GRANITE® Cross-Release Interoperability

Introduction

What is Cross-Release Interoperability (CRI)?
Cross-Release Interoperability (hereafter referred to as CRI) allows users of an earlier release of Pro/ENGINEER® to open parts and assemblies saved in a later release of Pro/ENGINEER. Earlier release users may utilize these parts and assemblies for down-stream applications like assembly, mold design, and cable routing. Changes made in the earlier release can be brought forward to the later release. Figure 1 illustrates the CRI conceptual model.
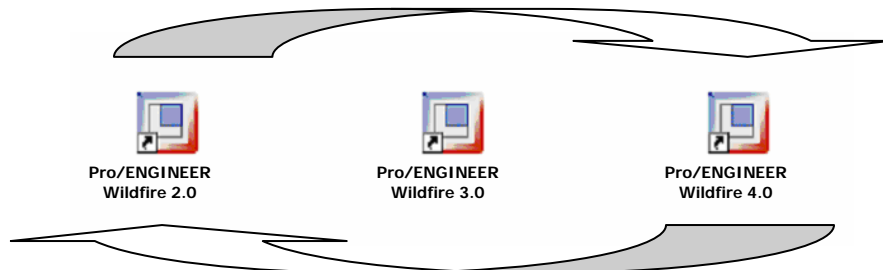

Pro/ENGINEER Wildfire 2.0   **Pro/ENGINEER Wildfire 3.0**   **Pro/ENGINEER Wildfire 4.0**

Figure 1.   CRI Conceptual Model

In the current CRI method, the model's geometry, attributes, and parameters are retained. Existing features are displayed in the model tree as read-only, and the earlier Pro/ENGINEER release user has the ability to:
- Add fully associative features to the "read-only" model
- Update (via ATB[1]) the geometry, attributes, and parameters of the "read-only" model
- Regenerate any features relations, parameters added to the model

CRI is different from forward compatibility. Users have always been able to create and save Pro/ENGINEER parts and assemblies in an earlier release and then open them in a later release without any special effort. Standard forward compatibility is not part of the CRI interaction.

The History of CRI
CRI was originally launched in the Pro/ENGINEER Wildfire® 1.0 release using a Pro/ENGINEER Neutral file approach. CRI leveraged existing infrastructure (Neutral files and ATB) to provide a limited "backward compatibility" for Pro/ENGINEER users. It enabled Pro/ENGINEER Wildfire 1.0 data to be opened in Pro/ENGINEER 2001, Pro/ENGINEER 2000i[2], and Pro/ENGINEER 2000i (with additional restrictions as the user moved further back in releases).

CRI leverages PTC's Associative Topology Bus (ATB) to maintain feature and placement references during geometry updates. The previous release model is an ATB Translated Image Model (TIM). The TIM is created automatically when a user opens a neutral file of a later release model in an earlier release of Pro/ENGINEER. TIM content can be updated with newer later release content when needed. Additional features, parameters, and relations can be added to the TIM model. The ATB functionality allows a later release user to append the new content to the original later release model, resulting in a fully featured, modifiable later release model.

This original CRI approach had several limitations that made it cumbersome for users. It required an explicit export process be used by the sender (File-Save As) to create the Neutral file.   It required that the additional neutral file be kept track of. It resulted in a single Import feature in the TIM part that did not capture feature tree information or feature-level

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[1] The Associative Topology Bus (or ATB) is a PTC patented technology that allows a 3D "snapshot" or "image" representation of external 3D CAD model data to be read into Pro/E while maintaining associative links to the fully-featured master representation of that external model data. This image model is referred to as a Translated Image Model or TIM. If the master representation changes the Pro/ENGINEER user can simply update his or her TIM to match the changes in the master model. The ATB maintains all the geometric entity IDs for the data so that all the power of associativity inherent in Pro/ENGINEER can be maintained, even with data from outside Pro/ENGINEER.

parameters. Finally, it did not provide a convenient mechanism to move new features that might be added to the CRI model back into the master model. Because of these limitations, the original CRI method (now referred to as NCRI for Neutral-based CRI) was redesigned. This new, revised architecture was intended to eliminate many of these limitations and is described in the following pages.

