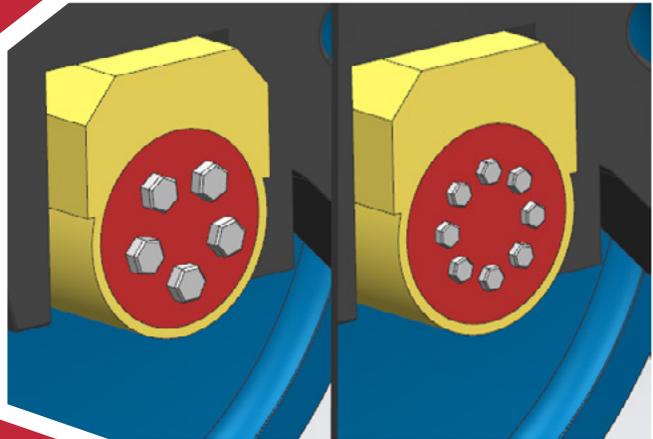


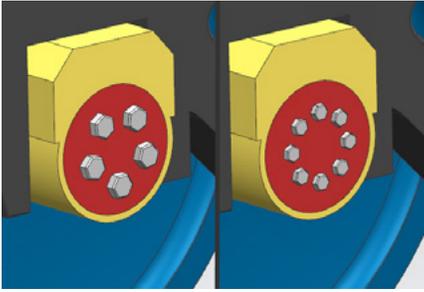
NX 9

## WHITEPAPER

# Assembly-Level Part Design Using Interpart Modeling in NX



# Assembly-Level Part Design Using Interpart Modeling in NX



Software:  
NX 9 Design

## Overview

Many commands in the Modeling and Assemblies applications can be used to create, manipulate, or modify geometry and control expressions across multiple parts. The parts need not be contained within a single assembly or subassembly. Interpart expressions, WAVE Geometry Linker, and Assembly Cut are just some of the features in NX that utilize interpart modeling functionality. Understanding how to use interpart modeling features in NX can speed up the design cycle for new or derivative parts.

*This whitepaper is part of a series of free Siemens PLM Software training resources provided by ATA. For more whitepapers, tutorials, videos, and macros, visit ATA's PLM Software website: <http://www.ata-plmsoftware.com/resources>.*

# Assembly-Level Part Design Using Interpart Modeling in NX

## Interpart Modeling Commands

There are several NX commands that are directly tied to the interpart modeling functionality within NX. This includes the “WAVE” commands, such as WAVE Geometry Linker and WAVE Interface Linker (see Figure 1). Assembly Cut is another command that takes direct advantage of NX interpart modeling functionality. Furthermore, any field within a command dialog that accepts a numerical value will also accept an expression name; thus, with interpart expressions, nearly every NX command can be used to take advantage of interpart modeling.

**Figure 1:** ►  
Gallery of WAVE commands.

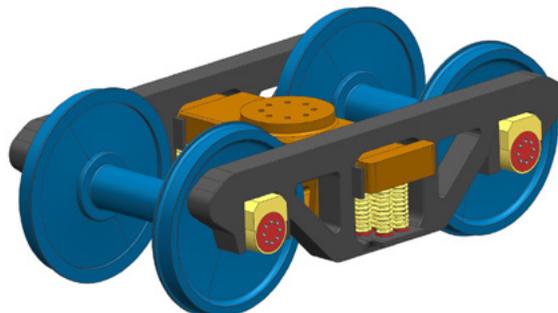


Three features are highlighted in this document: interpart expressions, WAVE Geometry Linker, and Assembly Cut.

## Interpart Modeling Functionality

As a multicomponent part, or “assembly,” progresses from concept to production, many changes are likely to occur. Some dimensions or features of one part will depend on the dimensions and details of other parts within the assembly. For example, when a component that interlocks with another is changed during the design process, the mating component may need to be updated to maintain the correct interface. Interpart modeling provides the designer with tools to facilitate automatic updates in these situations. This functionality becomes especially useful when an assembly contains many parts or when several members of a team are working within the same assembly. Consider, for example, the model of a railcar wheel truck, or bogie, shown in Figure 2.

