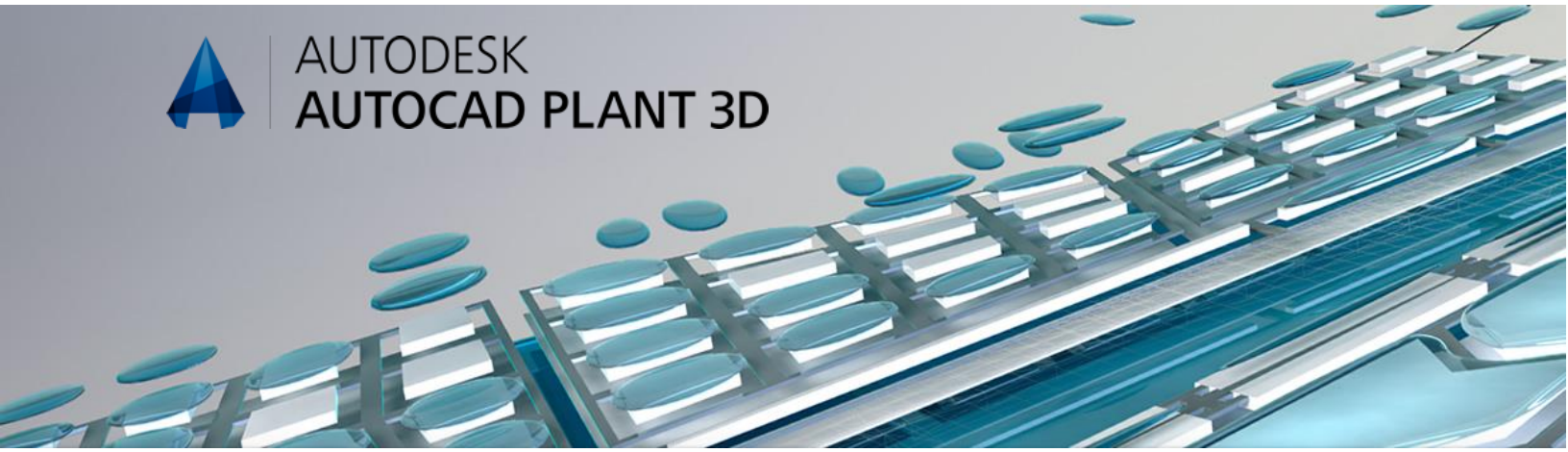




AUTODESK
AUTOCAD PLANT 3D



Understanding AutoCAD Plant 3D and P&ID Database Operations

This document outlines the fundamentals of how AutoCAD Plant 3D and P&ID 2016 communicate with the project database. The intent of this document is to help the user create a procedure for data recovery.

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AutoCAD Plant 3D and P&ID Data

AutoCAD Plant 3D and P&ID are both designed to allow users to collaborate within a central project database as well as work “off-line” on a project drawing. This means that sometimes the most current source of data may be the drawing itself as opposed to the project database. This requires constant synchronization during the editing process as well as certain unique processes during Open and Save events. We will discuss what goes on “behind the scenes” so that you can understand and develop procedures to help mitigate data loss due to network disconnections or outages.

