo/myserver2/DIR> set 0 /dir/mybackupdir2
    ```

    and

    ```
    Edit:WS/demo/myserver2/DIR> cd ../../myserver3
    Edit:WS/demo/myserver3> cd DIR
    Edit:WS/demo/myserver3/DIR> set 0 /dir/mybackupdir3
    ```

28. Change location to the scenario level.

    ```
    Edit:WS/demo/myserver3/DIR> cd ../..
    ```

29. Save scenario.

    ```
    Edit:WS/demo> save
    ```

30. Start a replication (you may be prompted to authenticate the server after entering run — enter <domain\username> and <password>).

    ```
    Edit:WS/demo> run
    ```

    After typing **run** (and <**enter**>), you get the following:

    ```
    Synchronization Method:
    File Synchronization<File>
    Block Synchronization<Block>
    Choose method [<enter> to cancel]:
    Type File and <enter>
    Ignore same size/time files [Yes]?
    <enter> again and Replication begins.
    ```

Monitor and Edit a Running Scenario

At this point, the synchronization of the master and replica directories has started. The program starts to monitor the replication process.

Now, do the following:

1. Check synchronization status in the event log by clicking any keyboard key to stop the monitoring. Then, access events.

   ```
   Run:WS/demo> events
   ```

2. Check that there are no error messages in the event log. Error events are highlighted. When the synchronization is completed, WANSync generates the following two events:

   ```
   Synchronization finished
   All modifications during synchronization period are replicated
   ```

3. Resume monitoring the replication process.

   ```
   Run:WS/demo> monitor
   ```

   The real-time monitor shows how many files were changed, removed or renamed, and how many Kbytes were transferred from master to replicas.

4. Click <**enter**> on your keyboard to exit the monitoring.

5. To make any changes to the scenario, you first must stop the replication:

   ```
   Run:WS/demo> stop
   ```

6. The prompt changes back to Edit mode.

   ```
   Edit:WS/demo>
   ```

7. Now, you can make changes to the scenario and save them to the file. For example, add another directory to be replicated.

   First remove replicas 2 and 3 (in order not to have to add new directories to them as well):

   ```
   Edit: WS/demo> rm myserver2
   Edit: WS/demo> rm myserver3
   ```

8. Now, add an additional root directory.

   ```
   Edit:WS/demo> cd myserver0/DIR
   Edit:WS/demo/myserver0/DIR> add /home/data3 Edit:WS/demo/myserver0/DIR>cd ../../
   myserver1/DIR
   Edit:WS/demo/myserver1/DIR> set 1 /home/data3 Edit:WS/demo/myserver1/DIR> save
   ```

9. Now, restart the replication:

   ```
   Edit:WS/demo/myserver1/DIR> run
   ```

Run the CLI in Non-Interactive Mode

In the non-interactive mode, CLI single-line commands can be used in scripts. In addition they can be used to configure a large number of hosts easily using standard input: `ws_cli < scenario.txt`.

Typing **`ws_cli -h`** from a command prompt displays the command list and usage:

```
CA XOsoft WANSync CLI v4.0.68 Usage:
        -v version information
        -I [hostname[:port]] - service state info
        -r <scenario_name>
        -U [domain\]username:password
        -R <replica host name>
        -m <run | stop | sync | events | status | synconly | suspend |
            resume | dbproc_start | dbproc_stop | propagate_dirs |
            bookmark | show_bookmarks | recovery | server_type | notify>
        -T <timeout (sec)>
        -b <bookmark name> (for bookmark setting)
        -b <bookmark ID> (for recovery)
        -t <bookmark type> = { all | regular | backup} (all - for show_bookmarks only)
        -e noecho mode
        -c <all | rewind | intact>
        -d <external notification message>
        -l <info | warning | error | critical> (notification message severity)
        Flags (without value):
        -F File Synchronization
        -B Block Synchronization
        -Y Ignore files with the same size and modification time
        -P Manual database processing
        -X Remove files that exist on Master only during recovery process
```

The following section provides a detailed explanation of each command.

Non-Interactive Mode Commands

The following commands are available in non-interactive mode:

Note: The commands that are used in the non-interactive mode perform the same functions as the ones that are in the interactive mode. For a detailed description of each command, see *Interactive Mode Commands*.

Command	Description/Example
-v	Displays version information. `ws_cli –v`
-I [hostname[:port]]	Displays all scenarios running on the specified server, the server role in the scenario and short statistics. `ws_cli –I <host_name>`
-U [domain\]username: password	Sets authorized user for scenario (when applicable). ws_cli –r <scenario_name> –**U** uesrname:password
-r <scenario_name>	Specifies the scenario name. Required for running a scenario. ws_cli –**r** <scenario_name> –m run –F
-R <replica host name>	Specifies the replica host name. Required for suspend and recovery actions. `ws_cli –r <scenario_name> –R <replica_host> –m recovery`
-m <run|stop|sync|events| status|synconly| suspend|resume| dbproc_start| dbproc_stop | propagate_dirs| bookmark| show_bookmarks| recovery|server_type| notify>	Runs the specified runtime command, as described below. **Note:** Some commands require a flag.
run	Starts a replication for the current scenario. `ws_cli –r <scenario_name> –m **run** –F –Y [–U username:password]`
stop	Stops a replication for the current scenario. `ws_cli –r <scenario_name> –m **stop** [–U username:password]`