**Figure 2:** ►  
Railcar wheel truck assembly.

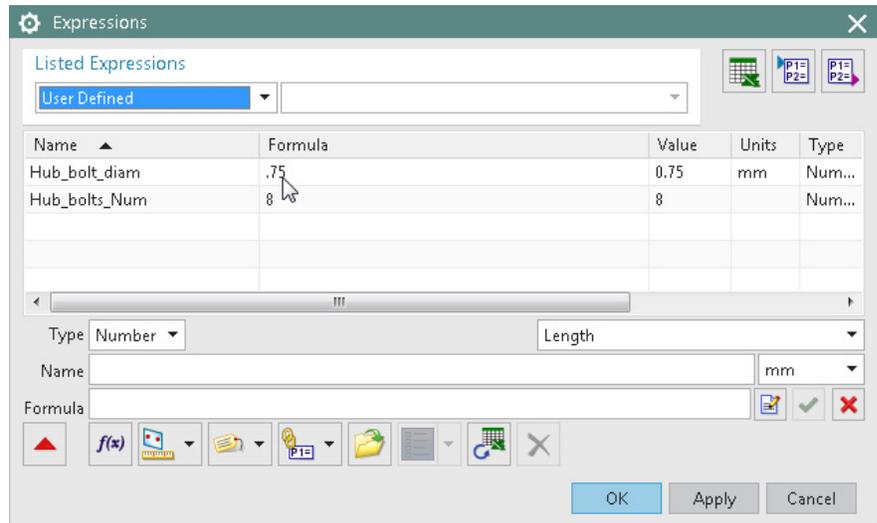


# Assembly-Level Part Design Using Interpart Modeling in NX

This relatively small assembly model uses several instances of seven different components. During the design of the wheel hub and bearing assembly, it may be necessary to evaluate different bolt pattern configurations. Using interpart expressions, the bolt size and quantity of bolts in the pattern are defined using the expressions manager at the top level of the assembly (see Figure 3).

**Figure 3:** ►

Source expressions are created within one part using the Expressions manager.

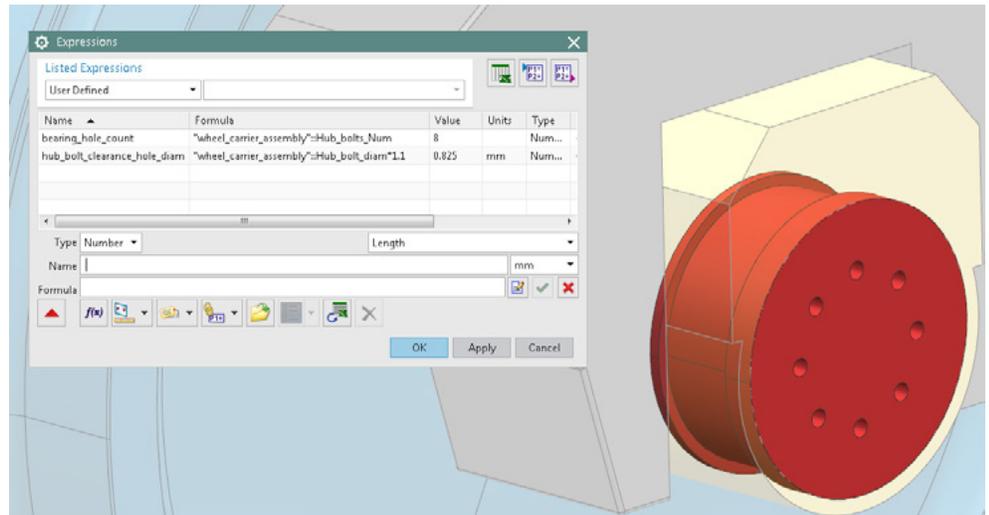


These expressions are then invoked by the assembly and select components so that an update of these two values at the assembly level will cause an automatic update everywhere else in the assembly. First, the appropriate dimensions in the bearing, wheel, and bolt part files are created to reference the source expressions in the top level of the assembly. The part file at the top level of the assembly is called “wheel\_carrier\_assembly.prt;” and using the following syntax in the expression manager creates the interpart links: “wheel\_carrier\_assembly”::Hub\_bolts\_Num and “wheel\_carrier\_assembly”::Hub\_bolt\_diam (see Figure 4). The links can also be created using the interpart expressions dialogs located at the bottom of the Expressions dialog (see Figure 5). The dependent expressions created in each component can be used as parameters for the Create Cylinder, Extrude, Hole, and Pattern Feature commands, for example, to fully link the component geometries to the source expressions in the top level of the assembly. In this case, the expression for the number of bolts in the pattern will dictate the quantity of bolt holes in the bearings and wheels. The instances of bolts in the assembly can also be controlled by invoking the source expression within the Pattern Component command dialog while the top level of the assembly is the work part.

