

## **SPARESYNC**

**User Guide**

**Version 2.0**



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## 1 Annotation

This manual was written for the personnel responsible for maintenance of the server infrastructure of your organization. All works related to setting up and operating this product should be performed **by qualified system administrators only**.

We strongly recommend you read this manual carefully before starting to operate SpareSync, as this will avoid unnecessary complexity in the work.

## 2 Terms

SpareSync — software product name.

Primary server — the server on which the Managed system is installed and which serves client (user) requests.

Secondary server — the server on which a copy of the Managed system is installed from the primary server and which is on standby for the primary server. In case of unavailability of the primary server, the secondary server takes over the role as the primary one to service client requests.

Managed system — an application that requires continuity of service overseen by SpareSync.

Reinitialization — full database replication from one server to another. Performed automatically or by user's action.

## 3 Software Requirements

SpareSync is designed to operate with Windows Server 2003 and above. To work correctly, it is necessary to install Microsoft .NET Framework 4.0 (or higher, if version is compatible with 4.0). Both servers should have identical updates affecting the behavior of the system related to the work of .NET Framework. Otherwise, the correct operation of SpareSync is not guaranteed.

Primary and secondary servers must be in the same time zone. In the ideal case, the servers should not have discrepancies in time (discrepancies are allowed for 30 seconds). SpareSync will automatically turn off if there are great differences in time (> 30 seconds). This is necessary to prevent synchronization errors.

**Microsoft SQL Server 2005 or above** should be used for the database synchronization (the database compatibility level should be 2005 or higher version).

If the Managed system is configured to store sessions in SQL Server, it is recommended to use SQL Agent.

## 4 Description

SpareSync is a software product designed to ensure the uninterrupted operation of the Managed system using a secondary server, through continuous one-way synchronization of the Managed system data, including database and file synchronization, as well as producing automatic transition into the maintenance mode on the secondary server when the primary one is unavailable by updating the appropriate DNS-record using Dynamic DNS (RFC 2136) protocol.

In operation, SpareSync performs two main functions: data synchronization from the primary to the secondary server, and monitoring of the primary server by using the secondary one. If necessary, it switches Managed system to the secondary server.

Monitoring the primary server from the secondary server is carried out by periodic message exchange, and the secondary server monitors the operation of the system (located on the primary server) through periodic requests of the test page and by checking its successful response. It should be noted that if such monitoring is checked through a local network, in case of a failure of external communication channels of the primary server, the secondary server cannot detect an emergency situation and take over control.

Therefore, to ensure full-scale operation, the secondary server should monitor the primary one via the Internet. Primary and secondary servers should be connected to the Internet via different channels (preferably different providers).

To enable data synchronization from the primary server to the secondary one it is required to ensure following:

1. There should be enough space in the file repository on both servers. The size of the file storage is different, depending on the amount of stored data. It is recommended that the amount of free space on the disc be comparable to the size of the repository. For example, if the size of the file storage is 100 megabytes, then there must be at least 100 megabytes of free space on the disk.
2. During synchronization, data is transmitted via the Internet. Therefore, a significant load on the server and insufficient bandwidth between the primary and secondary servers may result in low speed of customer servicing and SpareSync malfunctions. In this case it is recommended to extend the communication channel of the primary and secondary servers with the Internet.
3. Free space in the database is required to operate SpareSync. When selecting a database version it should be noted that when using SpareSync the database may exceed the amount of data actually stored up to two times. As a result of this, the use of MS SQL Express Edition is recommended for database volume up to 5 gigabytes. If database size is greater, you should choose another editions of MS SQL Server.

To switch to maintenance mode on the secondary server SpareSync uses Dynamic DNS protocol. The following is required for correct switching:

1. The primary DNS server should support Dynamic DNS (RFC 2136) protocol and the ability to allow access to it from the server platform. The primary DNS server is recommended to be installed on the secondary server. Also, secondary DNS server is required (can be located anywhere). You must perform appropriate delegation of the DNS zone.
2. The primary and secondary servers should have (possibly through NAT) different real static IP addresses.

## 5 Operational Features of SpareSync System

Please note that automatic switching to service mode on the primary server is not included in the functions of the software product.

