SQL Server 2005 Books Online (September 2007)

Quorum: How a Witness Affects Database Availability

🖊 Send Feedback

🔁 See Also

⊟ Collapse All

Database Mirroring Sessions > Synchronous Database Mirroring (High-Safety Mode) > Database Mirroring Witness >
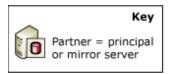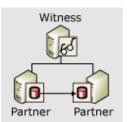
Updated: 17 July 2006

Whenever a witness is set for a database mirroring session, *quorum* is required. Quorum is a relationship that exists when two or more server instances in a database mirroring session are connected to each other. Typically, quorum involves three interconnected server instances. When a witness is set, quorum is required to make the database available. Designed for high-safety mode with automatic failover, quorum makes sure that a database is owned by only one partner at a time.

If a particular server instance becomes disconnected from a mirroring session, that instance loses quorum. If no server instances are connected, the session loses quorum and the database becomes unavailable. Three types of quorum are possible:

- A *full quorum* includes both partners and the witness.

- A *witness-to-partner quorum* consists of the witness and either partner.

- A *partner-to-partner quorum* consists of the two partners.

The following figure shows these types of quorum.

As long as the current principal server has quorum, this server owns the role of principal and continues to serve the database, unless the database owner performs a manual failover. If the principal server loses quorum, it stops serving the database. Automatic failover can occur only if the principal database has lost quorum, which guarantees that it is no longer serving the database.

A disconnected server instance saves its most recent role in the session. Typically, a disconnected server instance reconnects to the session when it restarts and regains quorum.

> **Important:**
> The witness should be set only when you intend to use high-safety mode with automatic failover. In high-performance mode, for which a witness is never required, we strongly recommend setting the WITNESS property to OFF. For information about how a witness affects database availability in a high-performance mode session, see Asynchronous Database Mirroring (High-Performance Mode).

Quorum in High-Safety Mode Sessions

In high-safety mode, quorum allows automatic failover by providing a context in which the server instances with quorum arbitrate which partner owns the role of principal. The principal server serves the database if it has quorum. If the principal server loses quorum when the synchronized mirror server and witness retain quorum, automatic failover occurs.

The quorum scenarios for high-safety mode are as follows:

- A *full quorum* that consists of both partners and the witness.

  Ordinarily, all three server instances participate in a three-way quorum, called a *full quorum*. With a full quorum, the principal and mirror servers continue to perform their respective roles (unless manual failover occurs).

- A *witness-to-partner quorum* that consists of the witness and either partner.

  If the network connection between the partners is lost because one of the partners has been lost, two cases are possible:

  - The mirror server is lost, and the principal server and witness retain quorum.

    In this case, the principal sets its database to DISCONNECTED and runs with mirroring in a SUSPENDED state. (This is referred to as *running exposed*, because the database is currently not being mirrored.) When the mirror server rejoins the session, the server regains quorum as mirror and starts resynchronizing its copy of the database.

  - The principal server is lost, and the witness and the mirror server retain quorum.

    In this case, automatic failover occurs. For more information, see Automatic Failover.

  Rarely, the network connection between failover partners is lost while both partners remain connected to the witness. In this event, two, separate witness-to–partner quorums exist, with the witness as a liaison. The witness informs the mirror server that the principal server is still connected. Therefore, automatic failover does not occur. Instead, the mirror server retains the mirror role and waits to reconnect to the principal. If the redo queue contains log records at this point, the mirror server continues to roll forward the mirror database. On reconnecting, the mirror server will resynchronize the mirror database.

- A *partner-to-partner quorum* that consists of the two partners.

  As long as the partners retain quorum, the database continues in a SYNCHRONIZED state, and manual failover remains possible. Without the witness, automatic failover is not possible; but when the witness regains quorum, the session resumes regular operation, and automatic failover is supported again.

- The session loses quorum.

If all the server instances become disconnected from each other, the session is said to have *lost quorum*. As server instances reconnect to each other, they regain quorum with each other.
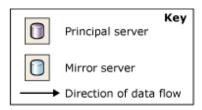
- If the principal server reconnects with either of the other server instances, the database becomes available.

