



## DB SERVER APPLICATION NOTE

### EVS Database Mirroring

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## INTRODUCTION

This application note describes the EVS redundant Database server. How it works and how to install it.

## MIRRORING PRINCIPLES

### SQL 2008/2016 MIRRORING

Database mirroring is a SQL Server 2008/2016 technology available for increasing database availability.

In database mirroring, an originating SQL Server 2008/2016 instance continuously sends a database's transaction log records to a copy of the database on another standby SQL Server instance. The originating database and server have the role of *principal*, and the receiving database and server have the role of *mirror*. The principal and mirror servers must be separate instances of SQL Server 2008/2016.

In addition to the two partner servers (principal and mirror) a database mirroring session may have an optional third server, called the *witness*. The witness server's role is to enable automatic failover. When database mirroring is used for high availability, if a principal server suddenly fails, if the mirror server has confirmation from the witness, it can automatically take on the role of principal and make its database available within a few seconds.

The principal and mirror servers must run SQL Server 2008/2016 Standard Edition. The witness server can run SQL Server 2008/2016 Express Edition. Both partners and witness must run the same SQL Server version.

## VIRTUAL IP ADDRESS

SQL Server 2008/2016 doesn't manage the clients redirection in case of failover. We have then developed a windows service that links an IP Address to the mirrored database. This service is called EVSDBIP.

EVSDBIP is installed on the Principal and mirror servers. It regularly queries the SQL server to check the mirroring status and the mirrored database state. If EVSDBIP runs on the principal server, it adds the virtual IP Address to the local TCP/IP stack. If EVSDBIP runs on the mirror server, it checks that the virtual IP Address is not configured on the server and eventually removes this IP Address from the local TCP/IP stack.

In case of failover, the server roles (principal and mirror) are switched. The Virtual IP is removed from the "old" principal server (if it is still available) and added to the "New" principal server.

EVSDBIP can manage multiple Database/IP links on the same servers. This means that multiple databases can be mirrored on the same couple of server, each database with its own virtual IP address.

## EVS DATABASE MONITORING

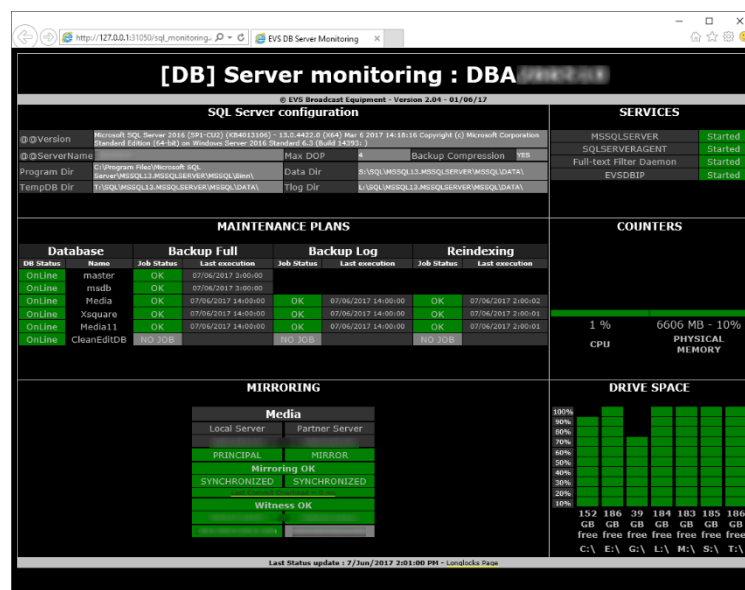
The tool “EVS Database Monitoring” is not recommended anymore. Removed on SQLToolkit 2016. Kept in SQLToolkit installed on SQLServer2008, this tool is limited to display 4 databases maximum.



## EVS DATABASE WEB MONITORING

The EVSDBIP service doesn't provide user interface to verify mirroring configuration and availability.

This web page verifies the EVSDBIP status and the mirroring state on each SQL server and displays the result in an “easy to use” interface. It also displays SQL server configuration, Services status, Maintenance Plans, CPU & Memory and Drive free spaces.



# MIRRORING INSTALLATION

## INTRODUCTION

Database redundancy installation is divided into several steps :

- SQL Server 2008/2016 installation
- EVSDBIP installation and configuration
- EVS Database Monitoring installation and configuration
- Database Mirroring initialisation

## SQL SERVER 2008/2016

SQL Server 2008/2016 must be installed on

- the principal server (where the database will be used)
- the mirrored server (the backup server)
- the witness computer (workstation used for automatic failover)

SQL Server 2008/2016 Standard Edition must be installed on principal and mirror servers. SQL Server 2008/2016 Express Edition can be installed on the Witness workstation.

## EVSDDBIP

EVSDDBIP must be installed on the principal AND the mirror server (not on the witness). When ordering a redundant couple of EVS DB Server, the service is installed by default.