Project Database

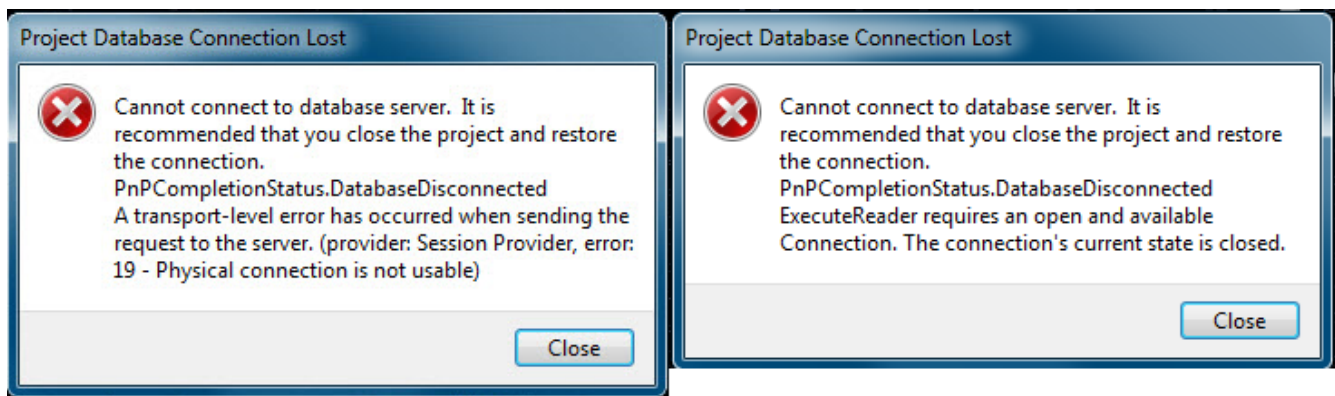
The project database can be either a set of SQLite files or a SQL database, both of which contain database tables for the project data.

*Regardless of the database type there will be an intermediate local data cache (LDC) file that is created and used – this is discussed in the next section. The only time a local data cache is not present would be if the project is stored on a **local** drive and not on a network share or mapped network drive.*

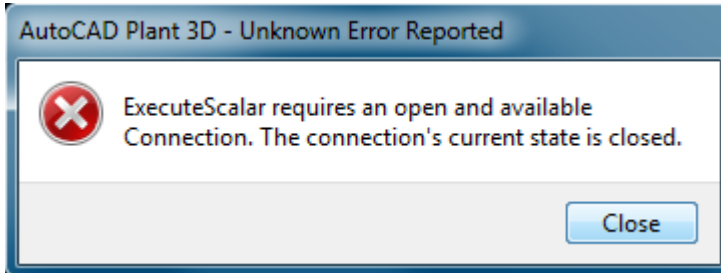
The project database is considered to be the primary source for shared asset data (line number tags, equipment tags, instrument tags, project drawings, etc.) and is updated when a user who is connected to a project creates or edits a shared tag. It is also the source for component data when opening a project drawing from within Project Manager.

Error Messages and Warnings

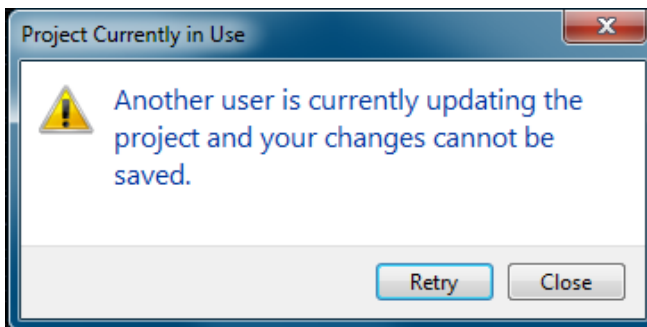
When the Plant 3D or P&ID project is opened, a connection is established with the project database. If the connection is lost subsequent to the project being opened, the user will get an error message similar to the messages shown below:



If any user working on a document in the project attempts to add a shared project asset like a line number tag while disconnected from the SQL project database they will receive an error like this:



Which may also be followed by this error message:



To restore the network connection the project must be closed and re-opened. The user should **never** work on any project drawings after receiving an error message indicating a lost connection. At this point, it is best to decide if enough work was done since the drawing was opened to either:

1. Exit the drawing and close the project, reopen the project to re-establish the SQL connection and then re-open the drawing. Changes made since the last successful save during the previous editing session will be lost.
2. Save the drawing without a SQL connection. This will attempt to save data to the drawing itself. Upon re-opening the drawing the project will recognize that the drawing had been updated offline and will ask the user whether they want to update the project with the drawing data.