# Assembly-Level Part Design Using Interpart Modeling in NX

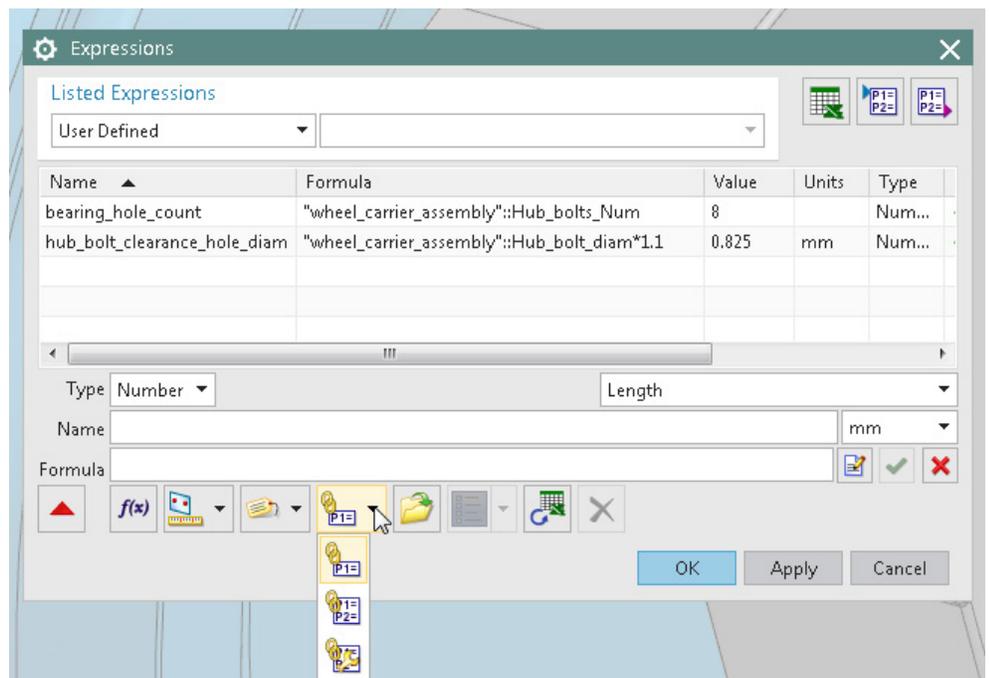
**Figure 4:** ►

The “<source part name>”:<source expression> syntax creates a direct interpart expression link.



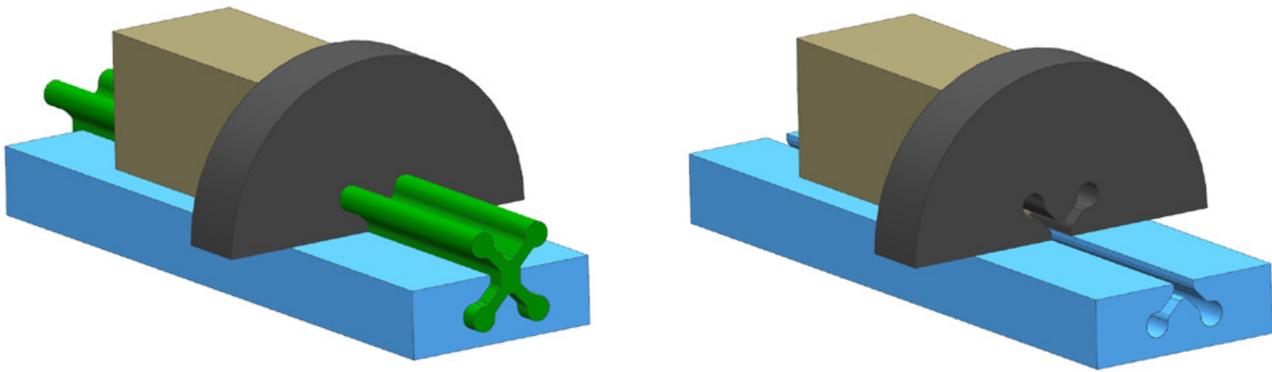
**Figure 5:** ►

Interpart expressions pull-down at the bottom of the Expressions dialog.