EVSDDBIP is a windows service. It can be installed with the setup file : EvsDbIp\_X.XX.XX.XXX.exe

No special configuration is asked during the setup process.

EVSDDBIP is configured through an INI file and the setup application will ask you to configure this INI file before the end of the setup.

On Windows Server 2008 (and SQL Server 2008), EVSDDBIP is version 2.7.0. The config file is located in folder:  
C:\Program Files (x86)\EVS Broadcast Equipment\EvsDbIp

On Windows Server 2016 (and SQL Server 2016), EVSDDBIP is minimum 4.90.25. The config file is located in folder:  
C:\ProgramData\EvsDbIp\

Using the "Mirroring Setup" tool (described later in this document), the config file is automatically located and can be configured.

The options contained in the ini file are described in the following table :

Option	Description
[EVSDbIP]	General configuration category
StaticIP	IP address of the managed server (typically local IP or 127.0.0.1)
DBLogin	SQL Server Login (typically : SA). This login is used to verify mirroring state
DBPassword	Password of the SQL Server Login
Port	TCP port used to make EVSDbIP status available to client ("EVS Database Monitoring"). By default : 10555
[XYZ]	Category where is described an association "Database / IP Address" to monitor. Typically XYZ = Database name. You can create as much category as the number of database configured on your server.
VirtualIP	Virtual IP Address added to the server where the database is principal (for the XYZ category)
RefIP	Reference IP address (for the XYZ category), used to locate the network interface where the Virtual IP will be attached (don't put 127.0.0.1 for this option)
DbName	Name of the mirrored database to monitor (for the XYZ category)

The ini file can be limited to :

```
[EVSDbIP]
StaticIP=127.0.0.1
DBLogin=sa
DBPassword=evs
Port=10555
[Media]
VirtualIP=1.1.2.180
RefIP=1.1.2.178
DbName=Media
```

Restart your server to make EVSDbIP running (or manually start the EVSDbIP service or use the Mirroring Setup Tool)

EVSDbIP logs are stored in c:\EVSLogs\EvsDbIp\

## MIRRORING INITIALISATION

The database mirroring can be initialized through different applications.

- SQL Server Management Studio
- The Mirroring Setup in the DB toolbar (installed by the SQL Toolkit)



EVS Mirroring Setup has been developed to easily create a database mirroring. This tool is described later in this document.

If you want to use SQL Server Management Studio you must first prepare your SQL environment:

- Verify that your database is in “Full” recovery mode
- Backup the database
- Backup the transaction Log of the database
- Restore the database on the mirror server with the “norecovery” option
- Restore the transaction Log on the mirror with the “norecovery” option
- Create a database on the witness server with the same name than the one you want to mirror (for example : IpRemote)
- In the SQL Server Management Studio, right-click on the database you want to mirror and choose “Tasks” -> “Mirror...” and complete the configuration through this wizard.