The first procedure is recommended as it does not rely upon failsafe operations within the software to recover data and store it within the drawing for later recovery. If the SQL disconnection was caused by issues with the workstation itself, the failsafe operations may not succeed and the user may end up updating the project database with incomplete data from the drawing. If this occurs, it is recommended to recover the most recent backup of the drawing file prior to the disconnection from network backups.

Local Data Cache

When users are accessing the AutoCAD Plant 3D or AutoCAD P&ID projects from the network server some of the data is cached locally. This is done primarily to improve performance of the application in areas where the data is not expected to change frequently.

The local data cache (LDC) is a group of files located in:

C:\Users

The LDC is synchronized with the project database while the user is working in Plant 3D or P&ID as well as when a drawing is opened or saved (see flowcharts at the end of this document.)

When to Purge the LDC

If the LDC contains incorrect information, a complete “purge” of the files can be done by running the program *PnPLocalDataCachePurger.exe* (located in the Plant 3D installation folder). All Plant 3D sessions on the workstation should be closed (i.e. drawings closed, project closed, and application closed) before running the purger. After purging, when the project is opened and the first drawing opened, the LDC is updated with data related to that drawing in preparation for the editing session.

Purging LDC after Restoring from Backup

It is always recommended to back-up the project and its drawings. The process to restore a backed up project is very straight forward; just copy the backed up project to original location using Windows explorer. There is no extra step required if you are restoring the project on your **local** machine.

If you are restoring the project to a **network** location in the same folder as the original project, then after copying the project it is necessary to clear the LDC. This is necessary because the local data cache still has data from old / original project that might not be relevant to the restored project.

To clear LDC, you have to run the *PnPLocalDataCachePurger.exe* tool. This tool is installed on your system with the installation of either AutoCAD Plant 3D or AutoCAD P&ID to the install root folder. The default location on Windows will be:

C:\Program Files\Autodesk\AutoCAD 2016\PLNT3D\PnPLocalDataCachePurger.exe

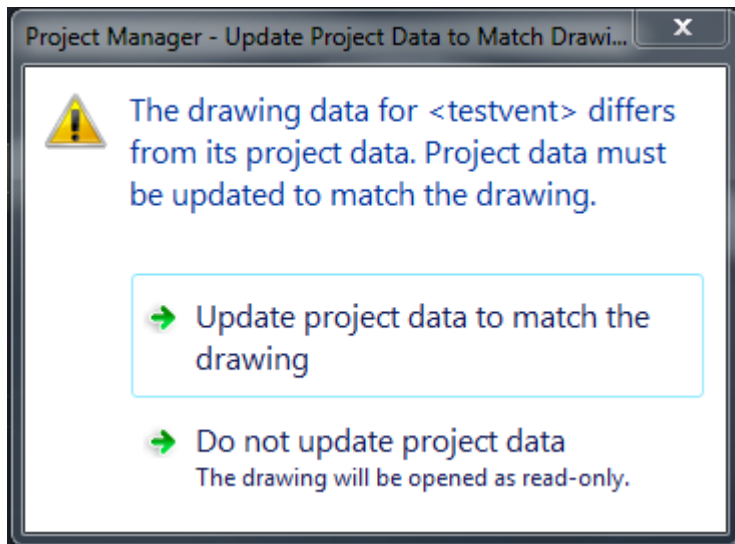
Purging the local data cache will not delete, remove, or corrupt your projects and the cache will rebuild again as soon as a particular project is opened. You can also consider running this tool when you see low disk space on your local C drive. This will purge the local cache so that you can release disk space usually used by completed projects.

After LDC has been purged opening the project and drawings may take longer than usual as the cache will have to be re-built.

Drawing “Blob” Database

Within the drawing file there is an instance of the drawing-related project data stored in what is referred to as a “blob” database. This blob is what is used to update the project database when a drawing is updated offline and copied into the project using Project Manager.

