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## PTC Product Focus

### Part and Assembly Layers for Wildfire 2.0

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## PTC Product Focus

### Windchill PartsLink Module for PDMLink 8.0

## Search and Reuse Process

The fabrication of a physical product is preceded by the development of deliverables that comprise its digital product data – product specifications, technical publications, marketing plans, heterogeneous mechanical and electrical CAD models, simulation results, production plans, and viewables. With the creation of all these deliverables, the process of finding and reusing these deliverables is called the search and reuse process. Windchill PDMLink supports

The search and reuse process involves some basic steps

- ☉ Identifying the deliverables to be searched against
- ☉ Identifying the technique for searching for the deliverables
- ☉ Locating the deliverables and reusing

The search and reuse process is a procedure for effective and efficient searching as well as reuse of existing deliverables.

# The History of Searching Relating to Parts

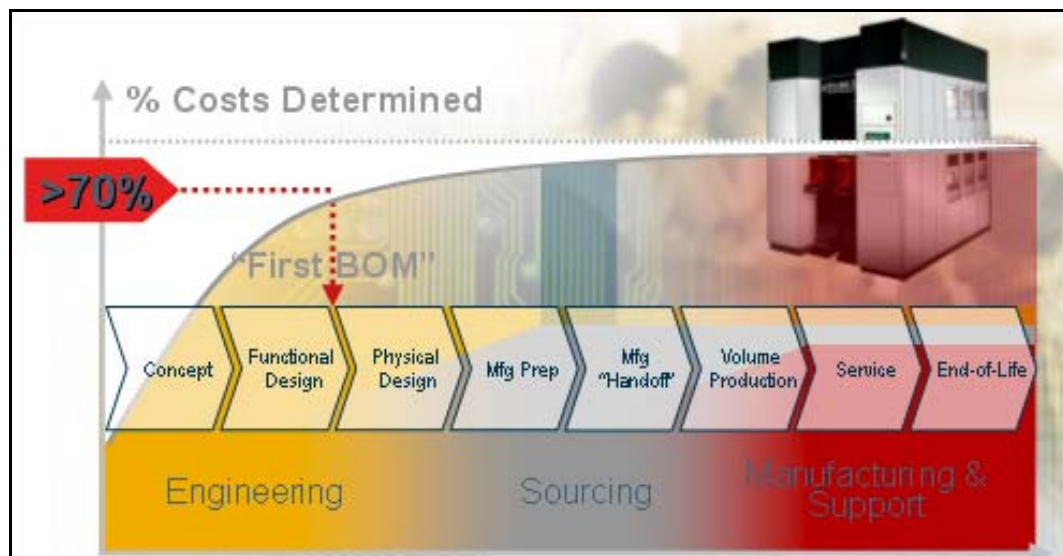
The first appearance of part numbers on a drawing was in 1798 by Eli Whitney. Eli Whitney was contracted by the U. S. Government to produce 10,000 muskets in two years. To meet this aggressive timeline for the day, Eli Whitney developed the concept of interchangeable parts. Each part in the assembly drawing had a name and a number to identify the part. The part numbers were sequential starting with one. Windchill PartsLink, although considerably more sophisticated, optimizes the solution to the same engineering challenges. It lets you quickly and effectively find and reuse preferred parts, select the “right” one by comparing important functional, supply chain, and environmental compliance characteristics.

## Benefits of the Search and Reuse Process

Once the search and reuse process is deployed, a range of benefits can be seen that break into two groups.

### Achieve Lower Product Costs

- ⊙ Select the “right” parts early in design, where over **70%** of product costs are “locked-in”
- ⊙ Effective design re-use of preferred parts & suppliers:
  - ⊙ *Average part introduction cost: \$10,000 - \$15,000*
  - ⊙ *Average number of duplicate parts: 5% - 32%*
  - ⊙ *Annual cost to maintain a supplier: \$6100 - \$16,600*
  - ⊙ *Annual cost to maintain a part: \$3000 - \$6000*
- ⊙ Optimize volume pricing opportunities by focusing spend on fewer, strategic suppliers



**Figure 1 Lifecycle Cost Locked Early (>70% in early design)**

### Achieve Faster Time-to-Market & Volume

- ⊙ *Find the “right” parts, faster:* Reduce time searching for parts, up to **25%** of an Engineer’s time.

