I bought Pro/NC... Now What?!?

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Agenda

- 3 steps
  - Foundation
  - Workflow
  - Documentation
- Supplemental information
- Q & A (time permitting)

First, CONGRATULATIONS!

The reasons you bought Pro/Engineer, and Pro/NC probably include:

- ***Fully integrated and associative Machining applications***
- ***NC Programming Functionality***
  - Mill
  - Turn
  - Wire EDM
  - Post-processing
  - Verification
  - Process planning and documentation
- ***Robust automated toolpath creation***
- ***The most versatile NC programming solution available***
  - Machines anything
- ***Enables truly concurrent design through manufacturing***

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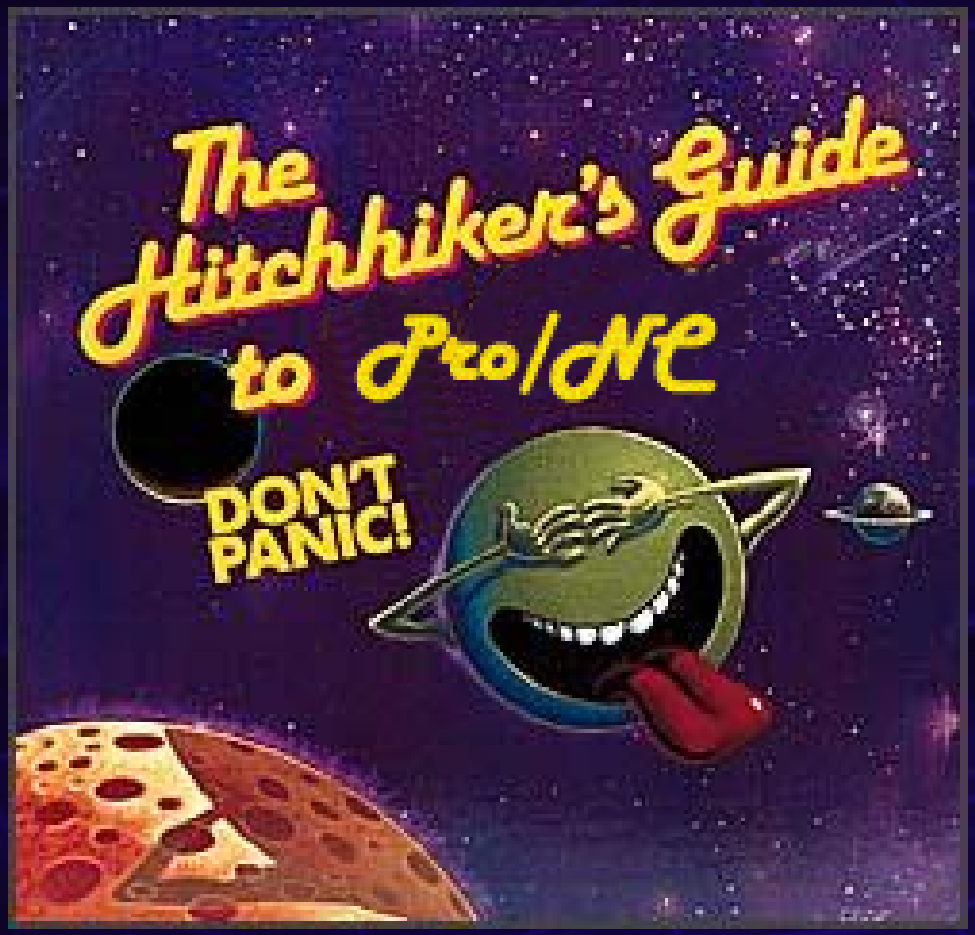
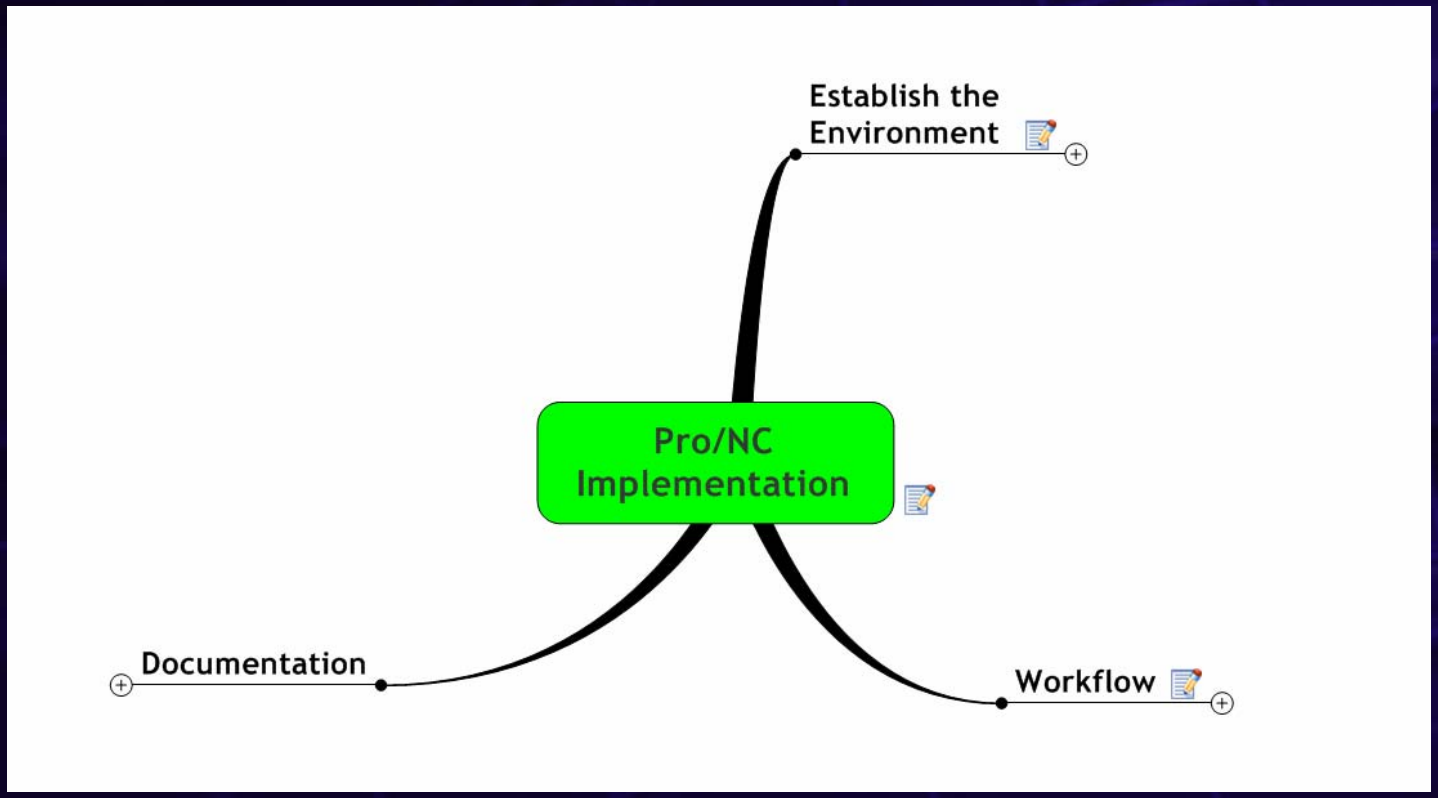
Next, Don't PANIC!



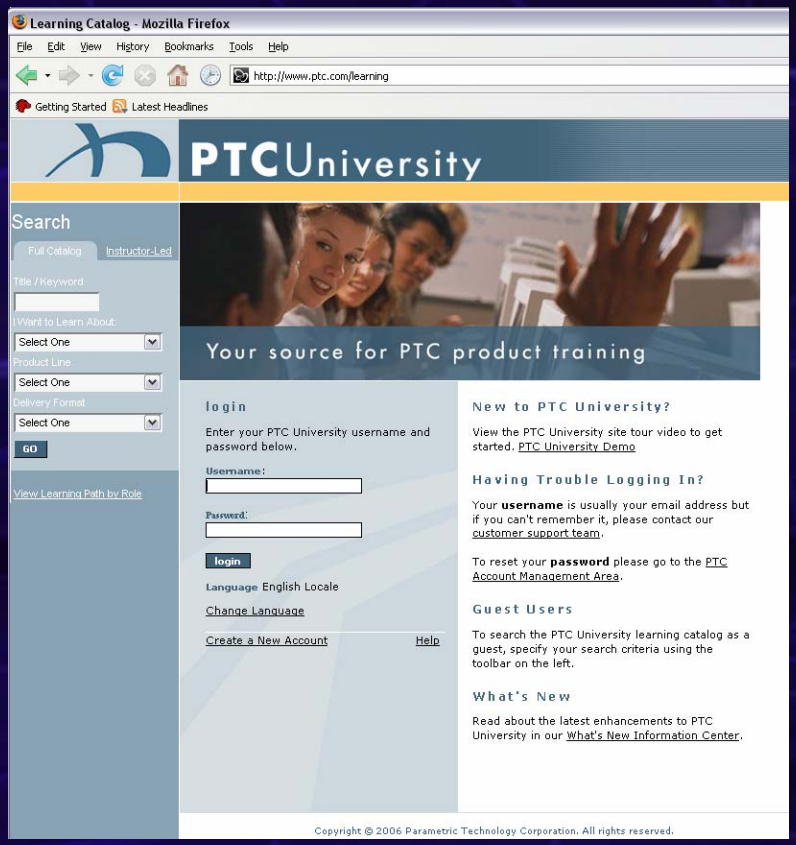
The Plan

- 3 phase approach to complete implementation



Training – It's not optional!