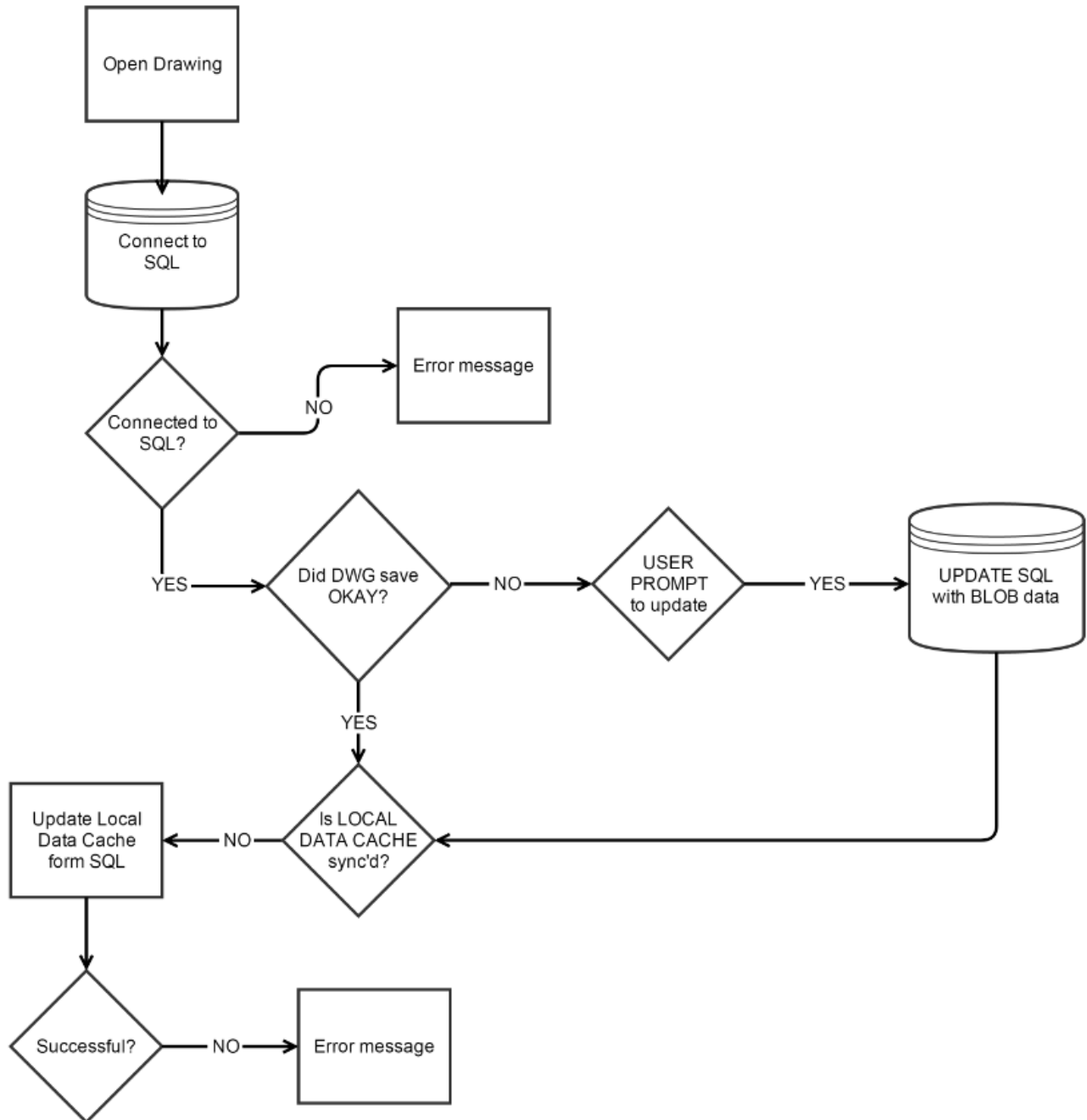
The blob database is also considered to be the most up-to-date source of drawing-related information when the drawing is opened in the project after being overwritten with a more recent file in the project directory. The software recognizes that the date-time stamp in the blob database is more recent than that stored in the project database and issues the following dialog box:



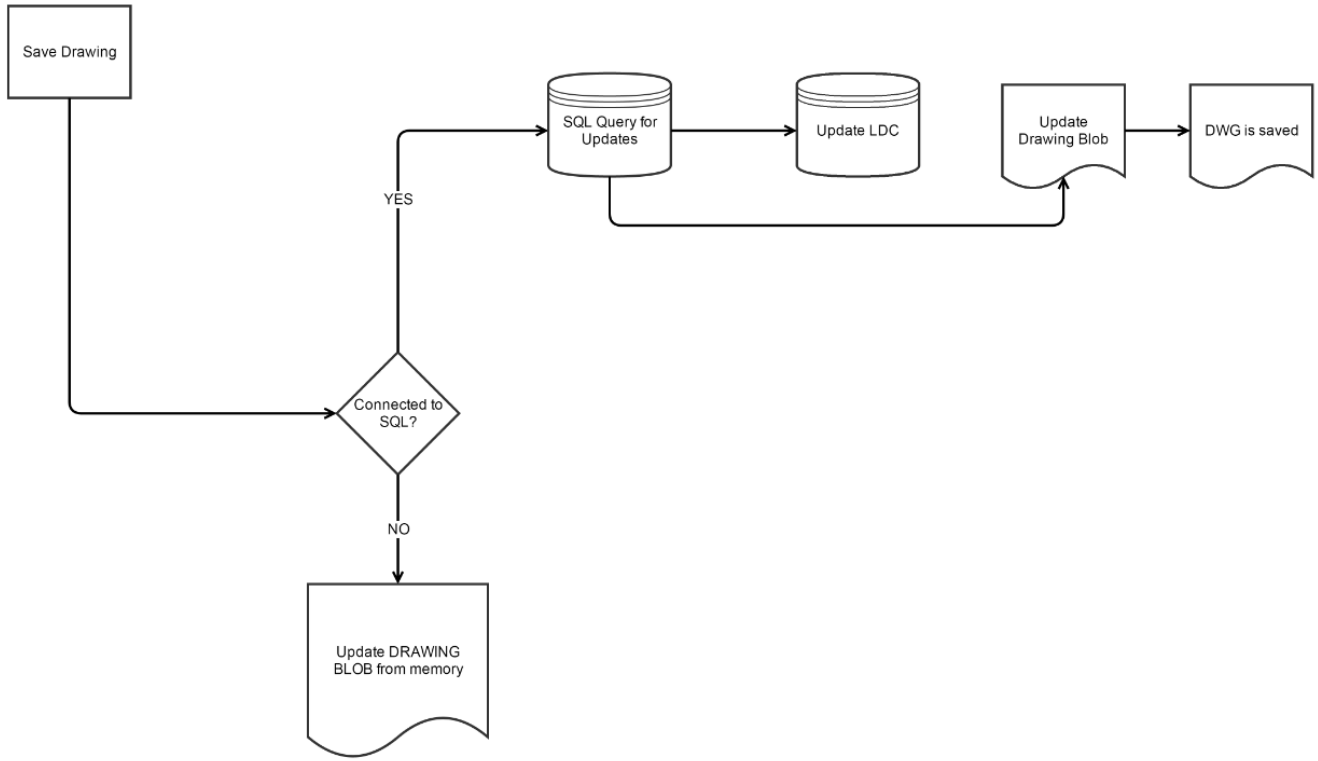
If the first option is selected, the project database is updated from the drawing blob database. If the second option is selected, the drawing is opened read-only, preventing any changes from being saved to the project database.

While editing a drawing, the drawing “blob” database communicates with the LDC to stay updated with project shared asset changes. In turn, the LDC is being synchronized with the project database in the background.

Open Drawing Process



Save Drawing Process



Network Infrastructure

This section describes the terminology and concepts of the software interaction with the project database and drawings across a network link. Each customer has their own network environment and infrastructure layout. We recommend consulting with your CAD admin and IT group if you experience the error messages shown in the first sections of this document.