- ⊙ Reduce new product re-designs by avoiding obsolete, long lead-time, or non-compliant parts
- ⊙ Speed sourcing & qualification of new critical-path parts

## **Windchill PartsLink Capabilities**

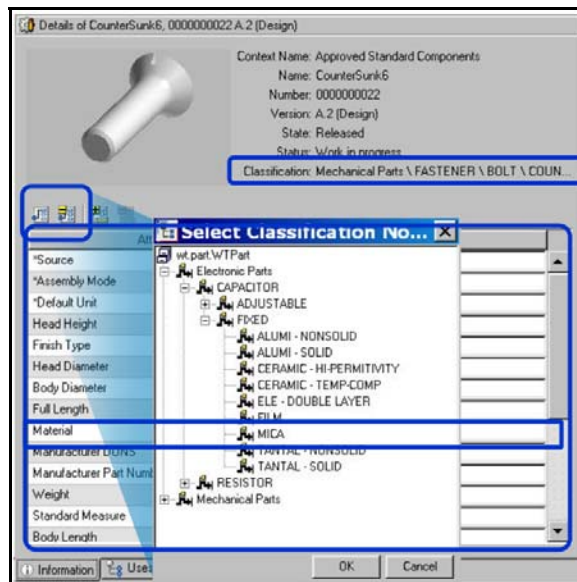
As an integral option of Windchill PDMLink, Windchill PartsLink Classification and Reuse provides everything needed for a comprehensive parts management solution, including data development, cleansing, validation, publication, control and change management. Its guided navigation and sub-second response times enable users to interact with the data. By presenting users with all choices available within a category, users quickly and intuitively refine the search to find the closest match. It eliminates the frustration of "no results found," and dramatically increase the likelihood that users will find and reuse parts instead of creating new, redundant ones.

### **Manage Parts**

- ⊙ Define and maintain the comprehensive, enterprise part record
- ⊙ Changes management process workflow
- ⊙ Access control - manage security by part record
- ⊙ Scalable Web-based architecture

### **Build Content**

- ⊙ Integrated, end-user friendly tools to develop part classification and content
  - ⊙ Create customized classification structures and attributes
  - ⊙ Prepare, cleanse and rationalize content
  - ⊙ Classify, validate and load content
- ⊙ Out-of-the-box support for commercial standards, including RosettaNet
- ⊙ Link to 3D CAD graphical models - quickly & easily



**Figure 2 Example of Part Classification**

## Integral with Windchill PDMLink

- ⊙ Standardized part introduction and change management workflows
- ⊙ Leverages Windchill for access control
- ⊙ Seamless visibility to product structures - "where-used"

## Advanced Tools for Parts Cleansing, Classification and Enrichment

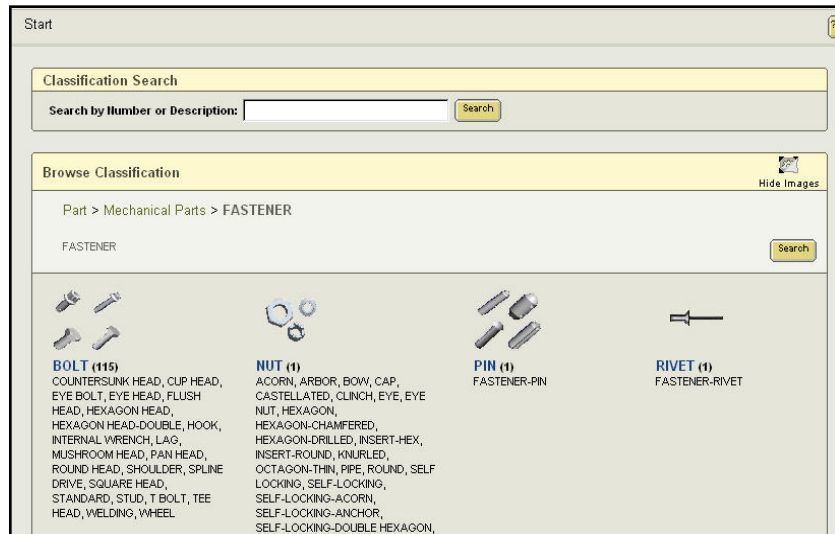
- ⊙ Create and manage classification structures and attributes with "WYSIWYG" tools
- ⊙ Standardize data terminology, units of measure, values, and constraints with industry-leading data engineering technology
- ⊙ Map and import legacy parts data to standardized classification and attribute schemas
- ⊙ Supports RosettaNet Technical Dictionaries (RNTD) standards out-of-the-box