Switch to the operational mode from the secondary server to the primary one should be performed in a technological break, during which one administrator should execute the switch command for the Managed system to the primary server through the administrative interface. A technical break is needed in this case to synchronize the data from the backup server to the primary. The Managed system administrator should understand that the operation of SpareSync imposes certain restrictions. In particular, rebooting the primary server or a temporary loss of communication between the secondary and primary servers may lead to switching into operational mode on the secondary server. To reduce the possibility of "false" switches, the administrator of the Managed system should set the following parameters:

- The time interval (delay) between detection of the primary server's unavailability and the transition to operational mode on the secondary server. It is recommended to set the value greater than the time it takes the primary server to restart.
- The time intervals (schedule) designed to reboot the primary server (for example, update installations). At this time SpareSync will only operate in sync data mode; the primary server will not be monitored.

Also, before rebooting the primary server or performing any works affecting the network infrastructure SpareSync should be disabled and re-enabled after the completion of the work.

It should be noted that in the case of failure of the primary server in these special modes, automatic switching to the secondary server will not occur.

SpareSync is designed for speedy data synchronization. If the primary server is heavily loaded (active data exchange is in progress), then, in case of failure, the loss of the data processed immediately prior to failure is likely to occur. The probability of data loss can be reduced by extending the communication channel between the primary and secondary servers.

Database synchronization failure can lead to automatic reinitialization of the database (full synchronization of all data). This may decrease the efficiency of the system and the load on the communication channels will increase. In the case of large data volumes and narrow channels reinitialization can take a long time. In this case it is recommended to disable automatic reinitialization of the database and perform the reinitialization from the backup copy through the administrative interface (during the technological break). It should be noted that before completion of reinitialization the data synchronization between the servers does not occur.

Database or file synchronization errors can lead to SpareSync being disabled and the need to fix the problems manually. In case of problems, SpareSync will send appropriate mails.

SpareSync makes every effort to ensure accurate data match between the secondary and primary servers. Nevertheless, it is recommended to perform periodic comparison of data using external tools (such as the RedGate database).

## 6 Safety

By default, all SpareSync interaction occurs via the protected HTTPS channel. In order to verify compliance of SpareSync systems on the primary and secondary servers the certificate and a special key will be checked. The certificate is selected during SpareSync installation, and its characteristics are automatically saved in the settings. Also, during installation a special key is generated and automatically saved in the settings.

Since the encryption of data being transferred requires some resources, in the case of a guaranteed secure channel between the servers, you can switch to the HTTP channel. However, this is not recommended if the Managed system provides open access to Internet users (without requiring VPN).

## 7 Administrative graphical interface

The system interface is accessible through a browser, via a secure HTTPS channel (may be changed to HTTP in order to improve performance if access to the system and its modules is restricted outside).

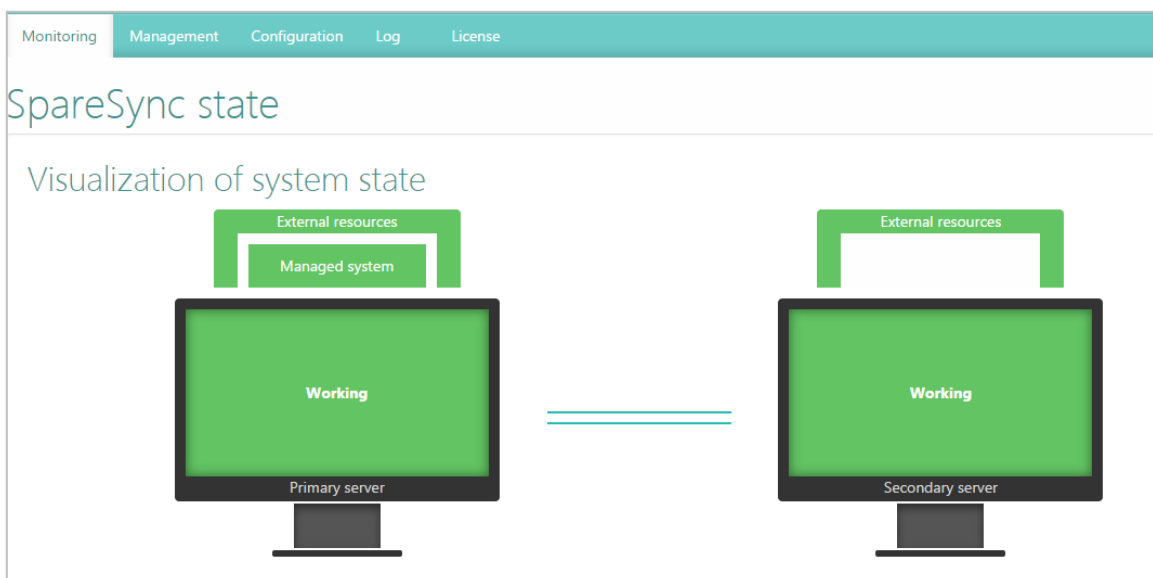
By default, access is provided by the following url: <https://server address: port number/web/>. Primary and secondary servers have identical interfaces, and when there is a connection exists between the servers operations can be performed in any of them.

