

BEACON Newsletter - August 2024

Large Assembly Management - Tips & Tricks

AssemblyXpert was right - Large Assemblies:

Activated the "Large Assembly Settings".

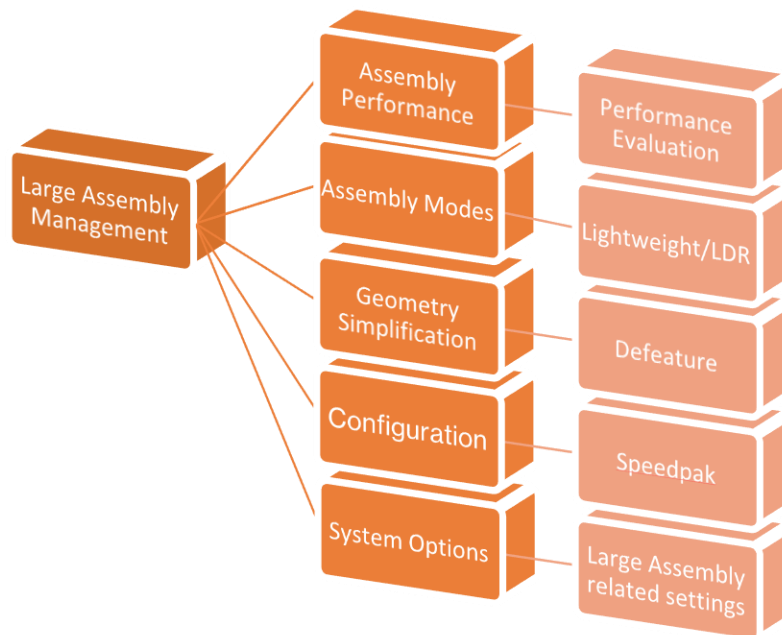
Improved your system configuration.

*Finally, loaded the assembly in **lightweight mode** yet issue continues?*

What's Next?

Back then, "AssemblyXpert" was justified name for this tool. Working with large assembly is no lesser than an art of problem solving. It takes a skilled approach that can help you to troubleshoot around large assembly issues and that's what separates a power user from others. If you started using SW from 2017 you might take some time to guess what tool I am talking about.

Before we reveal the name, let's begin with what are the important tools in the arsenal of SOLIDWORKS when you must deal with Large Assembly. Below is the *decision tree* that we have created that not only highlights the focus area and corresponding functionalities, but it can also serve as a template which you can expand as you learn more solutions, system settings and customize your workflow that suites as per your system's working environment and desired outcomes.

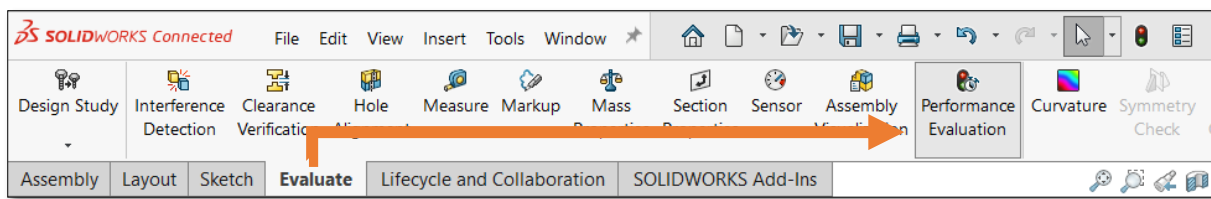


The tool we are talking about is **Performance Evaluation**, prior known as AssemblyXpert. It is a feature that many users hesitate to integrate in their workflow. ***But why?***

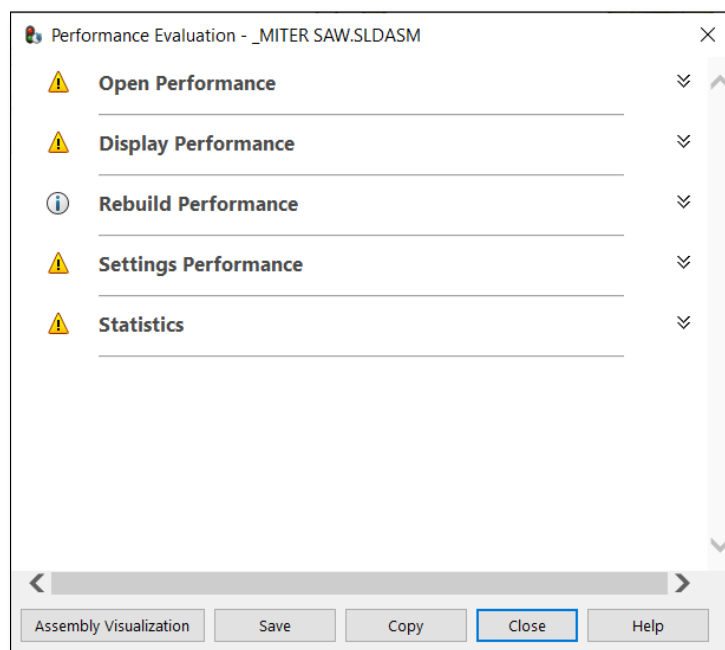
The single reason for users not including in their troubleshooting process is because *it does not provide you with straightforward solution*. Rather, it provides you with all the possible data related to files and current settings deployed, that could be affecting assembly open or rebuild time, slower performance etc. Then it is a test of your skill & resilience to produce a solution that is suitable for you.