## Parts

- ⊙ High-performance, flexible Web-based search
- ⊙ Sub-second response times - scales to millions of parts
- ⊙ Guided navigation for high search success
- ⊙ Integrated PLM security for role-based access
- ⊙ Advanced usability features such as part count, query re-use, and find similar parts

## High Performance, Web-Based Search

- ⊙ Keyword or parametric search with guided navigation
- ⊙ Search on an unlimited number of attributes
- ⊙ Save and reuse queries
- ⊙ Toggle unit of measure systems from within search results



**Figure 3 Graphical Classification Browsing**

Start > Browse > Refine Search

**114 Matching Parts**

Refine Search: COUNTERSUNK HEAD

Classification:   Measurement System:

To enable sorting, refine your search until there are less than 100 parts matched.

Attribute	Value	Range	Unit
Thread Major Diameter	<input type="text"/>		
Number Of Threads Per Inch	<input type="text" value="10"/>	(0 - 12.0)	
Bolt Head Shape	<input type="text"/>		
Unthreaded Length	<input type="text"/>		
Full Length	<input type="text"/>	(0 - 0.75)	<input type="text" value="m"/>
Head Height	<input type="text"/>	(0 - 5.0)	<input type="text" value="cm"/>
Head Diameter	<input type="text"/>	(0 - 45.0)	<input type="text" value="cm"/>
Application Industry	<input type="text"/>		
Weight	<input type="text"/>	(0 - 0.065)	<input type="text" value="kg"/>
Countersunk	<input type="text"/>		

**Figure 4 Parametric Searching**

Windchill Visualization Collection | Learn | Help | Publications | E-mail Page | Hot Links | Copy Page

Home Product Project Change Library Organization Site Search:  Go

Overview Assignments Updates Checked-Out Work Workspaces Meetings Notebook Subscriptions Reports Utilities

Start > Browse > Refine Search > Results

Showing 1 - 15 of 24 Matching Parts

Classification Search Results Measurement System SI Go

Classification: COUNTERSUNK HEAD

Refine Search Export to file PSE Page 1 of 2 First 1 2 Last

Name	Number	Actions	Thread Major Diameter	Number Of Threads Per Inch	Bolt Head Shape	Unthreaded Length
Countersunkb22	0000000130	<a href="#">See Actions</a>	10	10.0	Eye	default
Countersunkb24	0000000132	<a href="#">See Actions</a>	10	10.0	Eye	default
Countersunkb19	0000000127	<a href="#">See Actions</a>	10	10.0	Eye	default
Countersunkb5	0000000113	<a href="#">See Actions</a>	10	10.0	Eye	default
Countersunkb6	0000000114	<a href="#">See Actions</a>	10	10.0	Eye	default
Countersunkb8	0000000116	<a href="#">See Actions</a>	10	10.0	Eye	default
Countersunkb1	0000000109	<a href="#">See Actions</a>	10	10.0	Eye	default
Countersunkb21	0000000129	<a href="#">See Actions</a>	10	10.0	Eye	default
Countersunkb2	0000000110	<a href="#">See Actions</a>	10	10.0	Eye	default
Countersunkb11	0000000119	<a href="#">See Actions</a>	10	10.0	Eye	default
Countersunkb12	0000000120	<a href="#">See Actions</a>	10	10.0	Eye	default
Countersunkb7	0000000115	<a href="#">See Actions</a>	10	10.0	Eye	default
Countersunkb14	0000000122	<a href="#">See Actions</a>	10	10.0	Eye	default
Countersunkb15	0000000123	<a href="#">See Actions</a>	10	10.0	Eye	default
Countersunkb20	0000000128	<a href="#">See Actions</a>	10	10.0	Eye	default