## PERFORMANCE CONSIDERATIONS

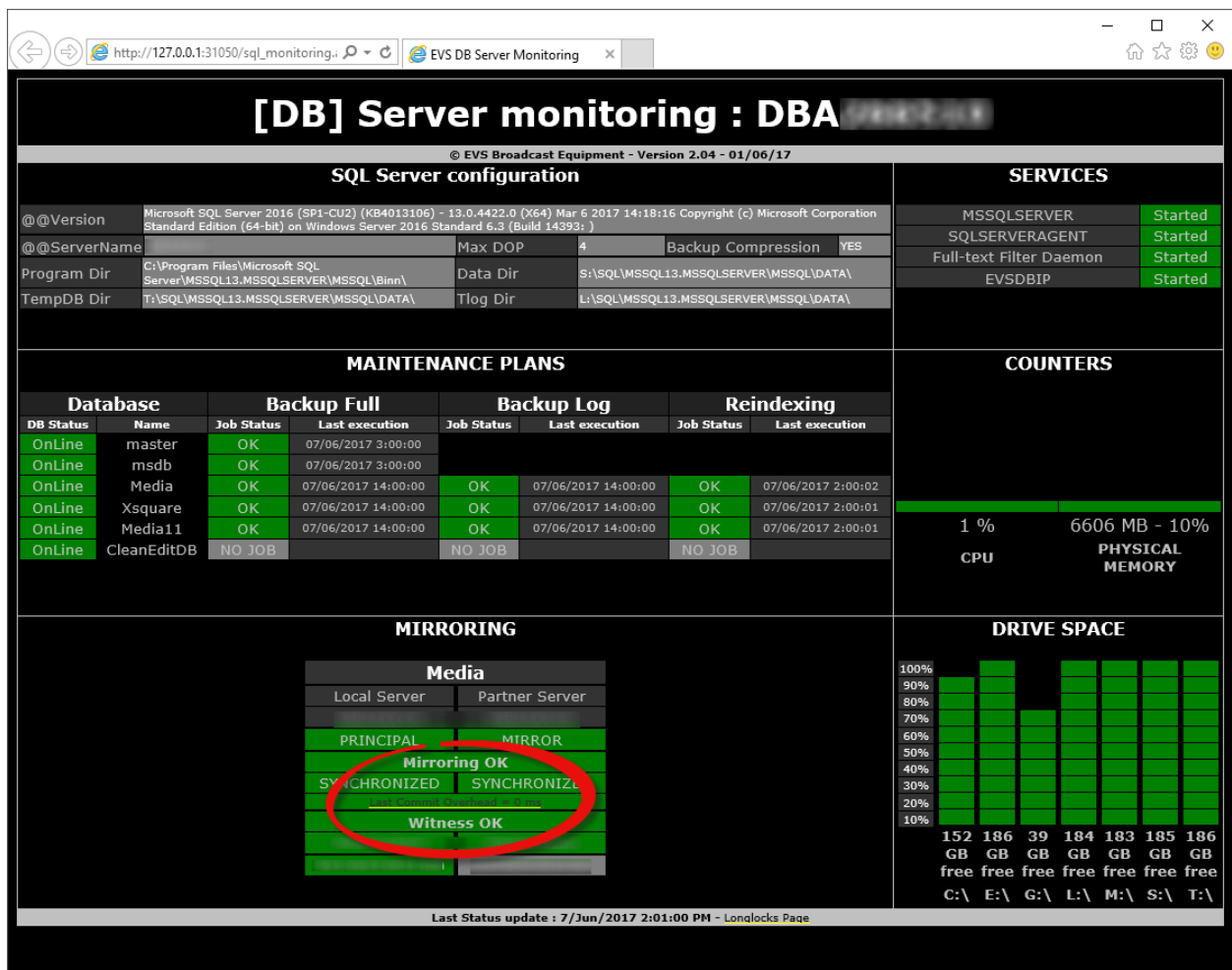
You may experience mirror slowness on heavily loaded database server.

Following our experience the slowness mainly comes from the “mirror commit overhead”, the number of milliseconds added to each transaction by the synchronous mirroring process.

If you think you experience this kind of slowness it's important to verify the effective mirror commit overhead you have on your database servers.

How to verify the “mirror commit overhead” :

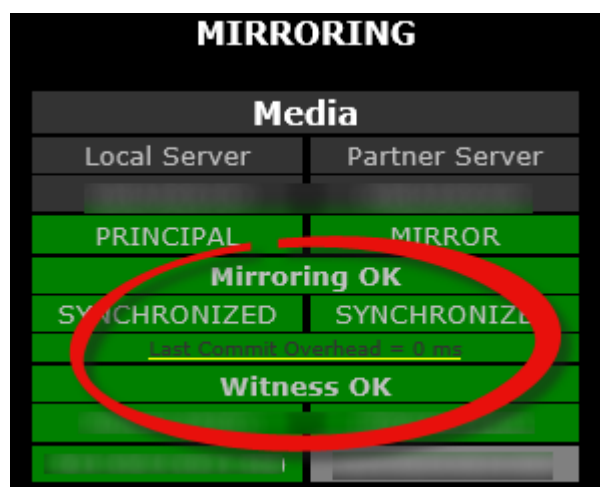
- Start the Web Monitoring page:



The Last commit overhead value is displayed by database couple.



- By clicking the “Last commit overhead = x ms” hyperlink, another web page will open:



- And displays Commit overhead history:

SQL Mirroring Commit Overhead :  
DBA [redacted] - Media

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DBName	Role	Mirroring State	witness status	log gen rate	unsent log	send rate	unrestored log	recovery rate	tran delay	tran per sec	avg delay	local time
Media	1	In Sync	OK	0	0	0	0	0	0	0	0	7/Jun/2017 2:37:41 PM
Media	1	In Sync	OK	0	0	0	0	0	0	0	0	7/Jun/2017 2:37:03 PM
Media	1	In Sync	OK	0	0	0	0	0	0	0	0	7/Jun/2017 2:36:40 PM
Media	1	In Sync	OK	0	0	0	0	0	0	0	0	7/Jun/2017 2:36:01 PM
Media	1	In Sync	OK	0	0	0	0	0	0	0	0	7/Jun/2017 2:35:38 PM
Media	1	In Sync	OK	0	0	0	0	0	0	0	0	7/Jun/2017 2:35:00 PM
Media	1	In Sync	OK	0	0	0	0	0	0	0	0	7/Jun/2017 2:34:37 PM
Media	1	In Sync	OK	0	0	0	0	0	0	0	0	7/Jun/2017 2:33:58 PM
Media	1	In Sync	OK	0	0	0	0	0	0	0	0	7/Jun/2017 2:33:35 PM
Media	1	In Sync	OK	0	0	0	0	0	0	0	0	7/Jun/2017 2:32:56 PM
Media	1	In Sync	OK	0	0	0	0	0	0	0	0	7/Jun/2017 2:32:33 PM

The mirror commit overhead should always stay below 10-20ms and have an average of 3 or 4 ms maximum.