- Some choices include:
  - PTC University
    - www.ptc.com/learning
  - Certified Training Partners
    - www.ptc.com/partners/training/index.htm



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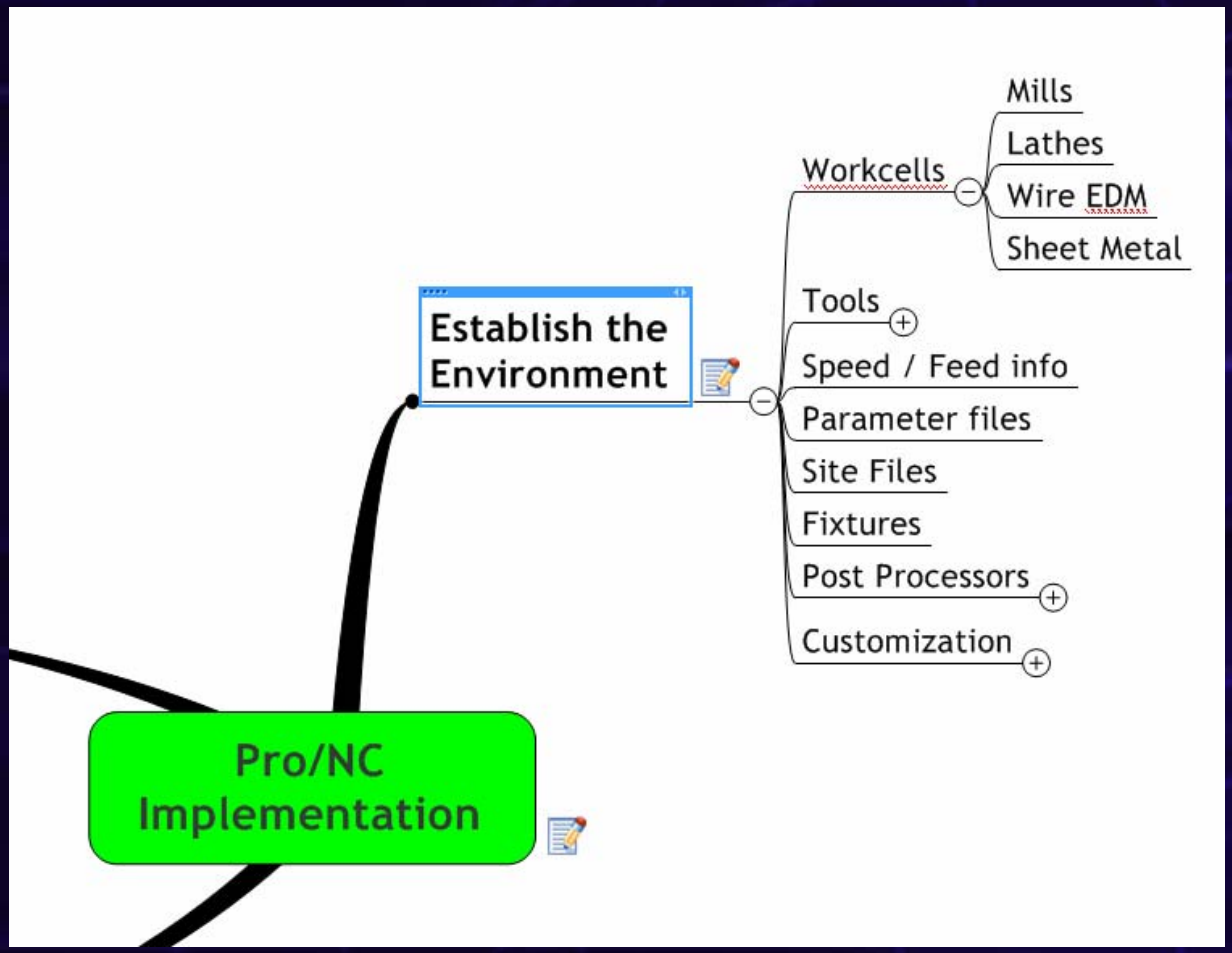
Establish the Environment

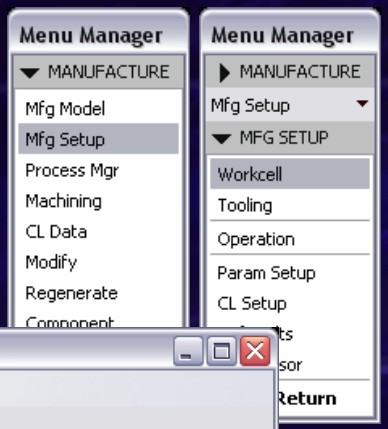
- Step 1: Set up the foundation

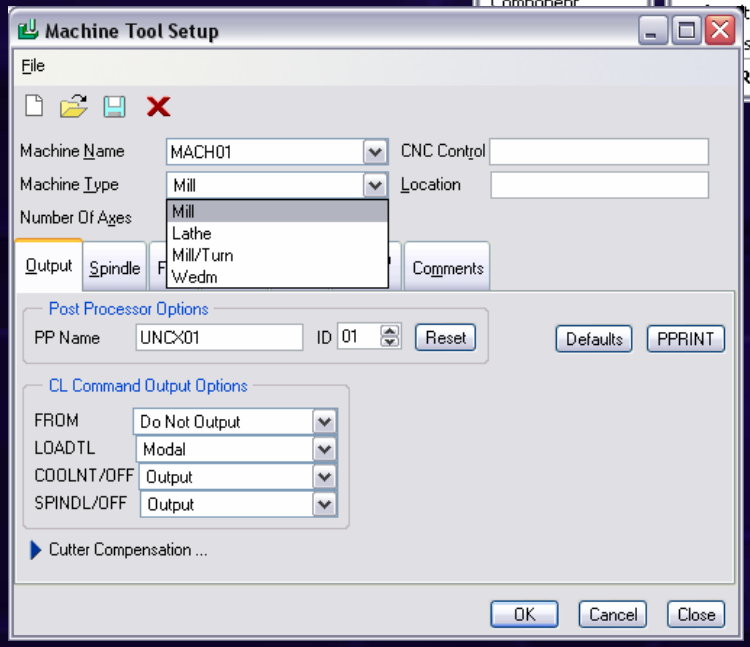


Workcells

Config.pro option: pro_mf_workcell_dir <drive?:\path\to\workcell\directory>

- Mills
- Lathes
- Wire EDM





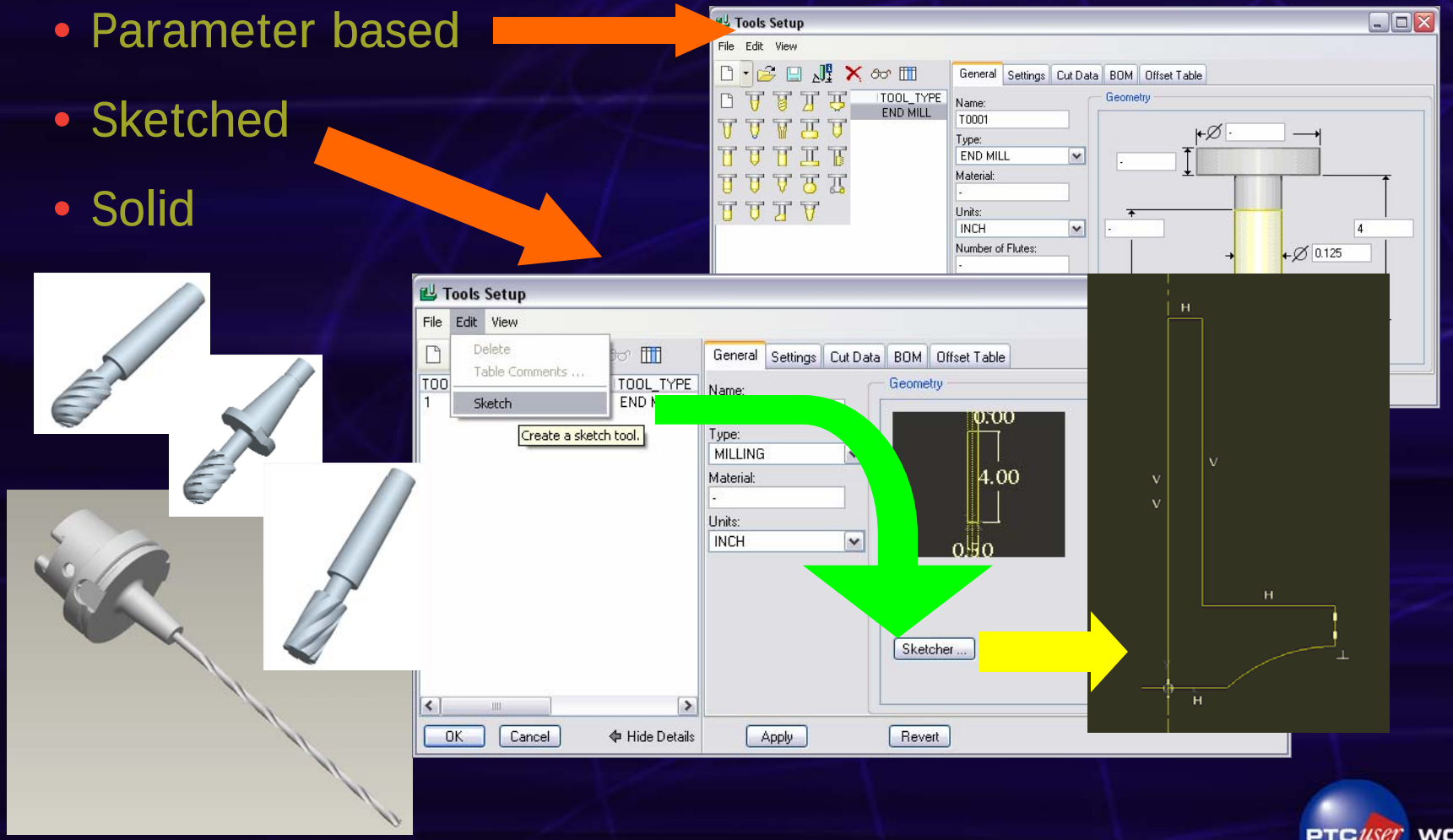
Don't forget to SAVE them!