**Figure 5 Hyperlinked Parametric Results**

## Windchill PartsLink Server

- ⦿ Sub-second response that scales for millions of parts
- ⦿ Unlimited scalability: number of parts, number of attributes and attachments per part
- ⦿ Leverages PDMLink security and access control business rules
- ⦿ Embedded support for RosettaNet e-business standards

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## Tips of the Week

### Creating Rule-Based Simplified Reps w/ AAX

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## Tips of the Week

### Windchill Workflow Tips and Techniques

This tips and techniques section is intended as a collection of useful observations about workflow. It is particularly focused on the common scenario of a business object maturing through it's lifecycle automated by a workflow. It is not intended to replace PTC's product documentation on workflow. Below are a few examples of documents that are available to you under the "Publications" link at the top-right of the Windchill homepage.

- Workflow Tutorial
- Windchill Business Administrator's Guide - "Administering Workflow Processes"
- ProjectLink User's Guide - "File Routing"
- ProjectLink User's Guide - "Automatically Executing a Project Plan"

Because workflow is a pervasive integral service within the Windchill product suite, in addition to reviewing the above, one can also do a global search throughout the Windchill documentation to find many other interesting insights into workflow and how it complements the Windchill product suite.

In addition, under "Download Reference Documents" on the PTC technical support page (<http://www.ptc.com/support/support.htm>) of [www.ptc.com](http://www.ptc.com), you can find documents called "Business Process Guides". "Business Process Guides" are process-oriented descriptions of how PTC's Product Development System (PDS) supports common Product Development processes. An example of a process guide that is helpful in understanding the applicability of workflow is "Product Development System Enterprise Change Management Business Process Guide"

## General Guidelines

### Workflow applicability

Workflows are typically applied in concert with lifecycles on a business object instance basis (i.e. document, part, change request, etc...). Keep in mind when designing workflows that processes (instances of workflow) apply to revisions. This means that:

- ☉ A process instance will execute once for all iterations of a given object revision,



- ⊙ Different revisions will go through different process instances.

Workflows can also be instantiated independent of a business object, but this is an atypical case. Typically the motivation for having a workflow is that there is a conceptual data packet that is routed through a process and matures through some sense of state.

Within PDMLink, workflows are typically initiated upon object creation. Within ProjectLink, workflows are initiated for an object ad hoc through the use of routing functionality and also in a coordinated fashion to automate a project plan. In addition, in PDMLink, promote functionality enables ProjectLink route-like functionality in PDMLink for multi-object state transition management.

### Workflows vs. lifecycles

Workflows automate a company's procedures by defining a set of user-based and system automated tasks, task linkages and routing rules, and an automated delivery user experience. The simplest visibility to process state is actually through the use of lifecycle state. Lifecycle state is directly visible on a business object and can be governed by the workflow process. Lifecycle give the following capabilities:

- ⊙ Measure and display information maturity level,
- ⊙ Criteria for search,
- ⊙ Method of control access to data by state,
- ⊙ And can be associated to workflows.

A process monitor is available for graphical and detailed process metric information. This is a very powerful and rich set of information. However, for the typical user, often lifecycle state conveys a simplified adequate sense of where an object is in a process.

### Lifecycle managed objects (Developer's Note)

Lifecycle managed objects are associated with a lifecycle template and one or more workflow templates on a per state basis. Lifecycle state is important for reporting maturity of data, controlling access to that data by maturity, and providing a state based filter for that data. Where state based behavior is not required by your users, it is recommended to develop objects that inherit higher in the object model. Folder resident objects are an example of a simpler object class. Particularly where a large number of object instances are involved, inheriting from the simplest object class possible offers maximum performance.

### Container strategy

Workflow templates can be stored at 3 primary levels within Windchill – Site, Organization, and Container. It is recommended that workflow templates be stored at the highest level where reuse is possible. For example, if all organizations can take advantage of a workflow template it should be stored at the site level. Workflow template reuse is a very powerful notion and should be considered. If the workflow template is truly only relevant within a single library, then it should likely be managed within that library. Keeping the workflow template in the lowest level, like a library, if the template is truly not reusable is a good practice in that it reduces potential clutter across the entire system.