When accessing the administrative interface from a browser, errors in certificate authentication may occur. This is normal, because this certificate is used for checks within the system, and enables encryption and authentication.

The login and password to access the administration interface is *admin/admin* by default; it should be changed through the settings.

The administrative interface allows to:

1. View the current status of the server;
2. View the status of the server and connection to a remote server;
3. Stop/start SpareSync;
4. Manually switch to the primary or secondary servers with the progress of the operation indication;
5. Change SpareSync settings and SpareSync interaction with the Managed system;
6. Install scripts for the database required for synchronization;
7. Set the reinitialization flag;
8. Perform reinitialization via a backup copy;
9. Restart SpareSync (necessary when changing the settings);
10. Send test messages to check the functioning of the notification system.



## 7.1 Editing Settings

Most of the settings can be edited through the administrative interface. Some settings are marked as critical (highlighted in orange), because they can directly affect the functioning of SpareSync or the Managed system.

By default, when editing the settings, if a connection with the remote server is available, settings will be immediately updated on both servers. This suggests that the Managed system and SpareSync are configured identically on both the primary and secondary servers (paths, service names, mail settings,



and so on). If for some reason the server settings are different, use the flag "Save only in the primary/secondary (servers)."

If the settings are changed when there is no connection between the servers, synchronization of settings does not occur in future.

If changing the settings has led to inoperability of the administrative interface (restricted access, changed username/password), you can restore the correct settings, directly modifying the SpareSync.Settings.xml configuration file with a text editor. This file is located in the SpareSync system directory.

Some settings require restarting SpareSync to be refreshed. Restart can be performed through the Administrative interface or by restarting the service manually.

### SpareSync configuration

- These settings are for the system administrator. The most important are highlighted in orange. **Changing some of them may result in failure of SpareSync.** In this case, you should recover manually by editing the configuration file. Also change some of the settings may result in loss of productivity.
- If there are differences in terms of infrastructure (different paths or email settings), check "Save only on the primary (secondary)" to set different parameters for the servers. Some settings make sense only on the primary (secondary) server.
- Some settings apply only after restarting SpareSync.

#### Settings templates

Network template: Not selected Apply

System template: Not selected Apply

#### Main settings Show advanced settings (10)

Time for the allowed unavailability (seconds) 120 ✎

Service intervals 12:30-13:30 ✎

Switch automatically Yes ✎

Scheme https ✎

## 7.2 Customization templates

Template settings are needed to adjust SpareSync optimally depending on the speed of your Internet connection, as well as the desired system behavior in different situations. Select the desired template from the dropdown list and click "Apply." After that the corresponding settings will be changed. The name of the template used will not be saved, and the dropdown list will return to "Not Selected" status. The new values for each of the selected templates are listed in the following tables. When applying the selected template, the current settings are deleted.

### 7.2.1 Network template

Name of the setting	Slow network	"Ordinary" network	Fast network
---------------------	--------------	--------------------	--------------

Block size of the file in the case of partial update (bytes)	65536	65536	65536
The maximum number of allowed connections to the server	1	3	3
Delay before sending changes (seconds)	5	3	3
Use compression	+	+	-
The maximum size of the transferred replicas	512	2048	4096
Check interval for the remote server (seconds)	10	5	5
Pauses for the iterative synchronization of the database (seconds)	20	5	5

### 7.2.2 System template

Name of the setting	Reduced attention mode	Recommended mode	Fast response mode
Switch automatically	+	+	+
Allowable response time of the managed system (seconds)	600	120	60
Switch to the operable state after the elimination of configuration errors	-	-	+
Switch when the managed system is not available, but the connection is active	-	+	+
Make a switch if the remote server has been stopped	-	-	+
Recovery period after the unavailability of external resources (seconds)	120	60	30
Consider database connection errors as fatal	+	+	-
Frequency for checking the availability (seconds)	60	60	30

## 7.3 Available operations

### 7.3.1 "Monitoring" tab

1. **Mark checked.** This button is displayed next to the date for the last shutdown of the SpareSync system and is used to indicate that the administrator has reviewed the situation.