If you see that your mirror commit overhead most of the time above 30 ms you may consider to upgrade the backup server.

This mirror commit overhead is often caused by disks bottlenecks on the backup server.

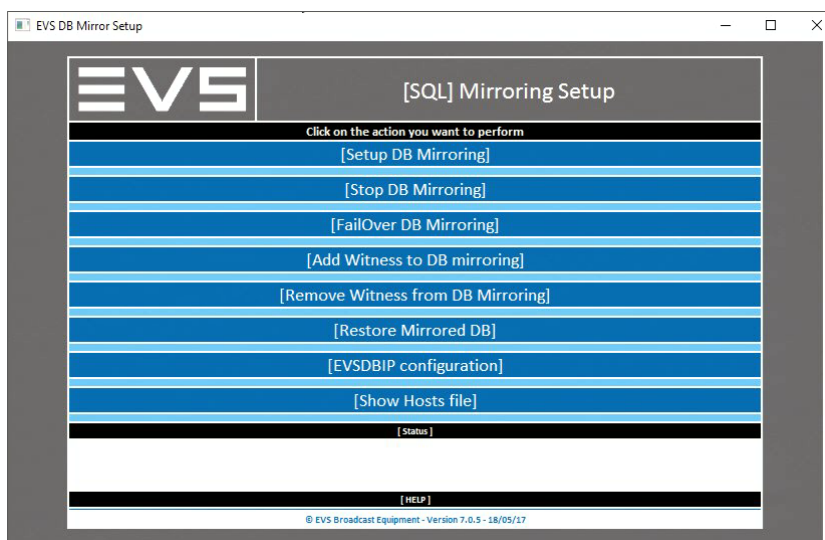
If you are experiencing this kind of issue contact the EVS support to check if an upgrade is possible.

## EVS DB MIRRORING SETUP TOOL

The EVS-DB-Mirroring-Setup is a small HTA file (HTML Application).

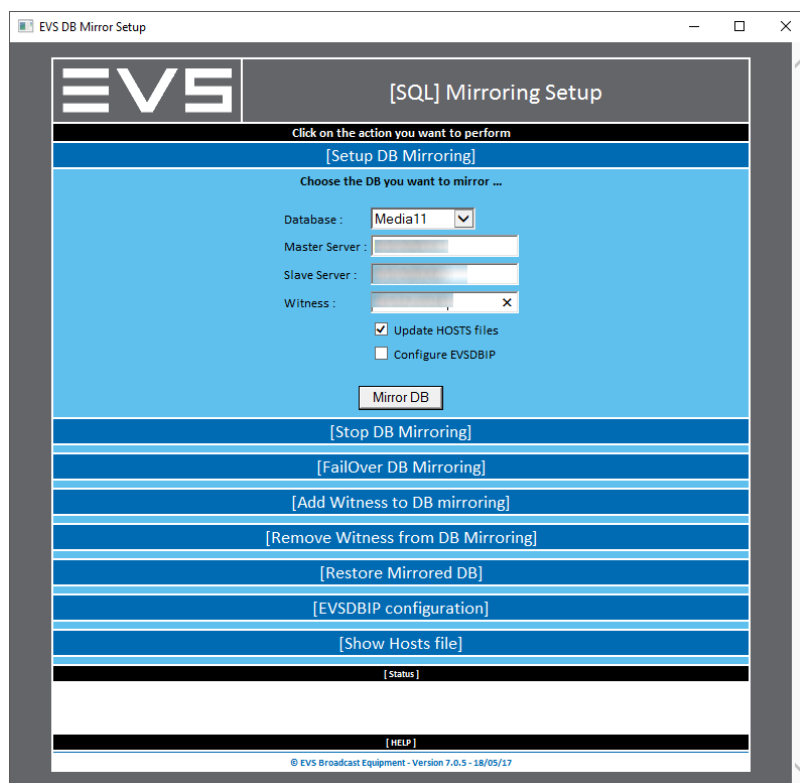
It has been developed to easily perform administrative tasks related to DB mirroring on SQL Server 2008/2016. The tool should be used locally on the SQL server.

The available administrative tasks are displayed in the following screenshot :



- [Setup DB Mirroring]  
Initiate database mirroring between two SQL 2008/2016 servers and configure the witness workstation
- [Stop DB Mirroring]  
Stop Database mirroring
- [Failover DB Mirroring]  
Initiate a manual failover. Mirroring roles will be switched between the two SQL servers.
- [Add Witness to DB Mirroring]  
Configures a witness on a mirrored database and enables the automatic failover.
- [Remove Witness from DB Mirroring]  
Removes the witness in the current mirroring configuration and disable automatic failover.
- [Restore Mirrored DB]  
Restores a database locked by a mirroring process, from a backup file.
- [EVSDbIP configuration]  
Displays the EvsDbIp.ini configuration, eases the virtual IP address addition and restarts the service.
- [Show Hosts file]  
Displays the Hosts file content, eases the edition in administrator mode (Windows 2016).