GRANITE-based Cross-Release Interoperability (GCRI)

GRANITE-based Cross-Release Interoperability (GCRI) was developed based on PTC's GRANITE Interoperability Kernel. The GRANITE Kernel, the fundamental cornerstone of Pro/ENGINEER's geometry model, is a software library that has the ability to read (or write) geometry, geometry attributes, layer information, user-defined parameters, and assembly structure from (or to) a Pro/ENGINEER *.prt or *.asm file without Pro/ENGINEER being present.

In the Pro/ENGINEER Wildfire 3.0 release, PTC created a GRANITE plug-in module to replace the neutral file approach to CRI. This plug-in module can be provided to a Pro/ENGINEER Wildfire 2.0 user and, when installed into Pro/ENGINEER Wildfire 2.0, will allow the Pro/ENGINEER Wildfire 2.0 user to read the Pro/ENGINEER Wildfire 3.0 model directly via GRANITE. This is without the need for the Pro/ENGINEER Wildfire 3.0 user to create an intermediate neutral file. All of the information that can be read from the Pro/ENGINEER model by the GRANITE kernel can now be leveraged by the Pro/ENGINEER Wildfire 2.0 user. Both GCRI and NCRI support ATB updatability.

Just like NCRI, GCRI leverages PTC's Associative Topology Bus (ATB) to maintain feature and placement references during geometry updates. The previous release model is an ATB Translated Image Model (TIM). The TIM is created automatically when a user attempts to open a later release model in an earlier release of Pro/ENGINEER. Existing content is read-only in the earlier release, but can be updated with newer later release content when needed. Additional features, parameters, and relations can be added to the read-only TIM model. If an updated later release model is available, the earlier release user can update the TIM directly via the ATB. The ATB functionality allows a later release user to append the new content to the original later release model, resulting in an extended, fully featured and modifiable later release model.

In the sections below, operational use of the Pro/ENGINEER GCRI capability will be discussed and some limitations and precautionary notes on its use will be outlined.

Cross-Release Interoperability Support Matrix

PTC continues to expand GCRI support with Pro/ENGINEER Wildfire 4.0 as shown in the table.

CRI Support Matrix					
		Source			
		Pro/ENGINEER Wildfire 1.0	Pro/ENGINEER Wildfire 2.0	Pro/ENGINEER Wildfire 3.0	Pro/ENGINEER Wildfire 4.0
Target	Pro/ENGINEER 2000i	NCRI	NCRI	NCRI	NCRI
	Pro/ENGINEER 2000i2	NCRI	NCRI	NCRI	NCRI
	Pro/ENGINEER 2001	NCRI	NCRI	NCRI	NCRI
	Pro/ENGINEER Wildfire 1.0	NCRI *	NCRI	NCRI	NCRI
	Pro/ENGINEER Wildfire 2.0	NCRI *	NCRI *	NCRI \ GCRI	NCRI \ GCRI
	Pro/ENGINEER Wildfire 3.0	NCRI *	NCRI *	NCRI *	NCRI \ GCRI

* Technically, it is possible to use NCRI within the same release or from older to newer. This might be useful in certain circumstances, but is beyond the scope of this document.

Operational Use

Before attempting to use the techniques described here, please refer to Appendix A, "How to Set Up GCRI", for information about setting up Pro/ENGINEER to use GCRI.

There are three elements in the workflow for GCRI. They are:

- Reading a newer release model into an older release and creating a TIM
- Using ATB functionality to check the status of a TIM model read using GCRI or updating such a GCRI TIM to match its master model
- Grafting of features, added to the GCRI TIM, back onto the master model it was created from

Each of these operations is described below.

Reading Later Release Models into an Earlier Release

Reading a later release model (prt or asm) into an earlier session is quite simple. The Pro/ENGINEER user selects **File->Open** from the menu bar to display the File-Open dialog and then selects any later release Pro/ENGINEER part or assembly file for opening.