# Workflow Definition

## Activities

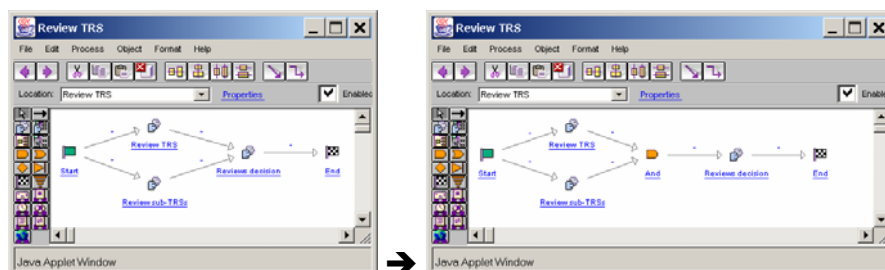
- ⊙ When defining a new activity, identify the Responsible role. The responsible role determines who will be notified if activities are overdue and/or process errors occur.
- ⊙ Enter an activity description. The description will be displayed for reviewing of the process templates or can be showed in the worklist. A URL can be included to reference more detailed documentation, or to provide ready access to stored form templates for attachment to the business object.
- ⊙ An instruction is what tells end-users what to do with the task they will receive. So that it's one of the most important information at the activity level. Tell here why they receive the task, when they may click the "Task Complete" button, and what will happen after. The more information (html format is supported) you give the better...
- ⊙ Make sure end-users have the right access (read, modify, ...) to the information. Applying these access policies at a domain level provides for easy downstream adjustment of those policies across all existing business objects, however the impacts of changing ACLs on executing workflow processes must be considered.
- ⊙ In some cases it is necessary to provide ad hoc "activity based" access rights because the access controls are unique to that instance and it's activity. In general, these should only be used in the most sophisticated workflow situations.

## Workflow variables

- ⊙ It is recommended to not use "space" characters in workflow variable names. Windchill allows using "spaces" in workflow variables. However, these will not be usable in workflow robot java code.
- ⊙ Java primitives are the mostly highly used and recommended workflow variables. They have the advantage of having an out of the box user interface in workflow task forms.
- ⊙ Windchill workflow's capability to track a variable as sophisticated as desired is very powerful. Because workflow variables are serialized when persisted into the database, it is very important to pay attention to how that class is serialized. If the serialization signature changes between releases of your process, you risk having process instances that contain serialized variables that are not decodable. So, if you change the object's serialization signature, it is important to provide serialization support for all previous signatures.

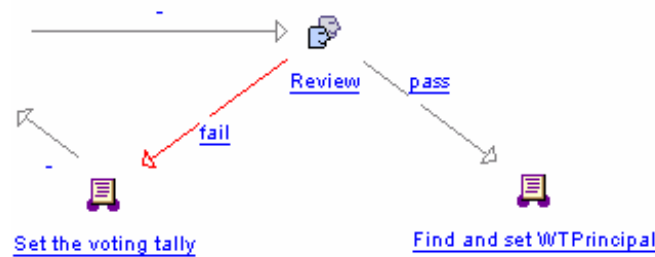
## Parallel activities

- ⊙ Use an "and" or an "or" connector when several parallel activities join into a single branch:



## Loop links

- ⊙ Identify as “loop link” the first link in the workflow path which may be used more than once:



## **Lifecycle State Mapping**

It is recommended in almost all workflow implementations to associate a single parent workflow with a life cycle to control all of an object's possible states. Here are some of the reasons behind this recommendation:

- ⊙ It's easier to manage one workflow association with the lifecycle instead of a separate one for each phase
- ⊙ Variables sharing across all activities
- ⊙ Variables sharing across the different lifecycle's states
- ⊙ It is possible to define loops to any activity when using a single workflow. It is not possible to loop among activities in separate processes.
- ⊙ Better performance results from less process overhead
- ⊙ It's easier to manage and monitor fewer running process instances

The parent workflow need not be large or complicated. It can be broken down into blocks and sub-processes so that you can obtain the same reuse and complexity reduction benefits with a single parent workflow as you can with a workflow associated with each phase and gate.