Network Links

As mentioned earlier, Plant 3D and P&ID are periodically communicating with the SQL Server hosting the project database, the file server hosting the project files and drawings, and/or the Vault if your project is hosted on a Vault Server. The stability and reliability of a network link between the end user's computer and the server is one of the most critical factors in maintaining the integrity of the project database and drawings.

Latency and bandwidth

Latency - The time from the source sending a network packet to the destination receiving it

Bandwidth - The maximum throughput of a logical or physical network communication path

Slower, high latency links such as a WAN (wide area network) or VPN (virtual private network) connection will cause a decrease in performance but should not affect the reliability of saving drawings or writing to the database. The same would apply to a lower bandwidth connection.

Stability and Reliability

The main issue(s) that could potentially cause a problem with project data are related to the stability and reliability of the traffic across any given network link. Some of the issues related to this are:

Packet Errors

Packet errors (or bit errors) are situations where data transfer across a network link is interrupted or altered due to an issue during the transmission.

Network Congestion

Busy or high traffic networks can result in a high number of packet collisions which can result in lower than ideal bandwidth. As machines are added to the network the probability of packet collisions increases.

Physical link loss

The loss of the physical link could range from a various number of factors:

- Network cable accidentally un-plugged or damaged
- Wireless network signal loss
- Placing the system into hibernation or sleep mode (closing the lid on a laptop with a project open)
- Network switch / router issues

Risk Assessment

The first step in resolving network issues and poor performance is conducting a risk assessment. The utilities listed below are just a few of the tools you can use to analyze and troubleshoot network traffic and software behavior.

Packet capture

Packet analysis software can be used to record network traffic for analysis. The data capture can be performed on the server or client machine and filters applied for final analysis. One of the more popular utilities for packet capture and analysis is [Wireshark](#).

File system monitoring

If you are experiencing issues saving a project drawing you can use a utility such as [Process Monitor](#) to capture the file system activity across the network. The log files from Process Monitor can be used with the packet capture logs from Wireshark to determine if any [SMB](#) (Server Message Block) errors are present at the time stamp of the save operation.

NETSTAT

The NETSTAT utility is built into Microsoft Windows and can give a good indication of the reliability of the local physical network interface. To run this command use the follow steps:

1. Open Windows Command Prompt by clicking the Start button, select Run
2. Type in "cmd" on the Run / Open dialog box and press Enter
3. Type in: `netstat -e`
4. The interface statistics will be displayed
5. Note any errors displayed and bring this to the attention of your IT staff

Network Optimization

Once a risk assessment has been completed steps can be taken towards optimizing the network. Optimization of the network infrastructure can be a very complex and specialized task. We recommend consulting with your IT department

Please refer to the document [sources](#) section at the end of the document for more information.

Summary

With AutoCAD Plant 3D and P&ID the following “best practices” are recommended for data reliability:

- Regular network backups of project files
- Regular backups of SQL Server databases
- Use of geographically local SQL database servers to minimize disconnections and latency
- Vault Server 2016 implementation with AutoCAD Plant 2016
- Only operate within a stable network environment
- Never purposefully interrupt network connections while editing project drawings. An example of this would be opening a Plant 3D model on a laptop and removing the laptop from its docking station while still in the Plant 3D session (even if switching to a wireless network connection)
- Develop a habit of saving frequently or using an [AUTOSAVE](#) interval of an hour or less
- Close and save all project drawings, right-click and select ‘Close Project’ from Project Manager before exiting out of Plant 3D at the end of your work session

Sources

Wikipedia.org

[Network congestion](#)

[Virtual LAN](#)

Allied Telesis

[Troubleshoot Slow Network Performance](#)

Lantronix

[Networking Tutorials](#)

Autodesk Knowledge Network

[Understanding AutoCAD backup and autosave files](#)

Microsoft Technet Blogs

[SMB2, a complete redesign of the main remote file protocol for Windows](#)

Wireshark

<http://www.wireshark.org>

Process Monitor

<https://technet.microsoft.com/en-us/Library/bb896645.aspx>

Document Revisions

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