- Sheet Metal

Tools

Config.pro option: pro_mf_tprm_dir <drive?:\path\to\tooling\directory>

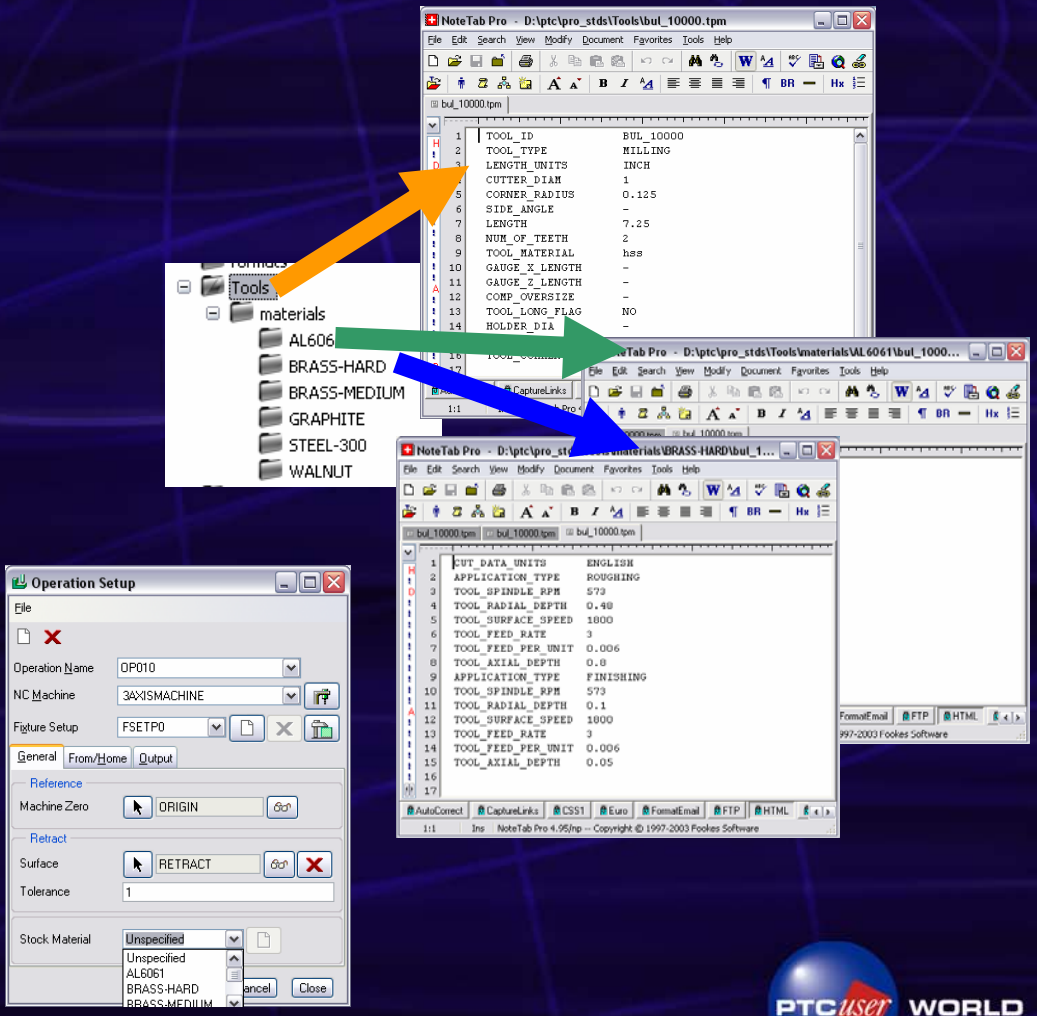
- Parameter based
- Sketched
- Solid



Speed / Feed info

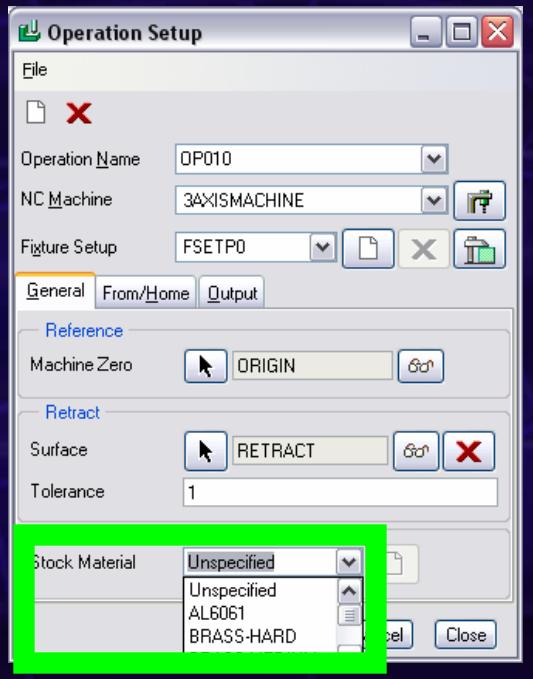
Config.pro option: pro_mf_tprm_dir <drive?:\path\to\tooling\directory>

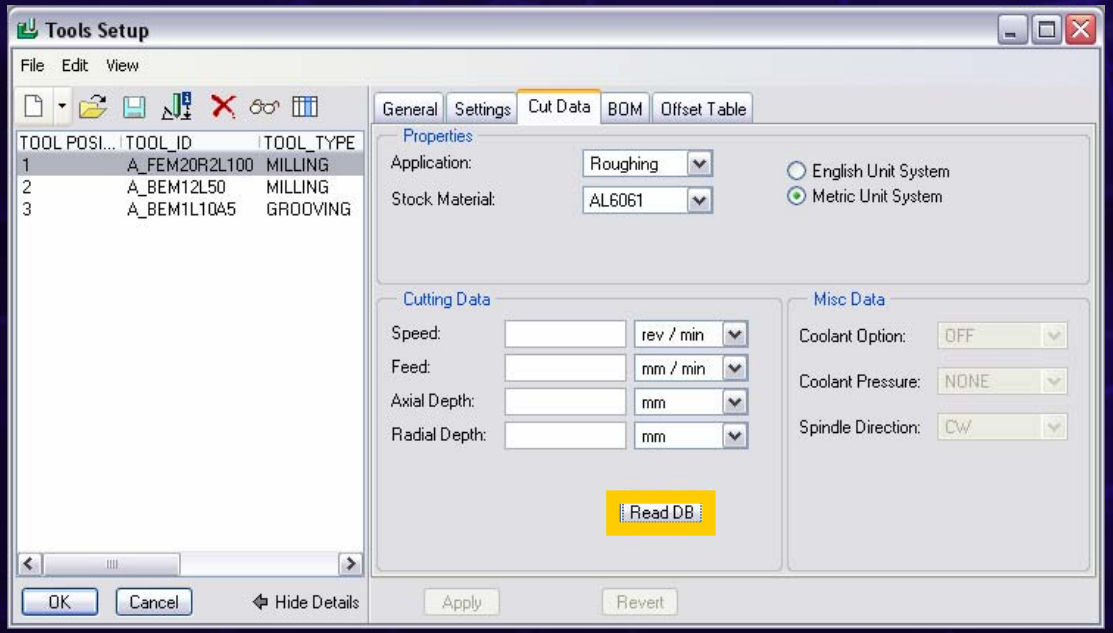
- Pre Wildfire 3.0:
  - Use a directory structure / flat ASCII files (*.tpm)
  - *.tpm for tool geom
  - *.tpm for speed / feed
    - One folder / material



Speed / Feed info (con't)

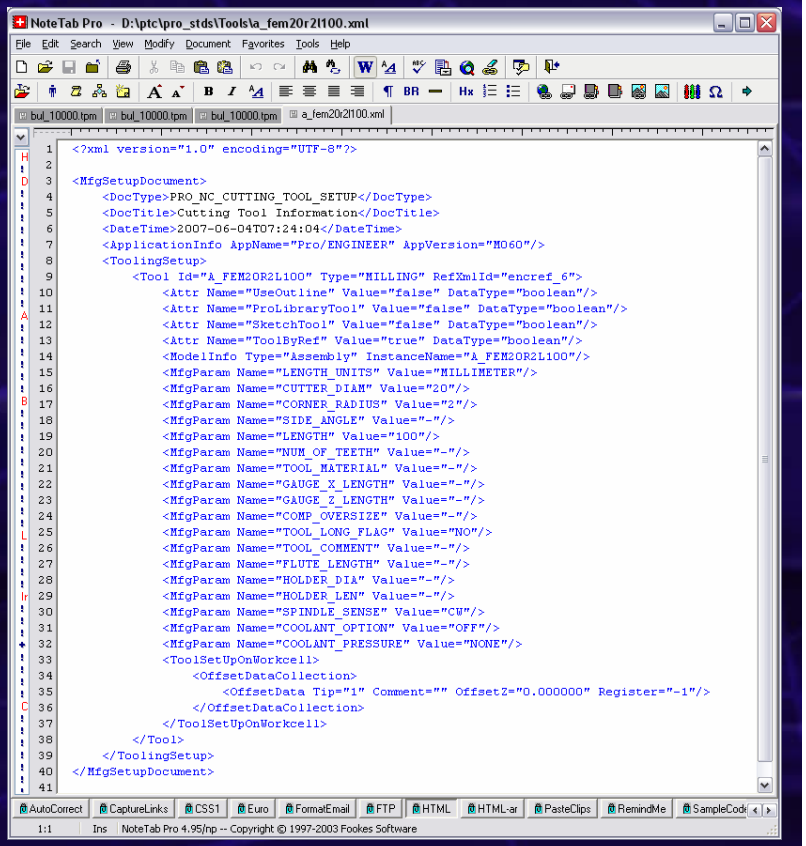
- Select material in Operation drop down menu, then...
- Read DB option in tooling dialog
- One method for entering S / F data





Speed / Feed info (con't)

- Wildfire 3.0 and beyond:
  - Store the machining tool parameter file in XML format, simplifying the interface to the external tool database management system. This single file, combining tool geometry and cutting technology, can also be easily managed by PDMLink.



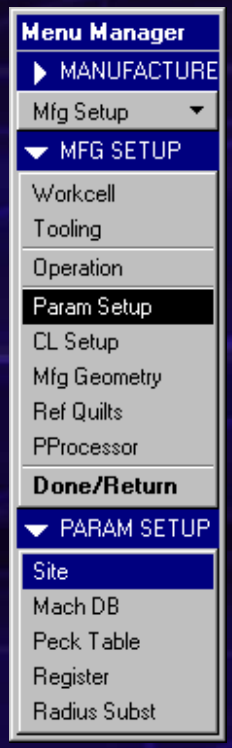
Parameter files

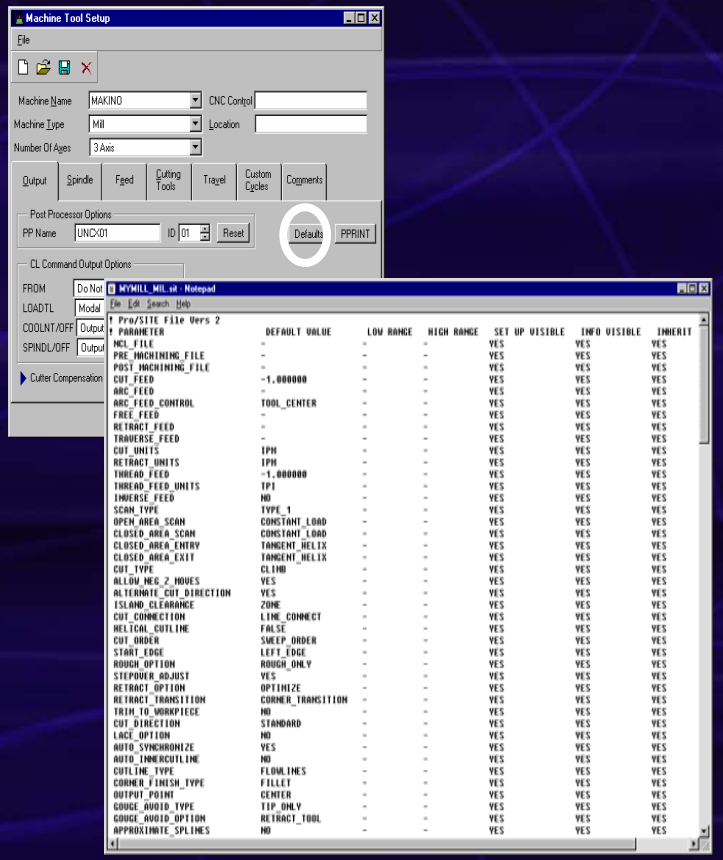
- Loading Parameters from a File
  - Store and retrieve parameters from your disk:

    Store specific manufacturing strategy
  - Search path defines by Pro_mf_param_dir config.pro option (default is working directory)
  - Parameter(s) loaded from a file will overwrite current setting
  - Parameter file can contain from one to all the parameters for a specific toolpath
    - Good for automation :
      - ***Create a Parameter with 1 single line:***
      - ***Create a mapkey to load the parameter file***
      - ***Create as many as you need***

Site Files

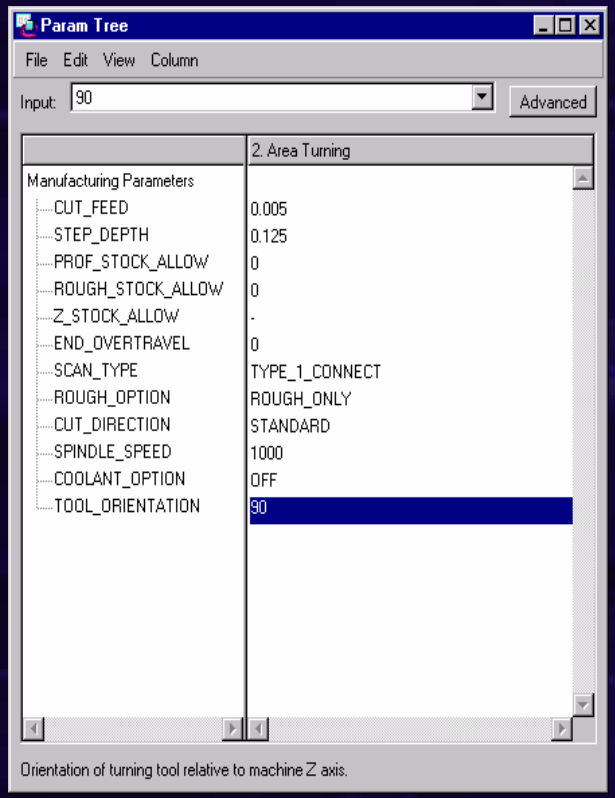
- Site File allows you to setup defaults for all the manufacturing parameters
  - Created in Pro/NC or with a text editor
  - Loaded or stored with the Workcell
  - Parameter and Site files have certain '-1' options which need to filled in every time
  - Minimum and Maximum values can be controlled
  - Visibility can be controlled (NC Sequence and Info)
  - Inheritance can be controlled (site changes - NC sequence changes)





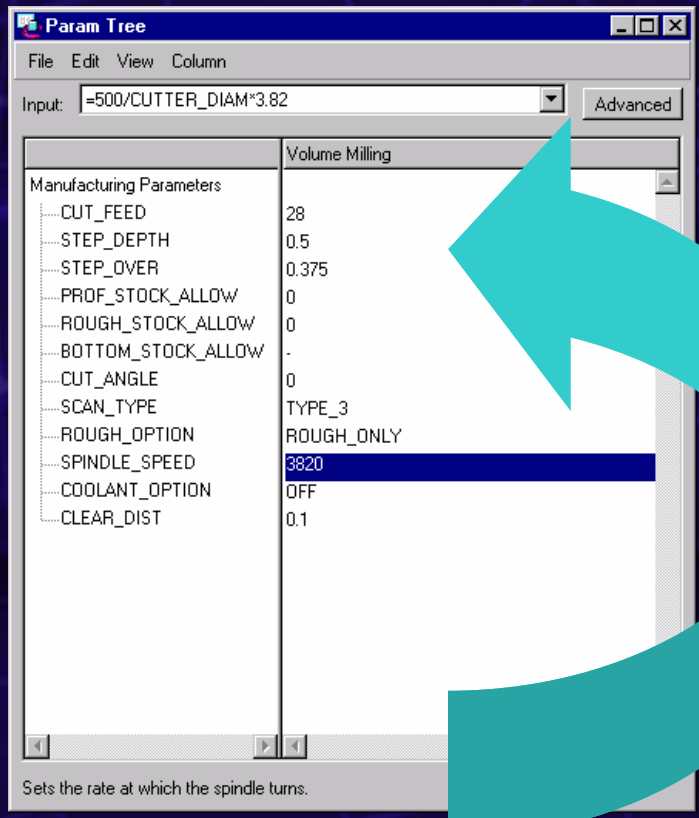
Site Files (con't)

- Values can be 'hard-coded'



-or-

- Driven via relations

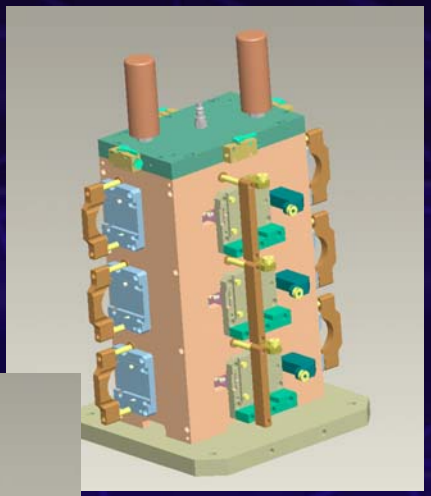


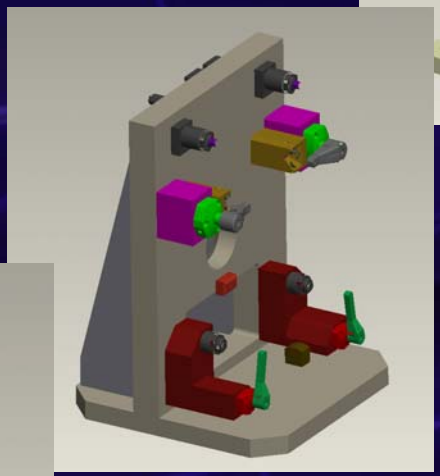
Spindle speed=500/cutter_diam*3.82

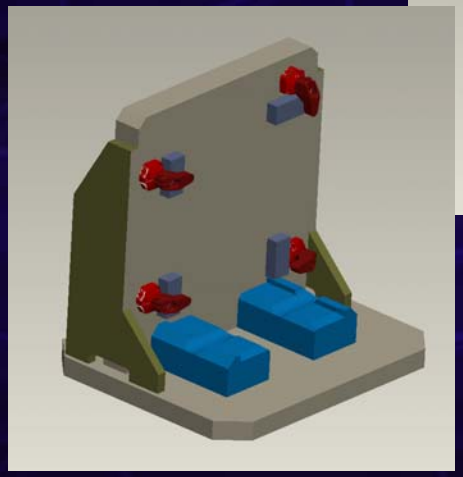
Relations can be used in parameters, too!

Fixtures

- Are optional, but can be useful for visualization and collision avoidance
- May consist of assemblies or a single part







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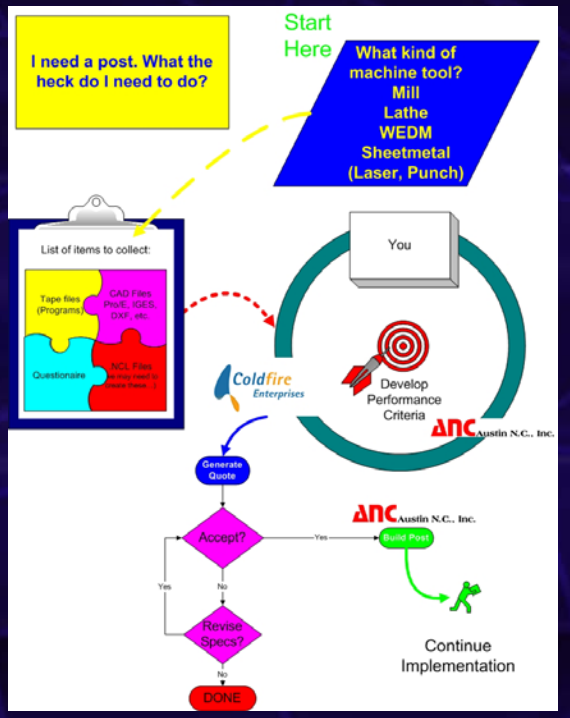
Post Processors

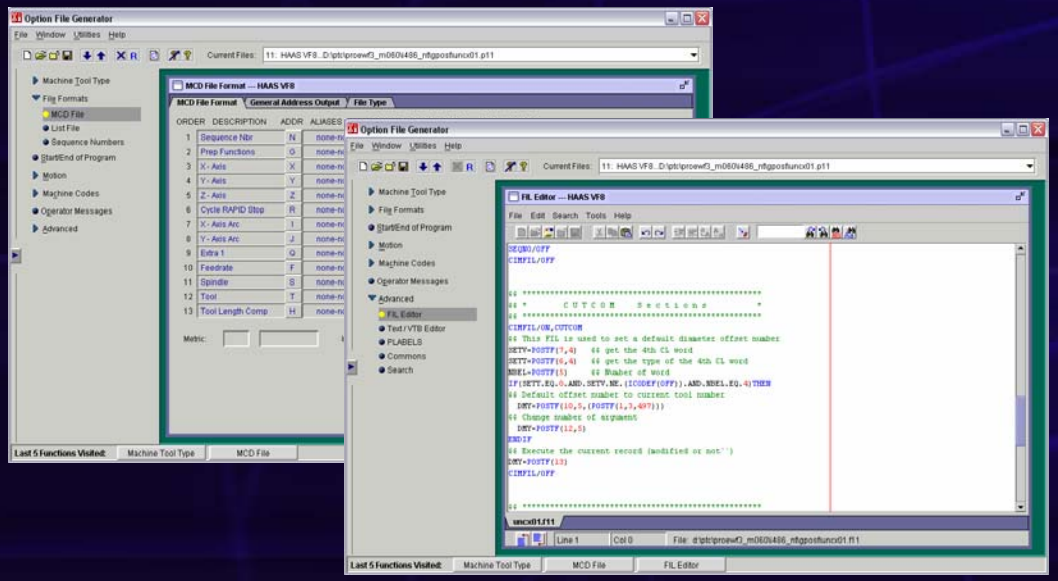
- Mills
- Wire EDM
- Lathes
- Sheet Metal