## **Role Resolution**

Roles for an activity are resolved at run-time so that the workflow can be re-used. Role resolution is just one mechanism for assigning participation to an activity. Roles are resolved from a team assigned in that activity by name or variable or from the object's team. The object's team is resolved using the team template, the life cycle template and, for Windchill PDMLink and Windchill ProjectLink, the context team.

- ⊙ The object type object initialization rules declare a lifecycle and team template for that object.
- ⊙ On instantiation of the object, a team instance is created for that object and is initialized the following way.
  - Team roles are determined by the combination of the lifecycle template and team template roles. Note that this does not include the container roles.

- Role membership is determined by the combination of the container team and the team template.
  - If the role does not exist in the team template, then the role membership is determined by the combination of the container team and the lifecycle template.
- ⊙ Note that if the container team or the team template are modified after object creation, the object's team must be augmented (refreshed) if it is desired that those changes always remain current within the process.

## Workflow Java Code

Note that activity java code is limited to 2000 characters, so create classes for more complex processing.

### Static code

- ⊙ Use static code calling helpers themselves calling server's methods
- ⊙ Java code in workflows should be minimized. So clean workflow coding would contain primarily calls to helper classes. This provides advantages to reuse of workflow helper capability and also improves testing efficiency through modularization.

### Exception handling

Properly deal with exception handling, as incorrect exception handling gives:

- ⊙ Hidden exceptions and no action taken,
- ⊙ Workflow that won't complete,
- ⊙ Unwanted behaviors

A good practice is to:

- ⊙ Return a "result" attribute in order for the workflow process to be routed specifically,
- ⊙ Return an "error Message" attribute in order for the next step of the workflow to have some information to give.

### Tests

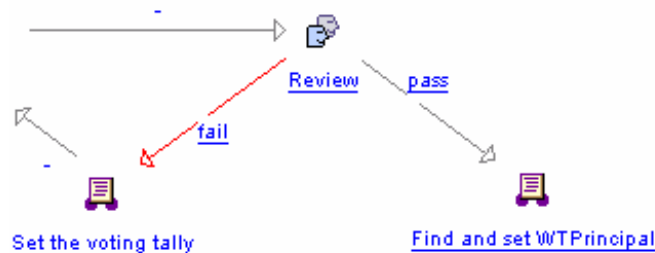
- ⊙ If the workflow contains pieces of java code, first test this code separately from the workflow using a small stand-alone Windchill client application. Also execute "Validate Code" frequently to make sure you code is functional.

### Synchronizations

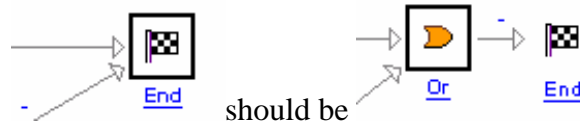
- ⊙ Avoid class-based synchronizations. Class-based synchronization typically creates excessive event firing. Typically when class-based synchronization is used, object-based synchronization would be even more effective.

# Workflow Testing

- ⊙ Iterations: Perform a check-in on the workflow before testing it. If you forget to check-in the workflow template, you won't be able to modify it anymore until the already launched workflow instances are terminated.
- ⊙ Flow Logic:
  - Reviewer should check for reasonable flow logic making sure there are no unterminated paths.
  - All looping paths should contain a loop link indicated in red.



- Multiple paths should converge with an and/or connector:



- Multiple paths may converge on tasks if only one path can fire per loop:



In this example 3 paths converge but only one can fire at a time.

- ⊙ Latest workflow instance: Lifecycle should always point to the latest workflow iteration.
- ⊙ Validate workflow: In the workflow editor execute the Validate All command.
- ⊙ Syntax check: In the workflow editor execute Check Syntax for all expression robots, task tallying, java code, etc.
- ⊙ Data: If the workflow modifies the data it applies to, or even just modifies the state, using csv load files to create the test data can be helpful. This allows for quick deleting and re-loading of the data for other tests.
- ⊙ Principal Setting: If expression code is used to set a lifecycle or similar function make sure this is done as the object creator not as the default administrator.