## [SETUP DB MIRRORING]



- Click on [Setup DB Mirroring] to display the tool options
- Choose the database to mirror in the local database list
- Configure the first SQL Server name (typically local server name)
- Configure the second SQL Server name (mirror)
- Configure the Witness server name (SQL Express 2008/2016 must be already installed)
- Click on "Mirror DB" to start the mirroring.

The tool executes the following steps :

- Check the DB recovery model and configure it to "Full"
- Create a DB Full backup on the principal server
- Create a transaction log backup on the principal server
- Restore the Full backup on the mirror server (with norecovery)
- Restore the Transaction Log backup on the mirror server (with norecovery)
- Create mirroring endpoints on principal, mirror and witness servers
- Start the mirroring process
- Add records to Hosts file on DB Servers and Witness

The witness field is not mandatory. If no witness is configured at this step, mirroring will be installed without automatic failover.

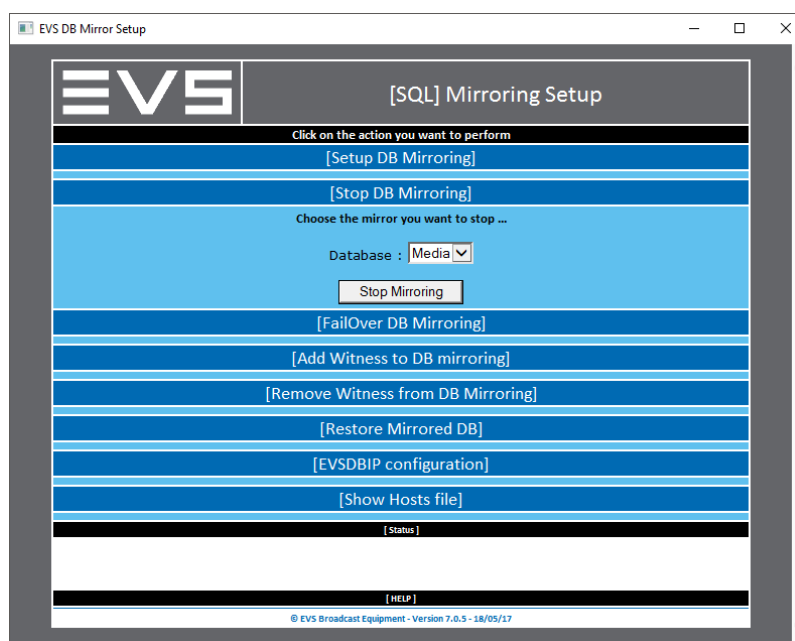
## [STOP DB MIRRORING]

The HTA can also be used to stop the mirroring applied to a local database.

The tool will list the mirrored databases on your server.

You will be able to choose a mirrored database and click on “stop mirroring”.

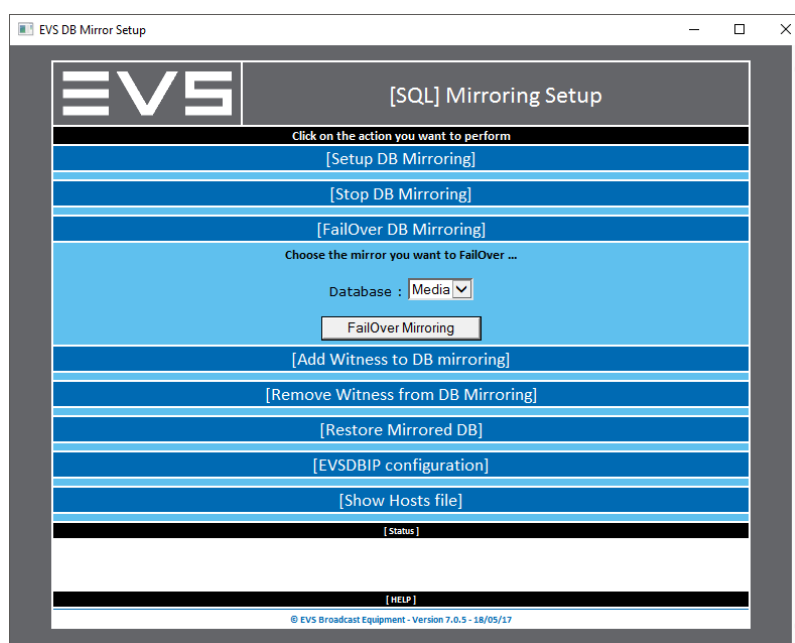
This action will definitely stop the data replication process and will remove the virtual IP managed by EVSDBIP



## [FAILOVER DB MIRRORING]

This option can be used to manually switch the server roles.