### 7.3.2 "Management" tab

1. **Turn off/turn on SpareSync.**
2. **Switch to primary/secondary server.** To start the process of switching to the primary/secondary server (see Section 10).
3. **Show Primary/Secondary.** The administrative interface of the main/secondary server will open in the current tab.
4. **Restart SpareSync.**
5. **Install scripts for database.** Scripts should be installed in the following cases:
  - the first time SpareSync starts;
  - if you change the database structure;



- in case of errors preventing further synchronization.
- 6. **Fix synchronization state.** Enabling SpareSync after turning off due synchronization errors can trigger the process of reinitialization. If you are sure that the data in the databases in the primary and secondary servers are identical, then you can set the correct status of the synchronization without reinitialization. This operation must be performed before enabling SpareSync. It should be noted that in case of different data, it may not be synchronized or lost.
- 7. **Set reinitialization flag.**
- 8. **Run reinitialization through backup.** For details, see Section 11.2 Database Synchronization.

### 7.3.3 "Configuration" tab

- 9. **Update test DNS-record.** This button is used to check that the DNS-server is configured correctly. When you click it, test DNS-records will be added and deleted.
- 10. **Send test message.** To validate the mail settings, send a test message.

## 8 SpareSync States

SpareSync can have the following states:

State	Description
Unknown	This only makes sense in the context of the remote server's state. This status is displayed when the state of the remote server is unknown
Stopped	The remote server was shut down properly. If the primary server is properly shut down, the secondary server will not attempt to switch over, because in this case, most likely, there is a planned work with the server (this behavior can be changed via the setting "Make a switch if the remote server has been stopped")
Turned off	SpareSync works but takes no action for data synchronization and switching of the Managed system. This status can occur in case of manual turnoff or errors in the operation that led to the inability to continue the work
Switched	SpareSync made a switchover to the secondary server
Configuration error	Critical error occurred during SpareSync operation.
Inactive	The remote server is unavailable, but before it was in working condition. When connection with remote server will be restored, it will switch to working mode
Working	SpareSync works normally
Working with errors	There are some non-critical errors in the SpareSync system
Switching to secondary	Switching to the secondary server is in progress
Switching to primary	Switching to the primary server is in progress



## 8.1 Reasons for error conditions

SpareSync can report error conditions in the following cases:

1. The primary and secondary servers have identical roles;
2. The primary and secondary servers have different versions;
3. Time on the primary and secondary servers is very different (the adjustable parameter is 30 seconds by default);
4. Time zones are different on the primary and secondary servers;
5. The domain name of the Managed system does not point to the primary server or the secondary server;
6. Database synchronization errors;
7. File storage synchronization errors.

## 9 Message Delivering

SpareSync sends informational messages and notifications of problems. Mailing delays and frequency can be configured. Messages can be sent by the primary server, secondary server, or by both servers if there is a situation when both servers are involved; for example, communication between SpareSync servers is lost, while the systems themselves operate. In this case, both servers will inform about the loss of communication.

SpareSync can send the following messages (delay and default frequency are specified):

Message code	Description	Delay (seconds)	Frequency (seconds)
MissingConnection	Lost contact with remote server	60	28800 (8h)
FileSyncProblemWarn	Not critical error occurred during files synchronization	60	14400 (4h)
FileSyncProlemFatal	Fatal error occurred during files synchronization	10	86400 (24h)
TurnedOff	SpareSync turned off	1	-
TurnedOn	SpareSync turned on	1	-
ConfigurationError	Critical error occurred during SpareSync operation	1	43200 (12h)
MainAppInvisible	Managed system is not available	120	86400 (24h)
MainAppVisible	Managed system became available	1	-
SwitchedSuccessfully	SpareSync successfully switched managed system	1	-
SwitchedFailed	SpareSync was unable to switch managed system	0	-

DbSyncProblemWarn	Not critical error occurred during database synchronization	60	14400 (4h)
DbSyncProblemFatal	Fatal error occurred during database synchronization	10	86400 (24h)
DbSyncReInitRequired	Database reinitialization is required.	1	-
SwitchOnMainAppUnavailable	Managed system is not available on the primary server, but there is a connection between SpareSync servers. Message is sent before switching to the secondary.	1	-
OtherStoppedNotify	Remote SpareSync was shut down. Switching operation will not be performed.	60	3600 (1h)
HttpServerNotStarted	Error while starting SpareSync. The system is operational, but the administrative interface is unavailable.	0	86400 (24h)
LinkServerNotStarted	An error occurred while starting the communication module between servers. The correct operation of the system is not possible.	0	86400 (24h)
ExternalResourcesInvisible	External resources are not available.	60	43200 (12h)

If you want to change the delay before sending a message or mailing frequency, you must set the "Settings for the period of sending/resending " in the administrative interface. Default values will be used, if message code is not configured in settings.