When reading backward, the banner shown in Figure 2 appears indicating that the model is a GCRI TIM, and asking for confirmation to open it. This confirmation is simply to inform users that they are opening a GCRI TIM, not a native model, and that certain model behavior and content differences exist between these two model types (see Notes and Limitations section for details).
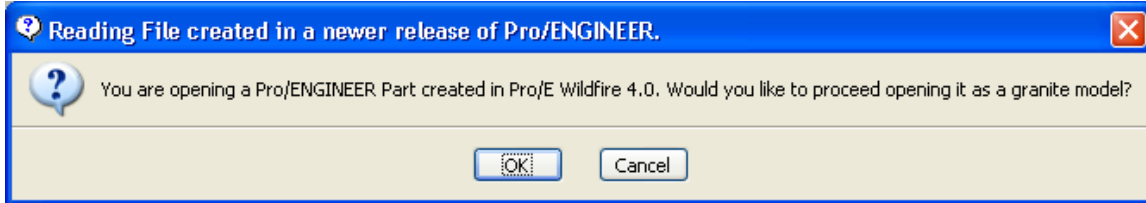

Figure 2. **Reading GCRI Confirmation Banner**

Performing an ATB Check Status or Update Operation

Although the earlier release user does not own the fully featured later release model, the user can use the model for any other downstream use. Examples of such use include Mechanica analyses, cable routing, manufacturing, annotation, rendering, or even the addition of new modeling features. Because of ATB associativity, rapid updating of the TIM based on changes made to its master model are handled quickly and easily.

The normal flow of operations here are to check the status of the GCRI TIM relative to its master model. This is done by selecting **File > ATB > Check Status** from the menu bar. The ATB functionality in Pro/ENGINEER will check the status of the earlier release TIM relative to its later release master model. The result will be a change in the color of the ATB icon for that part from blue (⬛) to red (⬛) and the presentation of a warning message in the message bar if the model is out-of-date relative to its master model. The user can choose to act on that notification right away or simply wait until a more convenient time to perform the second operation, the Update.

The Update operation is performed by selecting **File > ATB > Update** from the menubar. The ATB functionality will replace the existing earlier release TIM with the latest version of the latest release master model and re-attach,

automatically, any earlier release features added to the model. Similarly, any downstream uses of the updated TIM (manufacturing, analysis, routing) will, of course, associatively update too!

For more information the ATB and how to customize ATB operations using configuration settings, refer to the Pro/ENGINEER On-Line Help pages for ATB.

Grafting Features added in the earlier release back onto the later release Master Model

A unique feature of GCRI is the ability of later release users to take new features that have been added to the TIM by the earlier release user and graft those features onto the original, fully-featured master model. This is similar to how a UDF works except the user doesn't have to pick the reference for the UDF to be placed; GCRI functions handle this placement automatically.

In order to perform a graft, the later release user starts with the original later release master model in memory. The later release user selects **File->Graft Features** from the menu bar. In the presented File-Open dialog, the later release user navigates to, and selects, the earlier release TIM that corresponds to the master model in session.

That's it! With just a few mouse clicks, the added features from the earlier release TIM are automatically copied into the active later release model and correctly referenced to the original master model references.

Notes and Limitations

Several precautionary notes and / or limitations should be made clear when using the GCRI capability. These will be described below. Please refer to the PTC Knowledge Base for additional detail about known issues and limitations of the GCRI process. First, it is important to note several considerations necessary to prevent model clashes which may disrupt ATB workflow.

1. Users or administrators should make sure that when an earlier release TIM is created, it is not saved back to the same location as the original later release master model. Since TIMs will take the same names as their master model counterparts, saving the TIMs in the same directory as the master models will result in the creation of a new version of the model file with the static, associative image content that will refer back to the fully-featured master model in the previous iteration. No data loss results however ATB operations are disrupted since ATB does not consider the version number of a model when referencing it. It is recommended that earlier release TIMs be segregated in different directory structures from their equivalent later release master data to avoid this possibility. The user can use File > Back-up to re-locate the model somewhere else.