NC G-Post

•Best-in-Class Post Processor Development tool

•FREE! Bundled with Pro/NC





- Do it yourself, or
- Have one built

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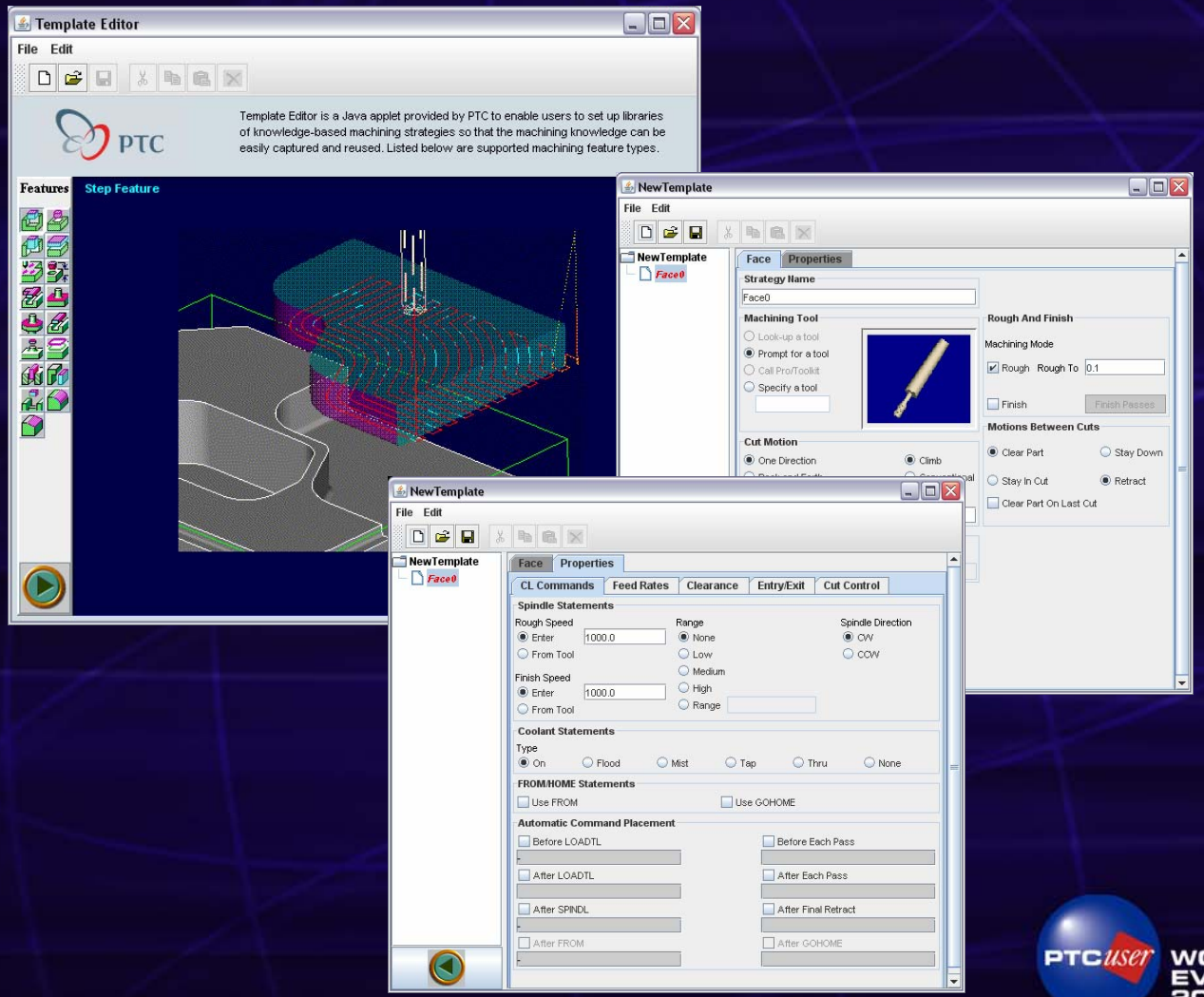
Customization

- Templates available in Expert Machinist:
  - Step
  - Pocket
  - Profile
  - Face
  - Hole making
  - Through Pocket
  - Channel
  - Slab
  - Flange
  - Slot
  - Boss top
  - O-Ring Groove
  - Through Slot
  - Undercut
  - Rib top
  - Round
  - Chamfer

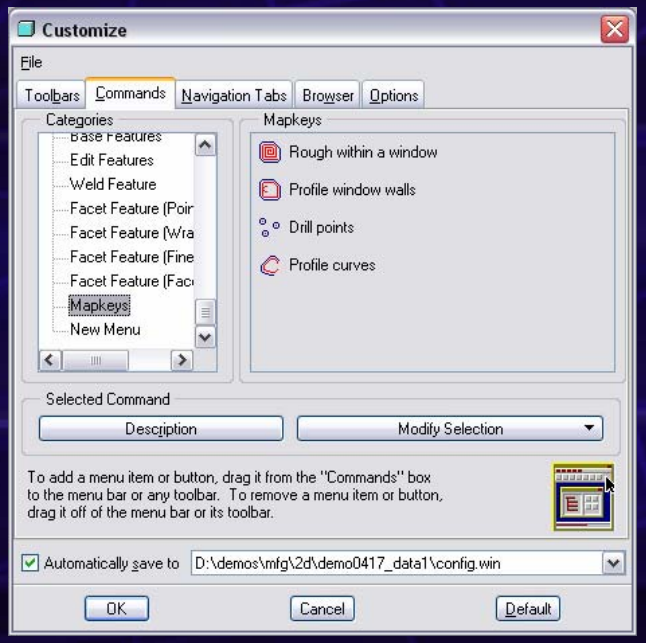


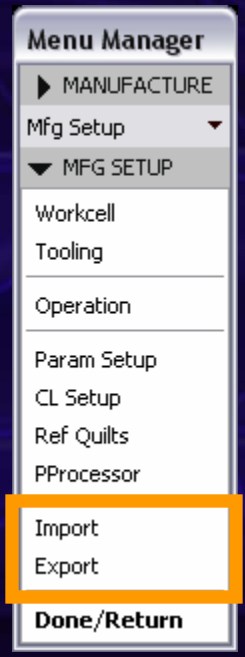
Customization (Con't)

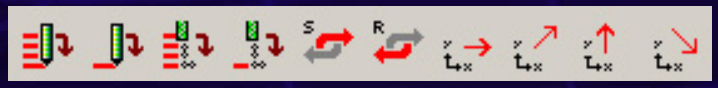
Stuff you can build:

Start Models
- Fixtures
- Operations
- Workcells
- etc.

- Mapkeys
- Menus / Toolbars
- Icons
- Templates (XML)
- M/UDF's
  - Holes
  - Threads
  - Pockets
- **Other Apps**
  - Toolkit
  - Weblink
  - External Applications







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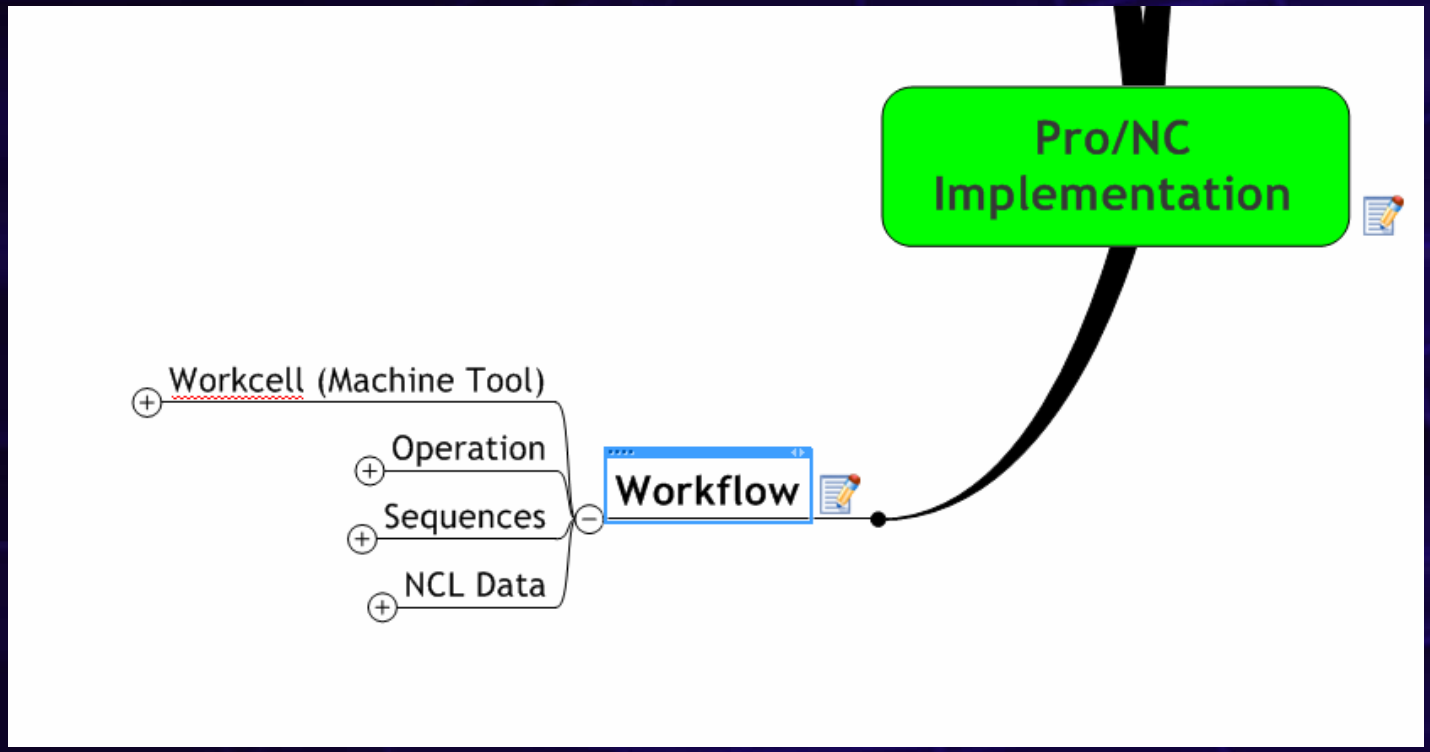
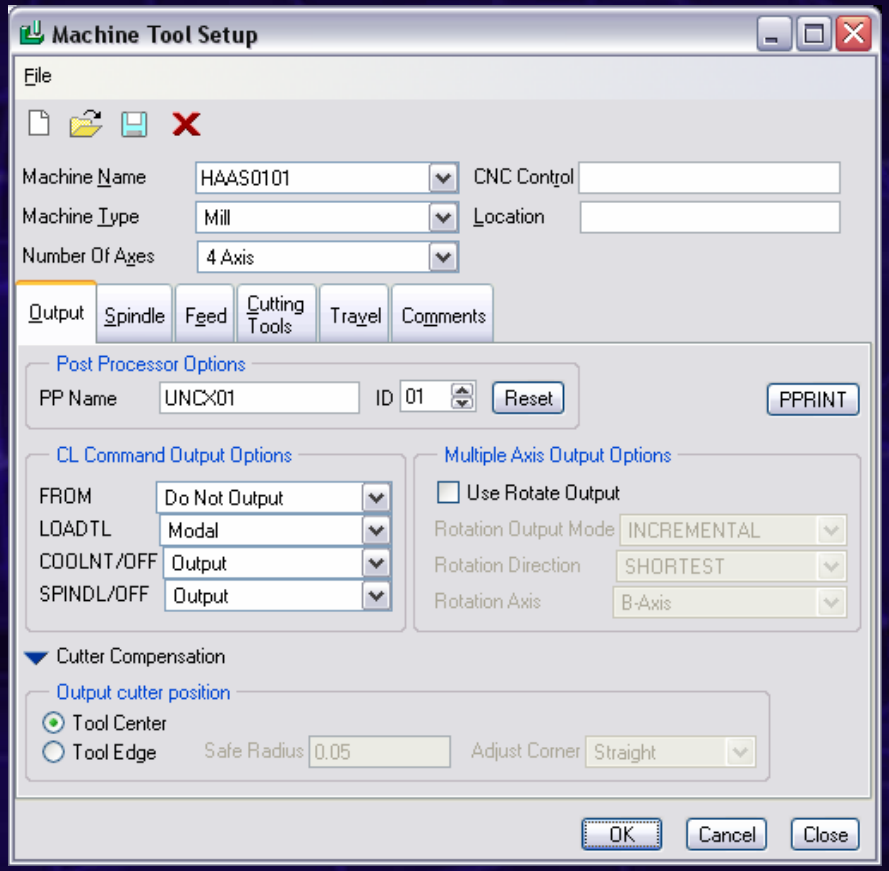
Define the workflow (or using the tools)