The principal server will become the target of the mirroring (the mirror) and the mirror will become the principal server. EVSDBIP will then move the virtual IP address from the first server to the “new” principal server. The clients will be disconnected from the database during 30 to 90 seconds.



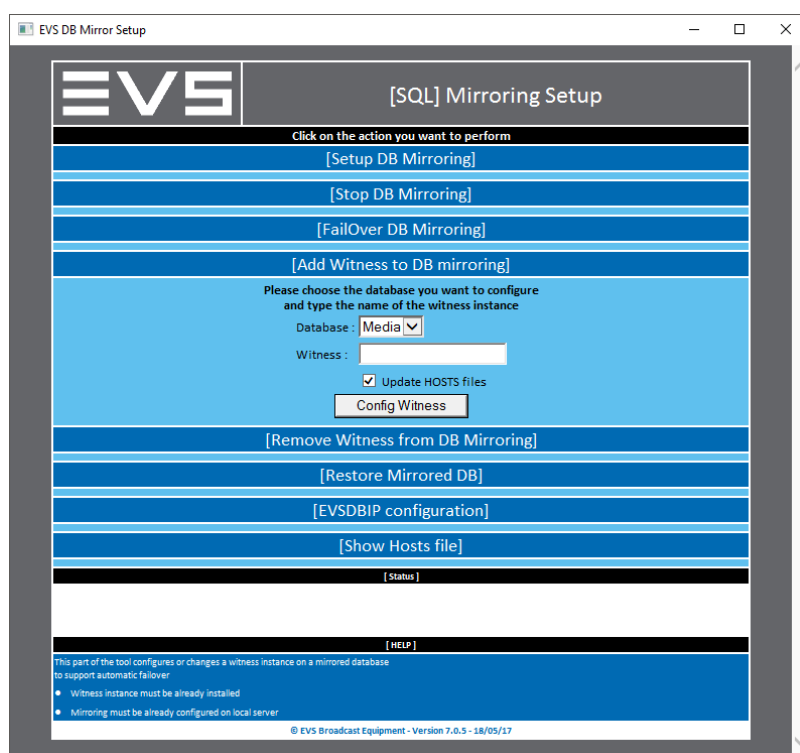
If you click on “Failover Mirroring” you will be asked to confirm the operation.

## [ADD WITNESS TO DB MIRRORING]

This option configures a witness on a mirrored database and enables the automatic failover.

The witness instance must be already installed .

If a witness is already configured in the mirroring configuration, remove it first before adding the new one.



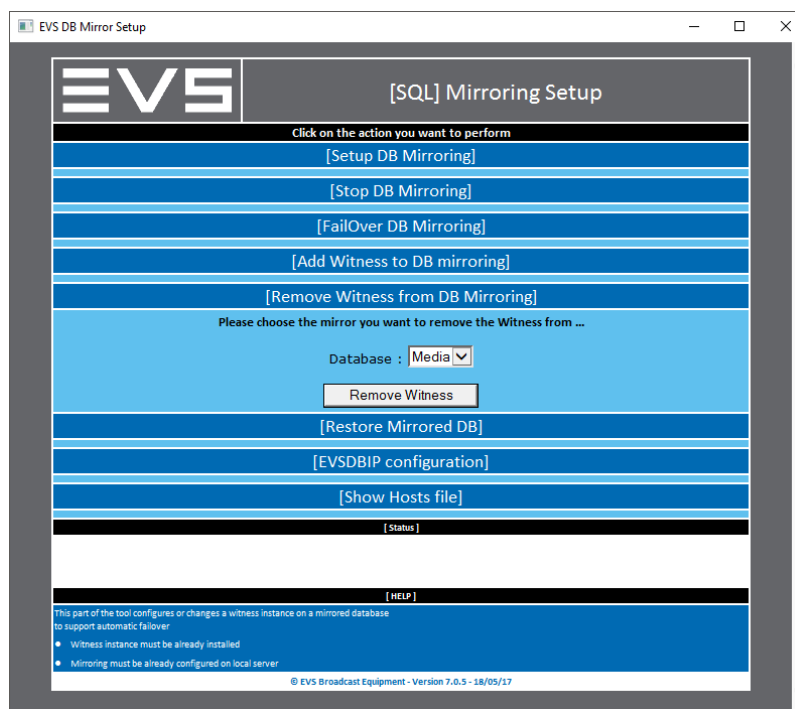
Hosts files on DB Servers and Witness will be updated (if the box is ticked). Its always recommended to double ccheck the Hosts files on the 3 members.

Adding a witness is an instant action without any impact on DB Server performances.

## [REMOVE WITNESS FROM DB MIRRORING]

This option removes the witness configuration on the select mirrored DB.