2. The GCRI methodology is based on the GRANITE kernel and certain limitations apply. It must be remembered that the GRANITE-based approach is restricted to support for parts and assemblies only. Drawings, layouts, and manufacturing models, for example, are not supported.

3. The user must remember that fully-featured, master definitions will not be transferred from later release to earlier release as fully-featured models. GRANITE-based TIMs will contain the following content and attributes. The user will see a static (non-modifiable) feature tree with highlighting (smart selection). Features shown in the tree will be considered read-only (see Figure 3) and these features can not be regenerated, reordered, or redefined.
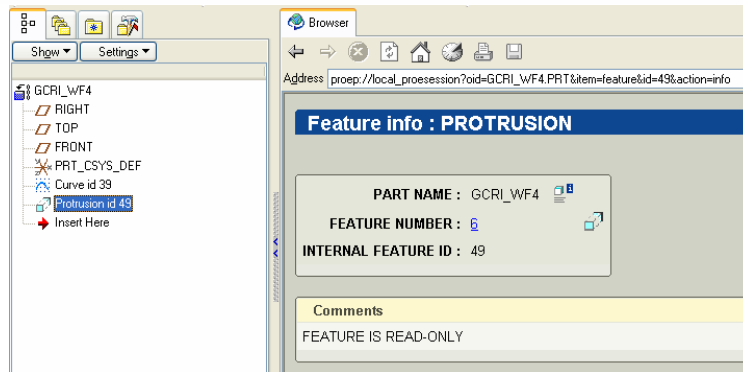
Figure 3.   Feature Info, Read Only Features

4. Geometric attributes such as layer and color will be transferred as will all user-defined parameters (model, entity, and feature).

5. Patterns are supported in that all instances of a patterned component and all geometry associated with instances of a patterned feature are transferred however pattern information is not (i.e. reference patterning in the GCRI model is not possible). Groups also have the same limited support as patterns. All of the features of the group will transfer, but there will be no group node in the GCRI model, grouped features will be exploded into individual features.

6. Family table instances are supported as long as the family table instant accelerator files (*.xpr for parts and *.xpa for assemblies) are saved with the master model, but simplified representations and explode states are not. Assembly features are only supported if accelerators have been used or if the assembly feature geometry has been stored in the part.

7. Bulk and Skeleton components will be identified as 'regular' components in the GCRI TIM. For Skeletons, this means that certain types of reference control for external references based on skeleton filters will not be possible in the GCRI TIM.

8. Unicode character encoding has been introduced in Pro/ENGINEER Wildfire 4.0. Conversion of Unicode to EUC encoding used in earlier Pro/ENGINEER releases is not supported by GCRI. This issue is visible when converting files with Unicode language characters, used in parameters, model notes, and model names to EUC encoded releases.

Conclusions and Future Support

Cross Release Interoperability provides a unique methodology to support the use of newer release Pro/ENGINEER models in earlier releases of Pro/ENGINEER.   Although the Pro/ENGINEER neutral file will continue to be supported, PTC will be focused moving forward on the GRANITE-based approach to Cross Release Interoperability.

As each new version of Pro/ENGINEER Wildfire is introduced, its GRANITE GCRI plug-in can be shared with earlier supported maintenance releases of Pro/ENGINEER Wildfire (back to Pro/ENGINEER Wildfire 2.0) to enable the GCRI operations described here. The earlier release user simply replaces any previous plug-in with the most recent one to upgrade GCRI to the latest Pro/ENGINEER Wildfire release.

From time to time, PTC may add new capability to the GRANITE kernel and therefore to the GCRI plug-in. When this happens, an earlier release user will simply not benefit from that particular upgrade until they upgrade their Pro/ENGINEER to the version in which that new capability was introduced. For example, PTC is considering added support for Named

Views, Explode States and Simp Reps in the Pro/ENGINEER Wildfire 5.0 release of GRANITE. A Pro/ENGINEER Wildfire 2.0, 3.0 or 4.0 user with the Pro/ENGINEER Wildfire 5.0 plug-in will be able to read Pro/ENGINEER Wildfire 5.0 models but will not retrieve Named Views, etc. A Pro/ENGINEER Wildfire 5.0 user will be able to retrieve such data when using the Pro/ENGINEER Wildfire 6.0 plug-in to read Pro/ENGINEER Wildfire 6.0 models however.