Step 2: Create the toolpaths



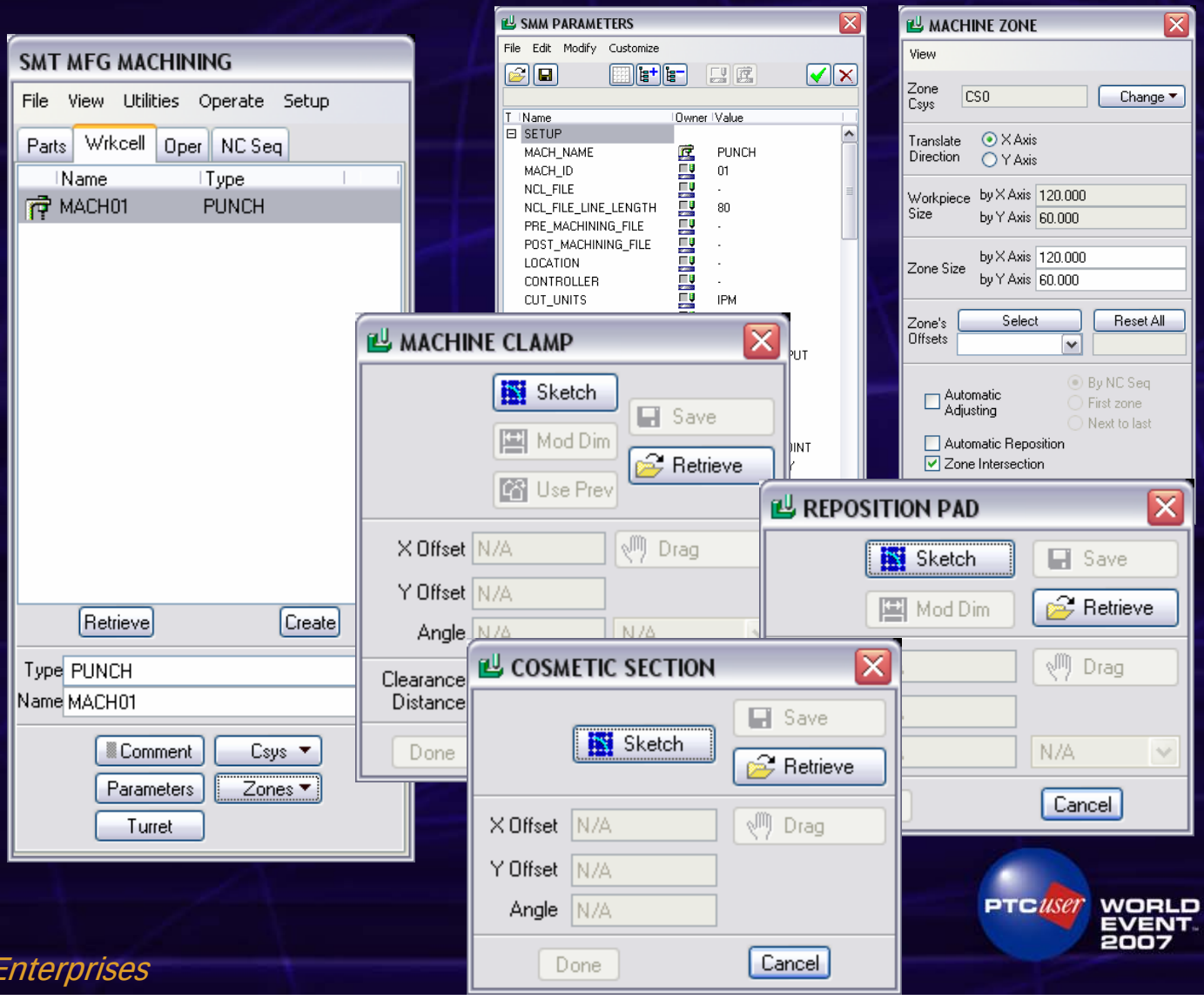
Workcell (Machine Tool)

- Type
  - Mill
  - Lathe
  - Wire EDM
  - Sheet Metal
- Number of Axes
- Output
- Spindle
- Feed info
- Cutting Tools
- Travel
- Custom Cycles
- Comments
- PPRINTS
- Cutter Comp. configuration



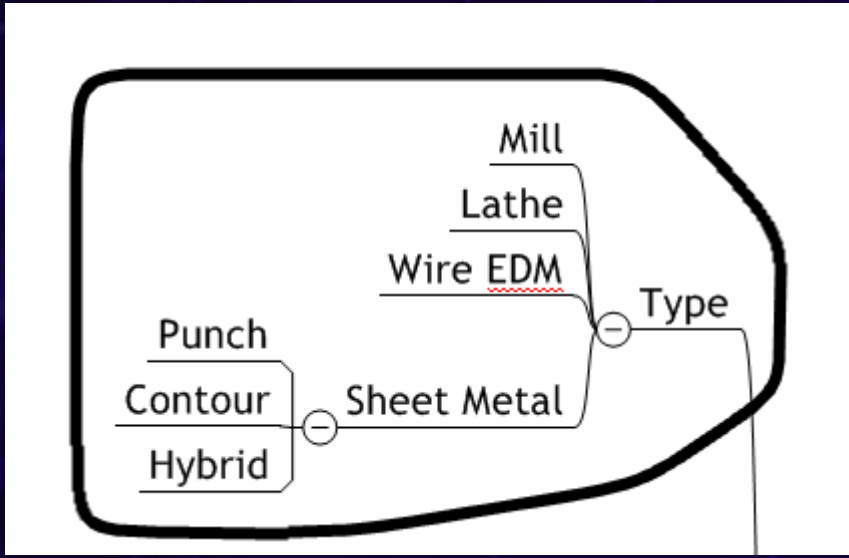
Workcell (Machine Tool) - Sheetmetal

- Sheetmetal
  - Parameters
  - Zones
  - Clamps
  - Turret
  - Pads



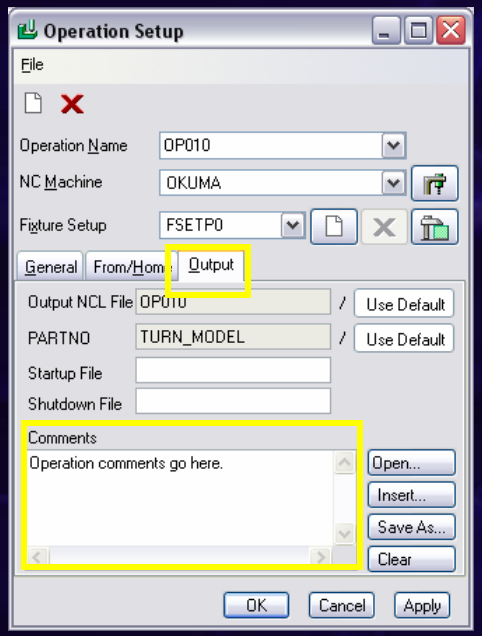
Type

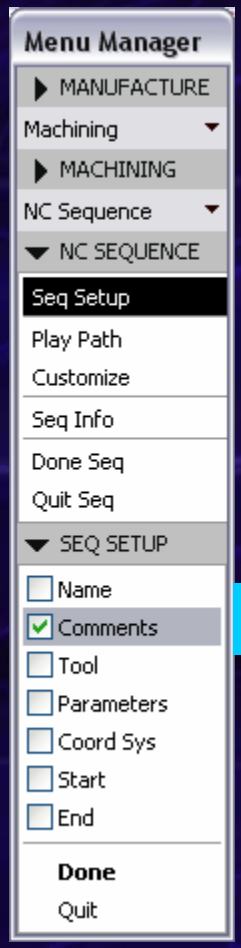
- Mill
- Lathe
- Wire EDM
- Sheet Metal
  - Punch
  - Contour
  - Hybrid



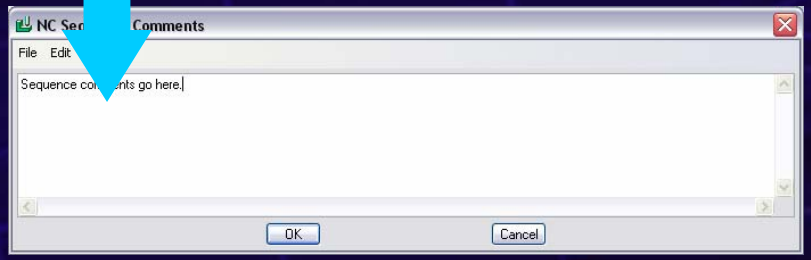
Comments

- Comments can be added at the operation level...