By the end of this article, you will discover how drastically this tool can reduce your efforts to identify focus areas in your assemblies.

To start with, you can find "*Performance Evaluation*" under the "*Evaluate*" tab in Assembly Environment.



Once you click on it, with an assembly opened, you will see a dialog box as below. It might look slightly different from yours as collapsed all sections are in collapsed state.



Let's go through each section. In each section, where there is scope of improvement, we will pick the file/settings that impact the most and try to solve it and compare it with the last result. Below is the image of the assembly that we will be considering for this article (1028 Parts).



1. Open Performance:

Currently, our assembly takes 2:27 minutes to open.

Name	Date modified	Type	Size	SW Open Time
40107001_Latest	12-02-2024 10:48	SOLIDWORKS Ass...	1,39,892 KB	2:27

Let's look at performance evaluation dialog and see what can be improved.

⚠ Open Performance

⚠ Details of the Open Document File:

File Name	Configuration	Open Time
50198001.SLDPRT	50198001	28.87
Front Chain.SLDPRT	Default	2.19
50127001.SLDPRT	50127001	1.71

[🔗 Show These Files](#)

⚠ Previous Version References
 258 of 321 documents in this assembly have not been updated to the latest version of SOLIDWORKS (until they are converted this will affect file open performance).
[🔗 Show These Files](#)

⚠ Modified On Open
 8 documents in this assembly were not up-to-date when the assembly was opened and were updated during open.
[🔗 Show These Files](#)

50198001.SLDPRT takes 28.87 seconds to open so let's focus on that. We will click on the folder icon to the left of the file name, and it will open the file.

The part is wheel and quite evidently the pattern of treads will be taking more time to regenerate. Hence, we will simplify this geometry in different configuration and ensure it looks visually identical in assembly.



After making a change, the assembly opening time was reduced by **21 seconds** & part's opening time by **8 seconds**. If you weren't the creator of this part file, the difference would be hard to notice as to where the change was made.

Name	Date modified	Type	Size	SW Open Time	
40107001_Latest	12-02-2024 10:59	SOLIDWORKS Ass...	1,39,414 KB	2:06	✓

File Name	Configuration	Open Time
50198001.SLDPRT	50198001	19.57



2. Display Performance:

This section highlights those files that affect the display performance as they contain more graphics triangle. No! the wheel wouldn't top list here as open time is related to the computations performed while display is which part consumes more memory once loaded.

⚠ Graphics Triangles
 The number of graphics triangles is an indicator of the level of detail in a component. A high value can indicate a component with excessive detail such as 3D modeled threads, grates or extruded text; a simplified representation can improve assembly performance. The results below omit components where the sum of graphics triangles for all instances is under 5,000.

Graphics Triangles Details

File Name	Configuration	Quantity	Total Triangles
⚠ Rear Chain.SLDPRТ	Default	1	2330900
⚠ Front Chain.SLDPRТ	Default	1	1194434
⚠ 50004001 SLDPRТ	50004001	64	473984

[Show These Files](#)

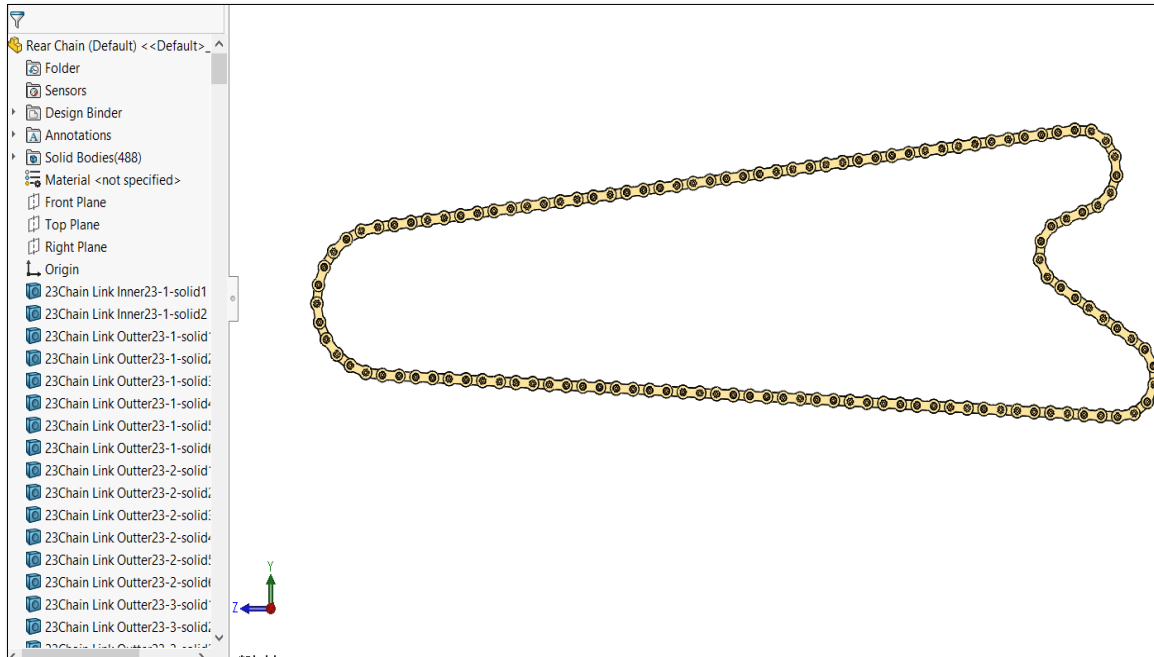
⚠ Shaded Image Quality
 48 parts have a medium high image quality set in the Document Properties.
[Show These Files](#)