Example of records in the settings: `MainAppInvisible:60:86400`

This means that a message will be sent in case of Managed system’s unavailability within 60 seconds (if the Managed system will become available, the message will not be sent). This message will be repeated once a day.

## 10 Switching

### 10.1 Automatic Switching

#### 10.1.1 Automatic Switching Criteria

In case of the Managed system’s inaccessibility from the secondary server, SpareSync will verify the following conditions from the secondary server:



1. Is there a connection with SpareSync on the primary server;
2. Is SpareSync in working condition;
3. Is "switch automatically" mode enabled in the settings;
4. Is the current time is the servicing interval (can be set in settings);
5. Are external resources available;
6. Is the period of unavailability for the Managed system greater than that specified in the settings.

These conditions are required in order to eliminate maintenance works and the situation where connection to the Internet is lost on the secondary server.

If it turns out after checks that the primary server has suddenly become unavailable for a long period of time, emergency failover will be performed.

If the primary server becomes available, it will try to execute operations to disable the Managed system to avoid the parallel work of both systems.

If the primary server has been disabled manually using the OS (and the primary server notified the secondary one of this), switching will not occur, as this is considered to be an ordinary situation. In this case, you should perform a manual switch in advance if long-term unavailability of the primary server is planned. This behavior can be changed in the settings.

Additionally, SpareSync's behavior can also be set if communication between servers is available, but the Managed system is not. By default, switching to the secondary server will occur, but the behavior is configured by setting and can be changed. When the Managed system is stopped, the app\_offline.htm file shall be added to the directory where it is contained (thereafter, when the Managed system is started the file is deleted).

### 10.1.2 Automatic switching from the secondary server to the primary one

To switch from the secondary server to the primary one you should:

1. Press the related button in the SpareSync interface ("Switch to primary server");
2. In the case of a switching error, correct problems and repeat the operation.

### 10.1.3 The procedure performed by the system for automatic switching from the secondary server to the primary one

1. Check that the application on the primary server is stopped (can be started if there has already been an attempt to restore, or switching occurs without connection with the primary server);
2. Create a database backup on the primary server (if the related setting is configured);
3. Stop the Managed system and service on the secondary server;
4. Reverse synchronization of the database and files;
5. DNS switching;
6. Start the Managed system and service on the primary server.

#### 10.1.4 Actions to be taken in case of failure to switch to the primary server and temporary restoration of the secondary server's operation

If the automatic switching attempt from the secondary server to the primary one is not successful and temporary restoration of the secondary server operation is required, one should cancel the actions performed by SpareSync. The list of actions which SpareSync has managed to perform will be specified in the administrative interface.

Actions to restore the operation may include the following points:

1. Change the DNS-records of the Managed system to the secondary server;
2. Activation of the Managed system service;
3. Activation of the Managed system (the app\_offline.htm file should be deleted).

## 11 Synchronization

### 11.1 Synchronization of Files

SpareSync synchronizes files between the primary and secondary servers, upon which the following conditions are met:

1. Changes in the primary server are copied to the secondary server after a small delay (can be changed in the settings). If a different file system from NTFS is used, it is recommended to disable this feature, because it will create a large load on the operating system;
2. Periodically (can be changed in the settings), both the primary and secondary servers run file analyses, unnecessary files in the secondary server are removed, and different files are copied to the secondary server;
3. When copying files, file attributes, creation time, and file changes will be taken into account (a difference in them can lead to file updating);
4. Changes in the secondary server are not taken into account and will be cancelled by restoring the files from the primary server (this condition is true only in the normal operation of SpareSync);
5. The files are copied entirely;
6. In the case of a limited channel between the servers, it is possible to enable data compression during their transmission. The case of a wider channel or poorly compressible data can slow synchronization;
7. In the case of switching from the secondary server to the primary one single synchronization occurs (changes occurring during or after synchronization are not taken into account);
8. Multiple folders can be synchronized simultaneously;

9. In the case of differences in the structure of directories of the primary and secondary servers, you should specify folders for synchronization individually for each server using the "Save only in the primary/secondary server" flag. Folders will be compared in related order.