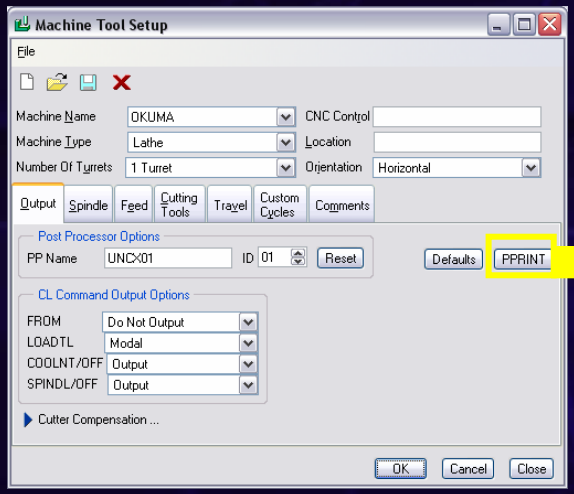


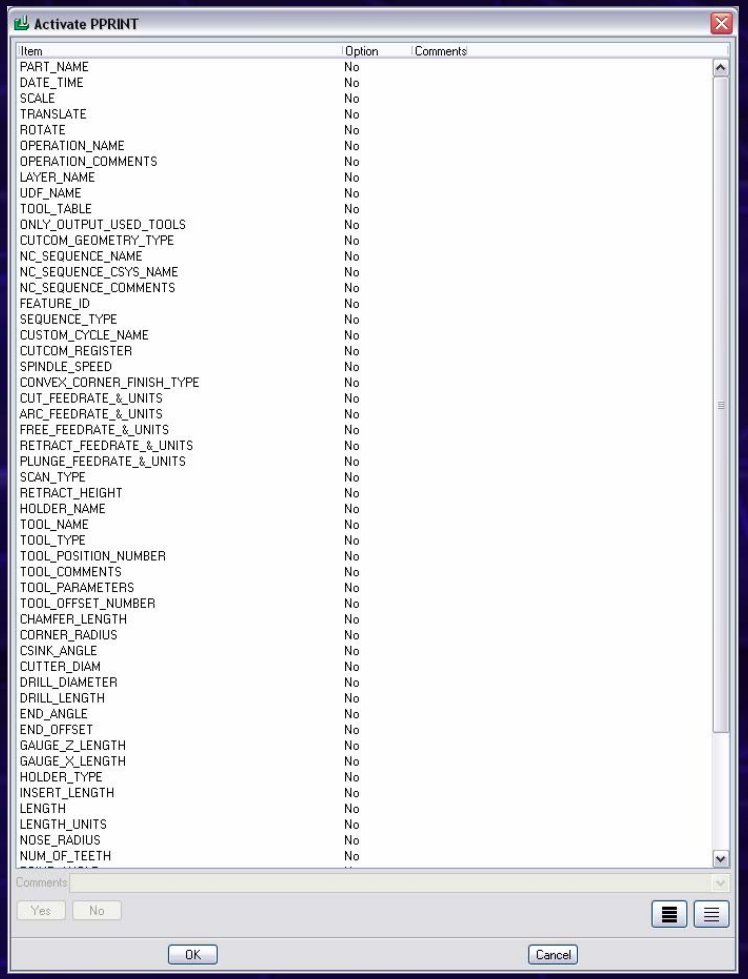
...or at the sequence level



PPRINTS

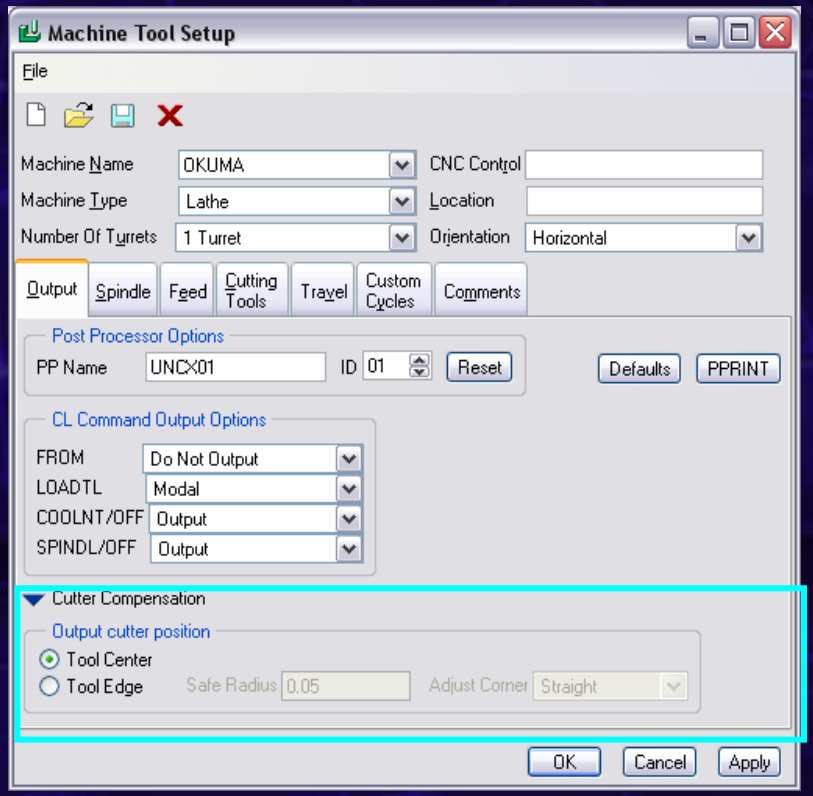
- Add information to be passed to the post processor, or the operator
- Save PPRINT file for later retrieval





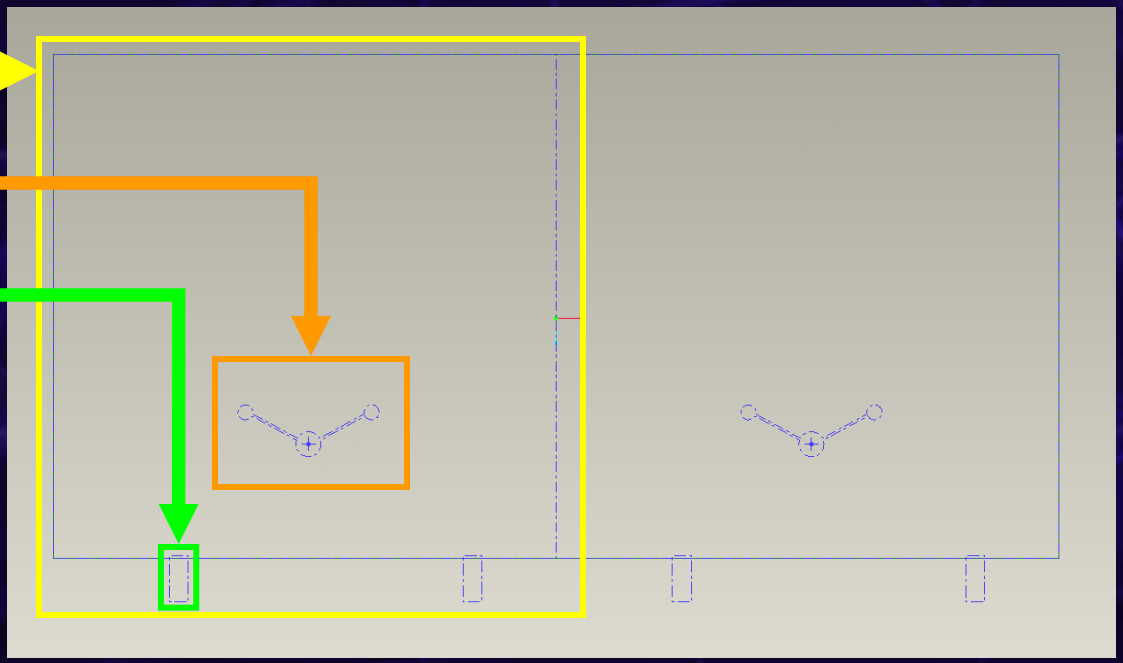
Cutter Compensation configuration

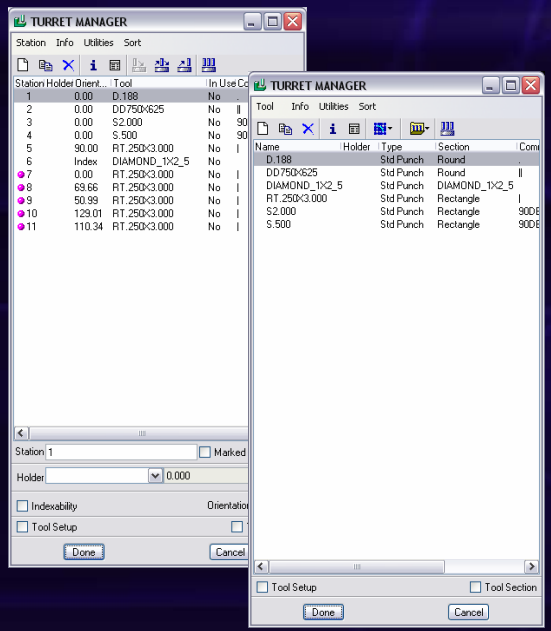
- Defined in Workcell
- Output defined for either:
  - Tool Center
  - Tool Edge



Sheetmetal

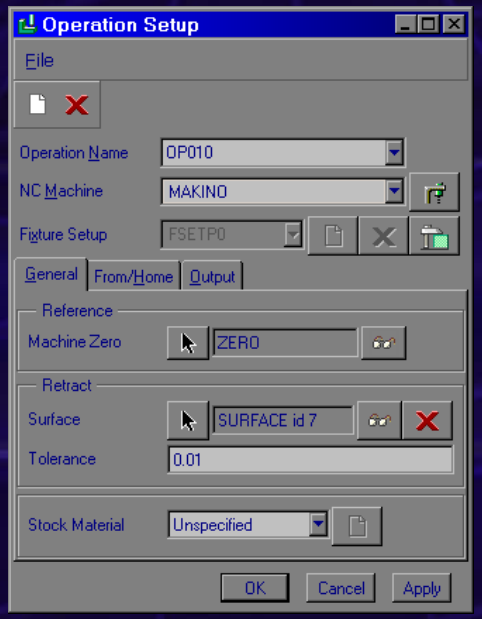
- Zones
- Pads
- Clamps
- Turret





Operation

- Machine tool *
- Coordinate system *
- Retract *
- Stock Material
- Fixture Setup
- Mfg Geometry



* required!