This will disable automatic failover but the mirroring will persist (DB still replicated)



This option can be used in the following cases :

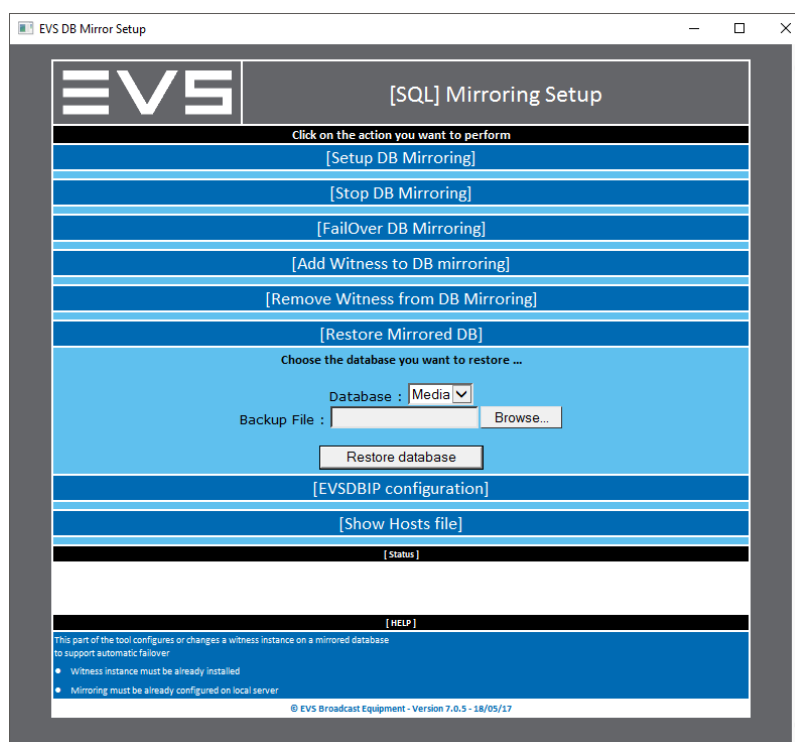
- You know that your Witness will be removed from the network and you have no other Witness to configure
- You know that your Witness and your backup DB server will be restarted at the same time but you want to keep your DB (and virtual IP) available on your main DB Server.
- You dismantle the EVS network at the end of an event and you don't know if the mirroring will be used in the next event (typically for rental servers). It is recommended to remove the witness configuration to avoid database unavailability if you start just one DB Server (without the other and the witness).

## [RESTORE A MIRRORED DB]

A mirrored database cannot be restored as a normal database. The mirroring must be first removed to be able to restore the database.

This part of the tool execute several actions to restore a mirrored DB :

- Stop mirroring off the configured database
- Take the first full database backup located in the configured backup file and restore it
- Check the DB recovery model and configure it to "Full"
- Create a DB Full backup on the principal server
- Create a transaction log backup on the principal server
- Restore the Full backup on the mirror server (with norecovery)
- Restore the Transaction Log backup on the mirror server (with norecovery)
- Create mirroring endpoints on principal, mirror and witness servers
- Restart the mirroring process



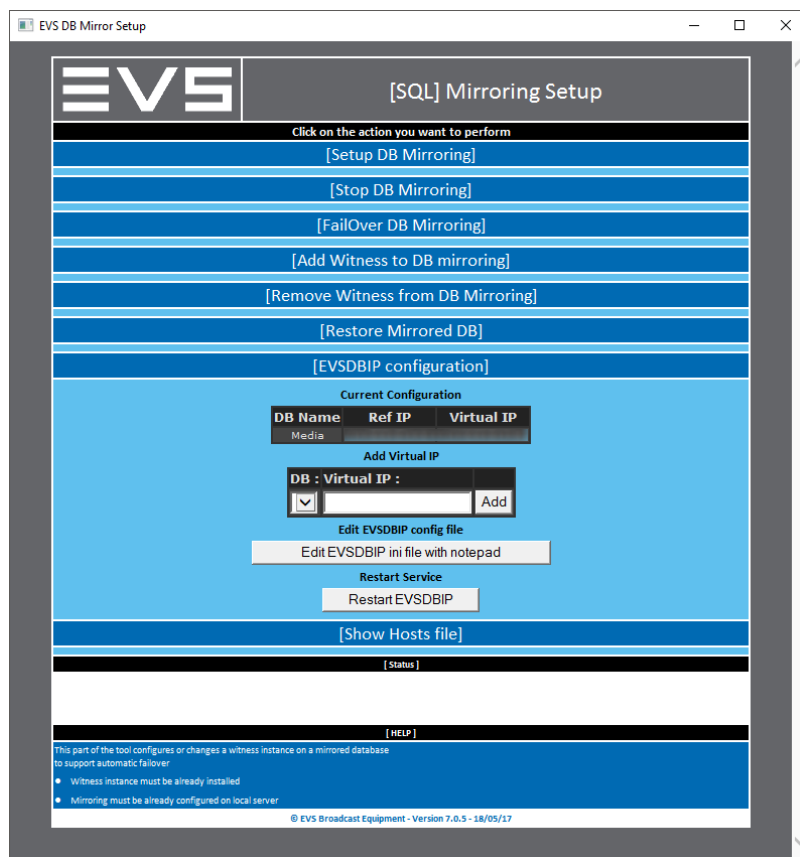
This operation can take a few minutes.