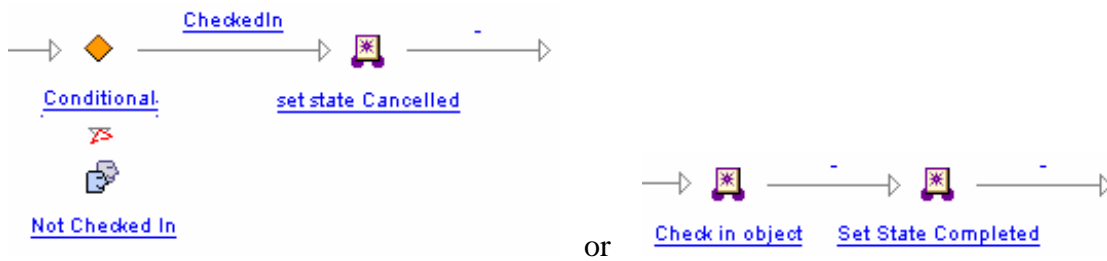
contains the code:

```

wt.org.WTPPrincipal creator = (wt.org.WTPPrincipal)wtcr.getCreator().getObject();
wt.session.SessionHelper.manager.setPrincipal( creator.getName() );

wt.lifecycle.LifeCycleHelper.service.reassign(wtcr,wt.lifecycle.LifeCycleHelper.service.getLifeCycleTemplateReference("My Lifecycle Template"));
  
```

- ⊙ Set State checking: In the case of a version/iteration controlled object such as WTDocument there should be code for checking whether the object is shared and/or checked in prior to each set state robot.



- ☉ Proxys: If workflow proxys are used and you are using loadfiles, make sure the proxies are imported first.

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  - Simulation/Analysis
  - Production
  - Design Collaboration
- Windchill PDMLink
- Windchill ProjectLink
- Pro/INTRALINK
- PTC Online Tools

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### **E-PROFILES IS HERE!!**

We have been eagerly anticipating the debut of the new electronic version of Profiles Magazine and now it is here! This new web site will supplement the print edition of the magazine and will

provide new useful features not feasible with paper media. e-Profiles will provide you with 24x7, worldwide access to key information previously available exclusively in the print version. "Tips & Tricks," a popular feature pioneered by Pro/USER, has also moved to the web and will be expanded as the site matures.

Please take a few minutes to check out this new web site. We don't think you will be disappointed.

<http://profilesmagazine.com/>

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## Upcoming Events & Training Class Schedules

Upcoming, 2006	Your local Pro/Engineer User Groups <a href="http://www.ptcuser.org/rugs/">http://www.ptcuser.org/rugs/</a>
June 4 - 7, 2006	Dallas, Texas PTC/USER International Conference <a href="http://www.ptcuser.org/">http://www.ptcuser.org/</a>

### Events

Our seminars and conferences seek to provide you with relevant information regarding product development trends in your industry as well as innovative software learning experiences. Think of them as a constructive day off where you can share experiences and swap ideas with your peers.

If you can't manage to get away, we'll bring it to you. Check back often for regularly scheduled live webcast events.

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<http://www.ptc.com/services/edserv/index.htm>

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Sessions are performed just like a traditional ILT (including interactive exercises where you and the instructor can work on lab exercises together) and feature some of our most popular ILT courses. These sessions cover the exact same material as the traditional ILT in-center courses. Also look for some of our most frequently requested mini-topics delivered in the same format that are only an hour - two hours in duration.

If you have any questions about these sessions or would like to see getting other courses, not on this list, on the schedule please feel free to contact me for more details. They are a great way to bring training to you without you having to worry about location or being out from work for long stretches.

You can register for these sessions just as you would for any normal ILT class either by:

1. calling order admin at <http://www.ptc.com/services/edserv/training/registra.htm> or
2. you can go to PTC University directly at <http://www.ptc.com/learning> and submit a registration request directly. All you have to do is search the catalog by typing in “virtual” in the search field and you will see a listing.

## PTC

**Note:** This PTC E-Newsletter will continue to be used for the following:

- 1) Inform you on events related to PTC products (user groups, conferences, training schedules, etc.)
- 2) Educate you on solutions that are available at PTC
- 3) Tips & Techniques using PTC Products

**Note:** These messages are compiled in the local PTC office and will be distributed via e-mail.

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