Command	Description/Example
sync	Synchronizes data on the replica hosts with the master server. For Run mode only. `ws_cli –r <scenario_name> –m **sync** –F –Y [–U username:password]`
events	Shows the list of replication events. ws_cli –r <scenario_name> –m **events** [–U username:password]
status	Shows the status of the specified scenario. `ws_cli –r <scenario_name> –m **status** [–U username:password]`
synconly	Synchronizes data on the replica hosts with the master server. For Edit mode only. `ws_cli –r <scenario_name> –m **synconly** [–U username:password]`
suspend	Suspends a replication process for a specified replica host. `ws_cli –r <scenario_name> –m **suspend** –R <replica_host> [–U username:password]`
resume	Resumes a replication for the currently suspended host. ws_cli –r <scenario_name> –m **resume** [–U username:password]
dbproc_start	Starts a replica integrity testing for assured recovery. `ws_cli –r <scenario_name> –m **dbproc_start** –R replica_host [–P][–U username:password]`
dbproc_stop	Stops a replica integrity testing for assured recovery. ws_cli –r <scenario_name> –m **dbproc_stop** [–U username:password]

Command	Description/Example
propagate_dirs	Propagates the master root directories to specific replica hosts. `ws_cli -r <scenario_name> -m` **`propagate_dirs`** `[-R {[+]|-}<list_of_replicas>] [-U username:password]` `<list of replicas>` - this is the list of replicas, represented either by name (as specified in the scenario), by ip address, or by indexes (as displayed in the "ls" command output). The replica names should be separated by commas.
bookmark	Sets a bookmark during a run. ws_cli -r <scenario name> -m **bookmark** [-b <bookmark_name>] -t { regular | backup } -T <number of seconds> [–U username:password]
show_bookmarks	Displays the bookmarks that are on the replica server. ws_cli -r <scenario_name> -R <replica host> -m **show_bookmarks** -t { regular | backup | all } [–U username:password]
recovery	Performs a recovery from the replica. `ws_cli -r <scenario_name> -R <replica_host> -m` **`recovery`** `-c { all | rewind | intact } -b <bookmark_id> [-U username:password] [-X] [{ -B | -F}]` `-X`: for file server scenario only. `-B/-F`: for –c=all only.
server_type	Displays a list of existing scenarios with their server types. ws_cli - m **server_type** [–U username:password]
notify	Sends a notification message that will appear in the message event list. You must add a severity level. Ws_cli –m **notify** –r <scenario_name> -R <replica_host> -l { info | warning | error | critical} –d <message text>

Command	Description/Example
-b <bookmark name>	Set a bookmark name (during a run). `[ws_cli –r <scenario_name> –m bookmark –b <bookmark_name> –t regular|backup]`
-b <bookmark ID>	Specifies a bookmark ID for recovery; use **show bookmarks** to see the ID for the recovery process. `[ws_cli –r <scenario_name> –m recovery –R <replica_host> –b <ID_no.> –c intact|rewind]`
-t <bookmark type> = <all | regular | backup>	Specifies a bookmark type; used in **bookmark** and **show_bookmark** commands. Bookmark type: ws_cli –r <scenario_name> –m bookmark –**b** <bookmark_name> –t {regular|backup} Note: you cannot use the **All** option when specifying a bookmark type. The **All** option is used for the **show bookmarks** command. Its aim is to filter the desired bookmark type. `ws_cli -r <scenario_name> -R <replica_host> -m show_bookmarks -t { regular | backup | all } [–U username:password]`
-T <timeout <sec>>	Sets a time frame for the duration of a certain task, such as recovery. If the task is not completed by the scheduled time, an error message will be sent. Recommended for: bookmarks, suspend /resume, assured recovery and recovery processes. `[ws_cli –r <scenario_name> –m recovery –T <no. of seconds> –R replica_host …]`

Command	Description/Example
-e	For batch files. It decreases the files' output to facilitate the parsing process. The **-e** can be added to every command. For example: `ws_cli –r <scenario_name> –m` **`resume`** `[–U username:password]` **`–e`**
-c <all | rewind | intact>	Specifies a recovery type: **all**: Replace all data on master with the data on replica. **rewind**: Rewind data on replica and replace all data on master. **intact**: Rewind data on replica and leave master intact. ws_cli -r <scenario_name> -R <replica_host> -m recovery **-c** { all | rewind | intact } -b <bookmark id> [–U username:password] [-X] [{ -B | -F}]
-d <external notification message>	Sends a notification message that will appear in the message event list. You must add a severity level. ws_cli -r <scenario_name> -R <replica_host> -m notify –l { info | warning | error | critical } **–d** <message text>
-l <info|warning|error|critical>	Specifies a notification message severity. Can be sent only with the external notification message (–d). The syntax is the same as in the –d command, above.

Non-Interactive Mode Flags

The following flags (without values) are available in non-interactive mode:

Flag	Description
-F	Files synchronization - synchronizes files by transferring modified and missing files. Add this flag upon using: `-m run|sync|synconly|recovery`
-B	Block synchronization - synchronizes files by transferring only the differences that exist between files. Add this flag upon using: `-m run|sync|synconly|recovery`
-Y	Ignores files with the same size and modification time from participating in the synchronization process. Add this flag upon using: `-F`
-P	Manual database processing. Add this flag upon using: `-m dbproc_start`
-X	Remove files that exist on the master only during the recovery process. Add this flag to the recovery process: `-m recovery`

Sample Use of the CLI in Non-Interactive Mode

If you enter the following command:

```
ws_cli -r test -m run -F -Y
```

the replication scenario named *test* runs and synchronizes using a file difference algorithm. It ignores files with the same size and modification time.

Note: By default, the test scenario file .xmc is located in the <INSTALLDIR>/ws_scenarios/ directory. You can change this destination directory in ws_rep.cfg file by removing the comment from the field ScenariosPath and entering the new full directory path.

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