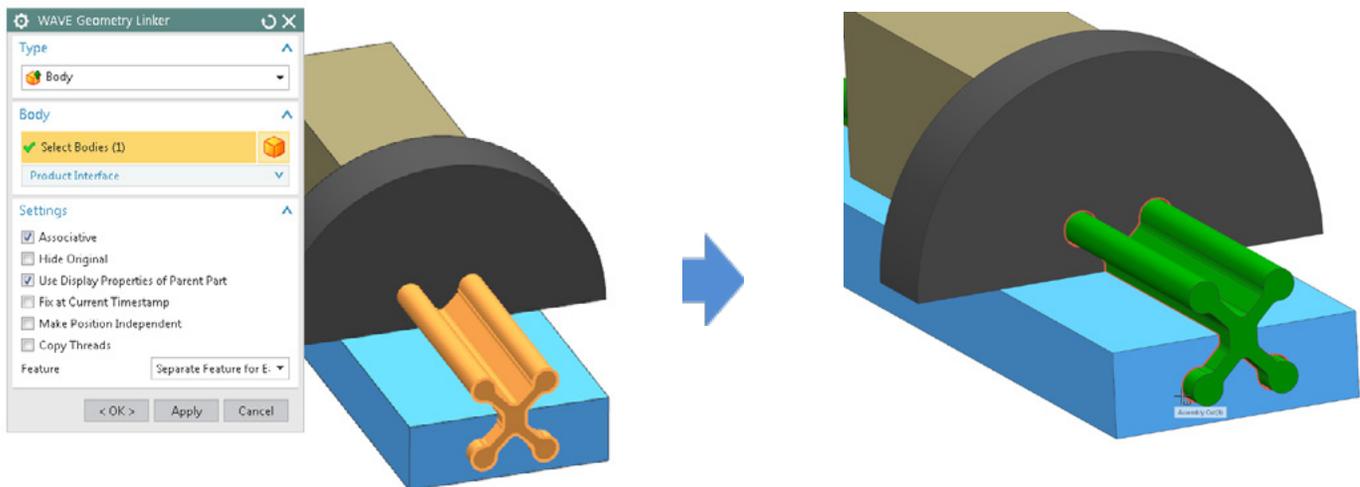
A second example is used to illustrate one application of the WAVE Geometry Linker and Assembly Cut commands. In Figure 6, three components are designed to interface with a specially shaped rail. To produce the groove for the rail in all of the adjoining parts, a model of a slightly larger version of the rail is created as a component in the assembly and positioned as needed.

# Assembly-Level Part Design Using Interpart Modeling in NX



**Figure 6:** ▲  
Multiple parts interfacing with a common rail.

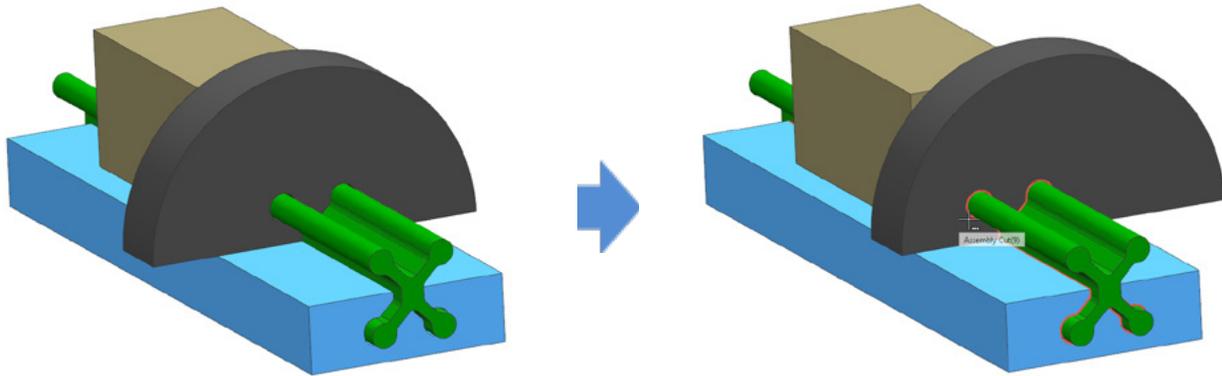
With the top level of the assembly as the work part, the WAVE Geometry Linker command (part of the Associative Copy group) is selected. The rail body is selected and the Associative box is checked in the Settings panel (see Figure 7). Then, the linked body of the rail is slightly enlarged using an Offset Surface operation within the work part. The resulting body will be used for the Assembly Cut. While the top level of the assembly is still the work part, the Assembly Cut command (part of the Combine group) is selected; the components to be cut (the two blocks and the “round”) are selected as Target bodies, and the enlarged rail is selected as the Tool body. In the command dialog, the user may choose to retain or hide the tool body. Because the body used to make the cut is not a physical part in the assembly, we choose to hide it. The result is a groove in the two blocks and the round that is slightly larger than the rail itself, allowing for a non-interfering fit.



**Figure 7:** ▲  
A WAVE-linked body is enlarged to create the cutting tool for multiple parts.

Arguably the most useful feature of the WAVE Geometry Link and Assembly Cut functionality is that a “live” or associative link is created. If the original rail part is updated, the groove cut through all of the parts will update automatically, and if the components in the assembly are repositioned, the groove will be recut into the interfacing parts (see Figure 8).

# Assembly-Level Part Design Using Interpart Modeling in NX



**Figure 8:** ▲

Persistent associativity allows for automatic updating of parts linked by the interpart modeling functionality.

## Interpart Modeling Summary

The design engineer will find many features in NX that take advantage of interpart modeling functionality. WAVE Geometry Linker and Assembly Cut are two commands that directly utilize this powerful capability. With interpart expressions, virtually any command can also indirectly use interpart modeling functionality. NX interpart modeling can significantly speed up the assembly design process for individual designers and engineering teams.

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