- If the principal server remains disconnected, but the mirror and witness reconnect to each other, automatic failover cannot occur because data loss might occur. Therefore, the database remains unavailable, until the principal server rejoins the session.

- When all three server instances have reconnected, full quorum is regained, and the session resumes its regular operation.
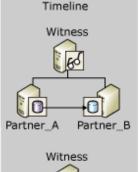

Important:

When a session has a partner-to-partner quorum, if either partner loses quorum, the session loses quorum. Therefore, if you expect the witness to remain disconnected for lots of time, we recommend that you temporarily remove the witness from the session. Removing the witness removes the requirement for quorum. Then, if the mirror server becomes disconnected, the principal server can continue to serve the database. For information about how to add or remove a witness, see Database Mirroring Witness.

How Quorum Affects Database Availability

The following illustration shows how the witness and the partners cooperate to make sure that, at given time, only one partner owns the role of principal and only the current principal server can bring its database online. Both scenarios start with full quorum, and **Partner_A** in the principal role and **Partner_B** in the mirror role.

Key

Principal server

Mirror server

→ Direction of data flow

Scenario 1

Timeline

Witness

Partner_A   Partner_B

The session has a full quorum, with Partner_A as principal server and Partner_B as mirror server.

Witness

Partner_A   Partner_B

Partner_A loses quorum, the session automatically fails over to Partner_B, which is the new principal server.

Witness

Partner_A   Partner_B

Partner_B and the witness lose quorum also, and the database goes offline.

Witness

Partner_A   Partner_B

Partner_A reconnects to the witness, and the witness tells it that it cannot bring its database online. The database is still unavailable.
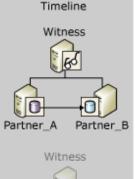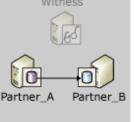
Witness

Partner_A   Partner_B

Partner_B reconnects to the session and brings the current principal database back online.

Scenario 2

Timeline

Witness

Partner_A   Partner_B

The session has a full quorum, with Partner_A as principal server and Partner_B as mirror server.
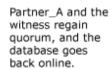
Witness

Partner_A   Partner_B

The witness loses quorum, but a partner-to-partner quorum remains. Partner_A leaves the database online.

Witness

Partner_A   Partner_B

Servers A and B lose their quorum, and the database goes offline.

Witness

Partner_A   Partner_B

Partner_A and the witness regain quorum, and the database goes back online.

Scenario 1 shows how after the original principal server (**Partner_A**) fails, the witness and mirror agree that the principal, **Partner_A**, is not available any longer and form quorum. The mirror, **Partner_B** then assumes the principal role. Automatic failover occurs, and **Partner_B**, brings its copy of the database

online. Then **Partner_B** goes down, and the database goes offline. Later, the former principal server, **Partner_A**, reconnects to the witness regaining quorum, but on communicating with the witness, **Partner_A** learns that it cannot bring its copy of the database online, because **Partner_B** now owns the principal role. When **Partner_B** rejoins the session, it brings the database back online.

In Scenario 2, the witness loses quorum, while the partners, **Partner_A** and **Partner_B**, retain quorum with each other, and the database remains online. Then the partners lose their quorum, too, and the database goes offline. Later, the principal server, **Partner_A**, reconnects to the witness regaining quorum. The witness confirms that **Partner_A** still owns the principal role, and **Partner_A** brings the database back online.

⊟ See Also

Concepts

Database Mirroring Witness
Asynchronous Database Mirroring (High-Performance Mode)
Automatic Failover
Possible Failures During Database Mirroring
Mirroring States
Manual Failover
Synchronous Database Mirroring (High-Safety Mode)

Help and Information

Getting SQL Server 2005 Assistance

⊞ Change History

Documentation Feedback

Microsoft values your feedback. To rate this topic and send feedback about this topic to the documentation team, click a rating, and then click **Send Feedback**. For assistance with support issues, refer to the technical support information included with the product.

Poor	1	2	3	4	5	Outstanding
	○	○	○	○	○	

To e-mail your feedback to Microsoft, click here: Send Feedback