138 parts have a very high image quality set in the Document Properties.
[Show These Files](#)

⚠ Appearance
 7 documents contains over 100 appearances applied to faces. This can affect assembly performance. Try applying appearances to bodies instead of faces to reduce the number of appearances, and improve performance.
[Show These Files](#)

Rear Chain.SLDPRТ is the part with the highest triangle count. But that shouldn't be your only focus point. Shaded image quality also affects the performance so make sure you have a common template for all files.

As soon as I opened the part, it turns out to be an imported file. The body count is 488. The feature tree shows that it is not a pattern but separate identical bodies. There are different ways to solve it and the feature tree could be minimize.



I have converted this part into a single body and now the triangle count reduces to 683482. Similarly, you can reduce the triangle count of other bodies and your assembly performance can improve significantly. The opening time has just improved from 2:06 to 2:01 minutes.

Graphics Triangles Details			
File Name	Configuration	Quantity	Total Triangles
Front Chain.SLDPRT	Default	1	1194434
Rear Chain.SLDPRT	Default	1	683482
50004001.SLDPRT	50004001	64	473984

3. **Rebuild Performance:**

In this section, you can find if there are any *circular reference* warning which would be very rare to have if you are creating assemblies with proper design intent. Total *mates*' detail is available. We would see it in more detail in the last section. Finally, you have assembly rebuild report from your previous session to compare.



4. Settings Performance:

This section reminds us of whether we have applied recommended system options settings or not.

- a) **Verification on Rebuild:** What it does is well described in the below image itself. Hence, it would be only good to enable it at certain stages of development.
- b) **Large Assembly settings:** Now comes the real difference. As you can read, 1028 components are in resolved state.

 **Settings Performance**

 **Verification on Rebuild**
Verification on rebuild is enabled. This option checks every new or changed feature against all existing faces and edges which can slow down rebuild performance. To disable this option, go to **Tools > Options > System Options > Performance**.

 **Large Assembly Settings**
The total number of resolved components in this assembly is 1028, the large assembly threshold is 100 components. To improve performance, enable Large Assembly Settings and/or use lightweight mode.

In the first section, I purposely didn't focus on 258 documents which were from previous versions. Most users ignore this warning but that really impacts the open time of assembly. Hence, I will make two changes here:

- Convert most of the files to the latest version.
- While opening the assembly, I changed the mode from "resolved" to "lightweight" & "Use large assembly settings".

This combination reduced my assembly time from **2:01 minutes to 1:12 minutes**.

We started from 2:27 minutes and reached 1:12 seconds in opening time. That is more than 50% reduction.

5. Statistics:

The major takeaway from this section should be to ensure that:

- There is as much possible lesser no. of *Top-Level Components*.
- Components in resolved state should be lesser to ensure smooth assembly operation.
- The first point makes obvious that we have lesser "Top Level Mates". They are always solved while opening assemblies. So whenever possible plan out more sub-assemblies than parts at top level.

Statistics	
Total Number of Components in 40107001_Latest: 1028	
Parts:	
Part Components:	973
Unique Part Files:	324
Unique Part Configurations:	278
Number Of Bodies:	2904
Subassemblies:	
Subassembly Components:	55
Unique Subassembly Configurations:	50
Unique Subassembly Files:	42
Components:	
Resolved Documents:	27
Number Of Top Level Components:	146
Resolved Components:	78
Lightweight Components:	935
Graphics Components:	0
Suppressed Components:	15
Hidden Components:	7
Virtual Components:	2
Envelope Components:	0
Assemblies:	
Maximum Depth:	4
Number Of Total Evaluated Mates:	265
Top Level Mates:	297
Flexible Subassembly Mates:	0

To summarize, large assembly can be drastically improved from conventional approach of working. It is just that you need to streamline your workflow. Always follow best practices for working with Large Assembly. Quoting this line from one of the articles by Adam Ferrer (Javelin Technologies, a Trimech Company).

“The good news is your assembly performance can be improved; the hard part is knowing where to look.”

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