The manual process can be an alternative method: Stopping a mirror, restoring using the "Maintenance Tool" and then recreating the mirror.



## [EVSDDBIP CONFIGURATION]

This tool eases EVSDDBIP configuration.



When the EVSDDBIP is already configured with local server properties (DB names and IP addresses), the tool will display the database(s) name(s) and their virtual IP addresses.

Another virtual IP address can be quickly added to the config file.

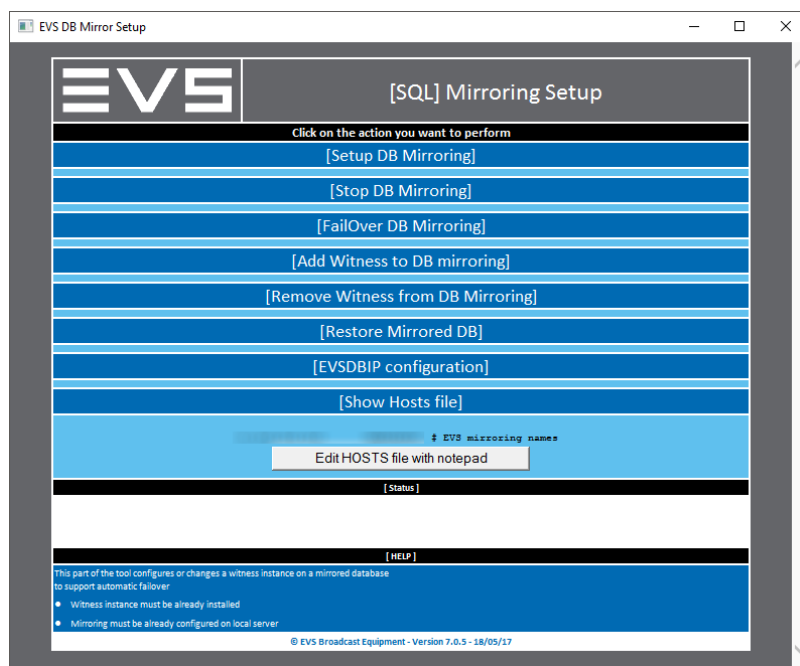
Or the config file can be opened with notepad.exe for manual edition or check.

Once modified, the EVSDDBIP must be restarted, the button 'Restart EVSDDBIP' will do it.

**PAY ATTENTION :** the already defined virtual IP addresses may not respond during several seconds during service restart !!!!

## [SHOW HOSTS FILE]

This tool displays local HOSTS file content and offers a quick edition button.



The content of the Hosts file is displayed automatically.

The button “Edit HOSTS file with notepad” will start a notepad in admin mode (Windows 2016).

## HOW TO INSTALL OR CHANGE THE WITNESS INSTANCE ?

The Witness instance is important to activate the SQL automatic failover capabilities.

If you have two database servers without any witness or if you want to change the witness server for performance or availability reason, we provide you two ways to configure the witness (Assisted or Manual).

**You should find a SQL Express on each IPDirector Station.  
This SQL Express is ready to host the witness role without other setup.**

If no SQL 2008/2016 is installed on the computer you want to use as witness, you can perform one of the following procedures

### INSTALL SQL EXPRESS 2008 (WINDOWS 7 ONLY) ON THE WITNESS WITH THE IP DIRECTOR FULL INSTALLER (HTA INSTALL)

This is the easiest way to have a SQL 2008 express on a Windows 7 station, ready to be used as witness.

- Retrieve the IP Director full installer from the IP Director release folder (HTA Install) or on the EVS Website Download Area.
- Launch the HTA Install and choose "New install – install IP Director on a new workstation"
- The HTA will install all prerequisites and SQL 2008 express with the needed configuration
- At the end of the installation, you can optionally uninstall the IP Director Remote Installer.
- Your workstation is now ready to be used as witness.

### INSTALL SQL EXPRESS 2016 (WINDOWS 10 ONLY) ON THE WITNESS WITH EVS SQL2016 EXPRESS SP1 ADVANCED SETUP

This is the easiest way to have a SQL 2016 express on a Windows 10 station, ready to be used as witness.

- Retrieve the EVS\_SQL2016\_EXPR\_SP1\_ADV\_Setup\_X.X.X.iso on the EVS Website Download Area.
- Launch the ISO file, a virtual DVD is mounted.
- Launch the setup and follow the instructions.  
Your workstation is now ready to be used as witness.