**When synchronizing files, it is possible (enabled by default; can be disabled in settings) to save files that have been deleted or changed in separate place.** These files are saved on another server (i.e. if the sync goes from the primary server to the secondary one when deleting files in the primary server, this file will be saved in the secondary server). For each synchronized folder a special *.deleted.* subfolder will be created. Deleted and modified files will be moved into it while preserving the original structure. Example: if when synchronizing folder A, the file was on the following path: A \ B \ file.txt, then it will be moved to the folder *.deleted* \ A \ B \ file.txt. If this folder already contains a file with the same name, the old file will be renamed, i.e. both versions will be saved. By default, files older than 7 days will be deleted automatically (the number of days can be changed in the settings).

You should not consider this opportunity as a tool for storing all file versions. For this, it is better to make periodic backup copies of files. This feature is useful to prevent accidental deletion of needed files, or to protect them against damages in the event of disk errors (for example, an unexpected server power cut can corrupt the file system and lead to a loss of the file contents).

It should be noted that in the case of an active change or deletion of files, the folder can be large enough, respectively, that enough space on the disc is required or this feature should be disabled. Also, if the Managed system requires a clear and correct file structure, the presence of an additional subfolder may break your application. In this case it is recommended to disable this feature.

## 11.2 Database Synchronization

When you first set up the database, you should install special scripts for the database which will provide ability for database replication to the secondary server (can be performed in the administrative interface). After that, all changes in the database of the primary server will be transferred to the secondary server with a slight delay (this can be changed in settings).

To be able to install scripts and further correct synchronization, the user of the database to be used when working with SpareSync should have *db\_owner* rights to this database.

With default setting, as well as in case of the inability to replicate changes, reinitialization occurs, which means the complete data is copied from the primary server to the secondary one. Also, reverse reinitialization occurs in the case of a failover to the secondary server and the following switching back to the primary one.

In the case of unforeseen changes in the database of the secondary server, one can manually set the reinitialization flag. This flag can be set in the administrative interface.



If adding or deleting tables, one should first disable SpareSync, then make the necessary changes and click on "Install Scripts for the Database." After enabling SpareSync, reinitialization will begin.

By default, in the case of some synchronization errors, reinitialization will be started. When you disable the "Start Reinitialization in Case of Error" settings when an error occurs, SpareSync will be turned off. Since reinitialization can take a long time, it can be done later in manual mode, when the system load is minor. It should be noted that the synchronization will not occur prior to reinitialization.

During database synchronization, errors may occur due to an incorrect synchronization status. In this case, you must reset the initial synchronization. To do this, you should install the scripts for the database by pressing the appropriate button.

Instead of reinitialization, in some cases it may be faster to perform reinitialization from a backup copy. SpareSync must be in off mode during reinitialization from a backup copy. This mode includes:

1. Database Backup creation on the primary server;
2. Copying the given backup copy to the secondary server;
3. Restoring the backup copy on the secondary server (the current database will be deleted);
4. Changes in the restored database to ensure a consistent state.

Reinitialization from backup is also possible when on the primary or secondary servers (or on both) the Managed system and database are located on different physical servers. In this case you should to specify the path for the backup copy.

**Example:**

For a Managed system located on the primary server, the database is located on the same server. For a Managed system located on the secondary server, the database is located on another server. In this case, one should set a corresponding flag and specify the path for the backup copy on the database server, as well as the path by which this backup copy will be available on the secondary server.

### 11.3 Specific Features of Reinitialization from the Backup Copy

To carry out correct reinitialization, the user should have enough rights to back up the database on the primary server and rights to restore on the secondary server. In this regard, it makes sense to create a separate user with sufficient privileges (users of both servers should have the dbcreator server role and the db\_owner role for the database), and change the connection string to the database to use this user in the settings of the administrative interface.

It is allowed to create a user with sysadmin privileges. If this is not possible, you should bear in mind the following:

1. Due to the implementation feature of SQL Server, users of different servers, even if they have the same username, have different internal identifiers that will lead to inaccessibility of the database for this user after recovery. It is therefore necessary to create a user on the secondary server using the following script specifying the SID parameter:

- 1.1 Create a user and run the script on the primary server

```
SELECT sid FROM sys.server_principals WHERE name='loginname'
```

- 1.2 Create a user on the secondary server using the script

```
CREATE LOGIN loginname WITH PASSWORD = 'loginpassword', SID =  
sid_from_primary_server
```

The username and the password in the script are given as examples.

2. Users of both servers should have the dbcreator server role and the db\_owner role for the database.