Suggestions and comments about GCRI, this document, or general MCAD Interoperability should be sent to Matt Meadows, Product Manager, MCAD Interoperability, Product Management, PTC, +1 781 370 5303, mmeadows@ptc.com.

Appendix A – How to Set Up GRANITE Cross Release Interoperability (GCRI)

Before setting up GCRI, you will need to download the latest GRANITE plug-in, readnewermodels.dll, from the Free Downloads page of PTC's web site for the specified earlier release platform. The GCRI plug-in for Pro/ENGINEER Wildfire 4.0 is currently supported for use in Pro/ENGINEER Wildfire 2.0 and Pro/ENGINEER Wildfire 3.0 on the following platforms: **Windows XP (x32 and x64), Solaris (SPARC x64 and AMD x64), HPUX 11i**.

STEP 1

Get the latest release readnewermodels.dll application component and place this application component in your earlier release loadpoint (i.e. **<loadpoint>/i486_nt/obj/readnewermodels.dll**).

STEP 2

Add the following configuration options to your earlier release config.pro BEFORE launching the earlier release of Pro/ENGINEER.

topobus_enable yes	**atb_auto_check_on_update off**
atb_show_log off	**atb_auto_check_on_retrieve on**

STEP 3

Add the config option "**cri_grafting_enable yes**" to your later release config.pro BEFORE launching the later release of Pro/ENGINEER.

STEP 4

Start your earlier release of Pro/ENGINEER and check to see that you have the menu: **File > Associative_Topology_Bus**

STEP 5

Validate the plug-in installation. When you attempt to open a later release model you should get a message like the one shown in Figure A-1.
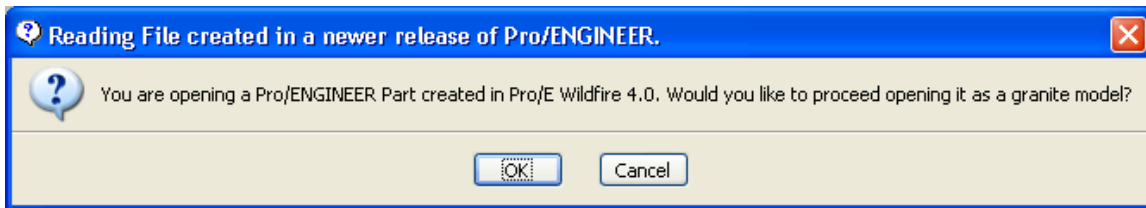

Figure A-1.   "Reading GCRI Model" Message

Select OK to continue. After reading a later release model in the earlier release, perform the following check. The icon for the part or assembly should be an ATB icon and if you RMB Feature Info for any feature, you should get a feature info web page like the one below i.e. FEATURE IS READ-ONLY as shown in figure A-2.
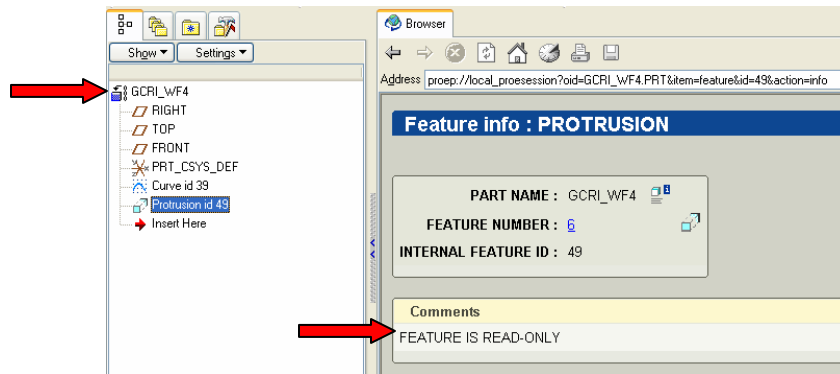
Figure A-2. **Read Only Feature**