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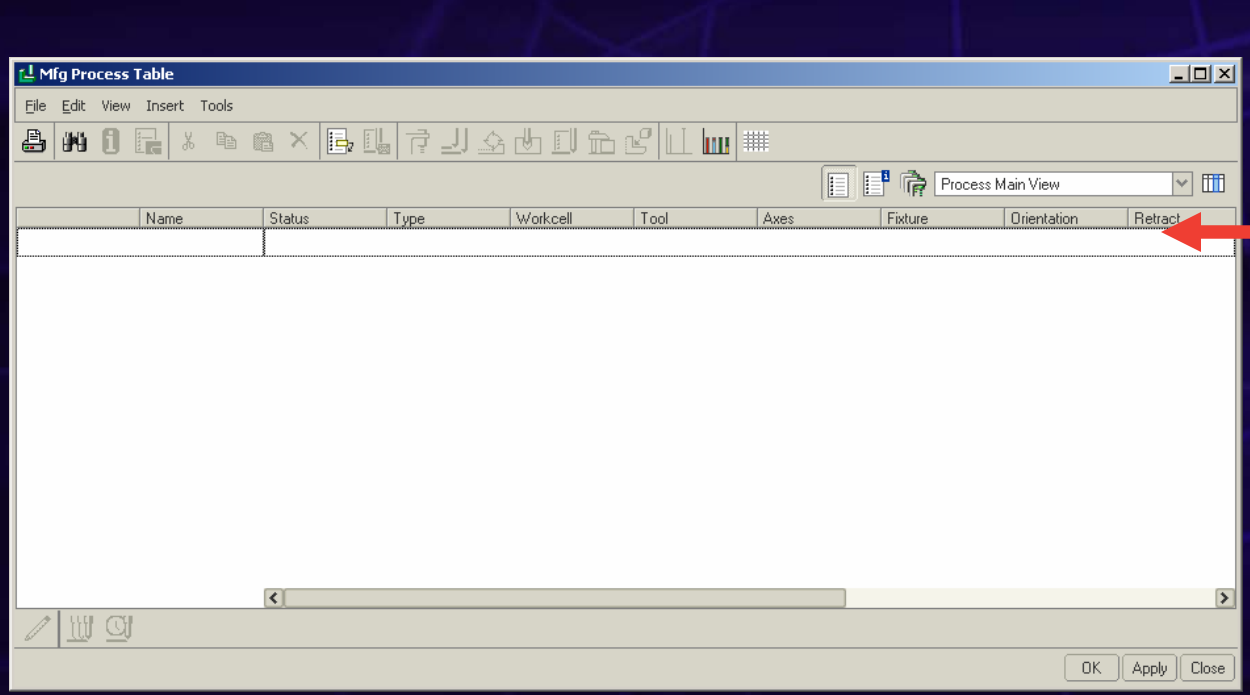
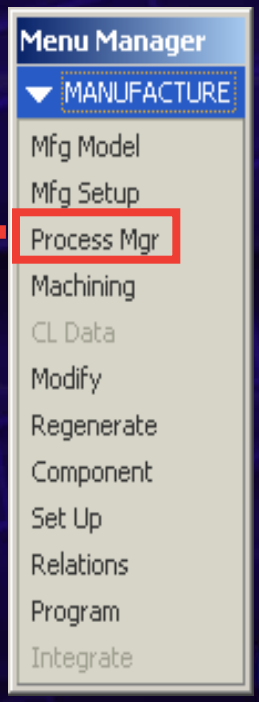
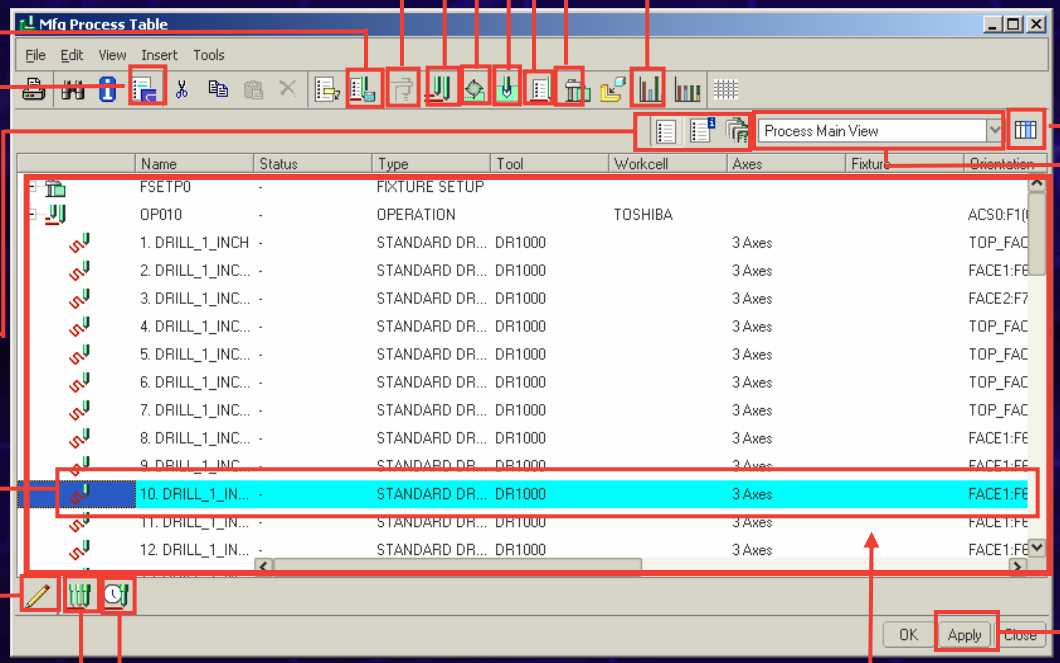
Meet the Process Manager...

- The Process Manager can be called from a Pro/NC session
  - Manufacture / Process Manager 
  - This is the central control point for the process creation





Overview of the GUI



Create holemaking step

Create step from template

Create Jig/Fixture

Create milling step

Create Operation

Time Graph

Create Workcell

Create Template

View builder

Highlight step references

View selection

View types

Create NC Features

Selected Step

Edit Selected Step

Play Path

Time computation

Steps view area

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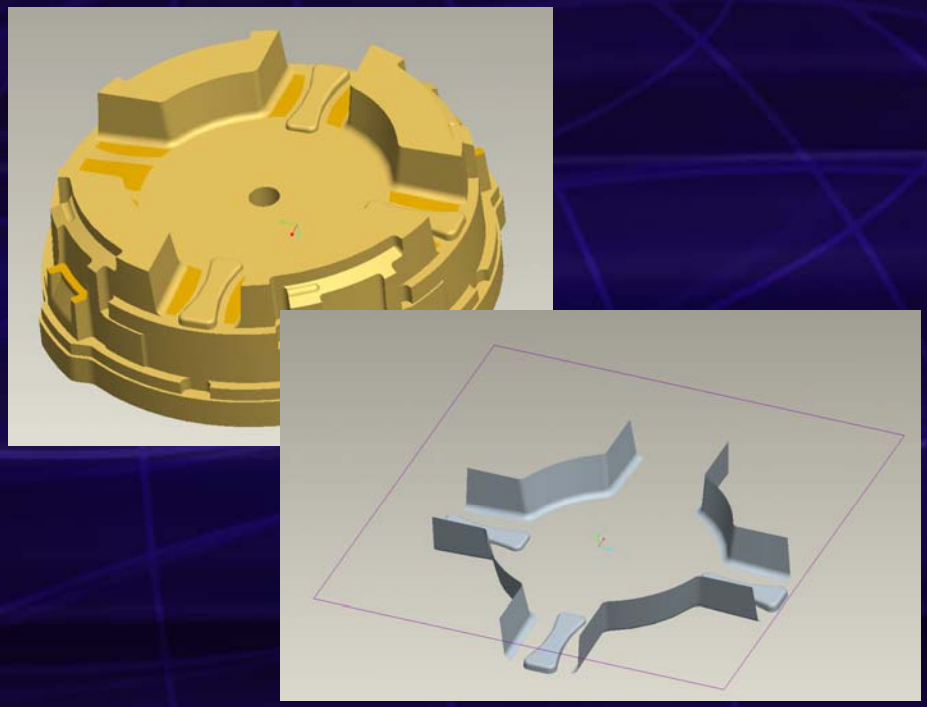
Sequences

- Mfg Geometry (optional)
- Types
- Parameters
- Tools
- Geometry
- Customize

Mfg Geometry (optional)

- Can be used to define surfaces to cut
  - May be different from the reference model
- Use as a ‘collection feature’ to save time when selecting geometry to cut
- Types
  - Window
  - Surface
  - Volume
  - Hole Group



Sequence Types: Milling

- Volume
- Local Mill
- Surface
- Facing
- Profiling
- Pocketing
- Trajectory
- Aux
- Engraving
- Plunge
- Roughing
- Re-Roughing
- Finishing
- Holemaking
- Thread

Sequence Types: Turning

- Area
- Profiling
- Groove
- Thread
- Holemaking
- Aux

Sequence Types: Wire EDM

- 2 Axis
  - Contouring
- 4 Axis
  - Taper Angle
  - XY-UV Type
- Aux

Sequence Types: Sheetmetal

- Contouring
  - Aux
  - Contouring
  - Slitting
  - Approach Punch

- Punching
  - Edge Nibble
  - Area Nibbling
  - Slot
  - UDF Punch
  - Point Punch
  - Tool Shaping
  - Forming
  - Shearing
  - Aux

Sheetmetal (2)

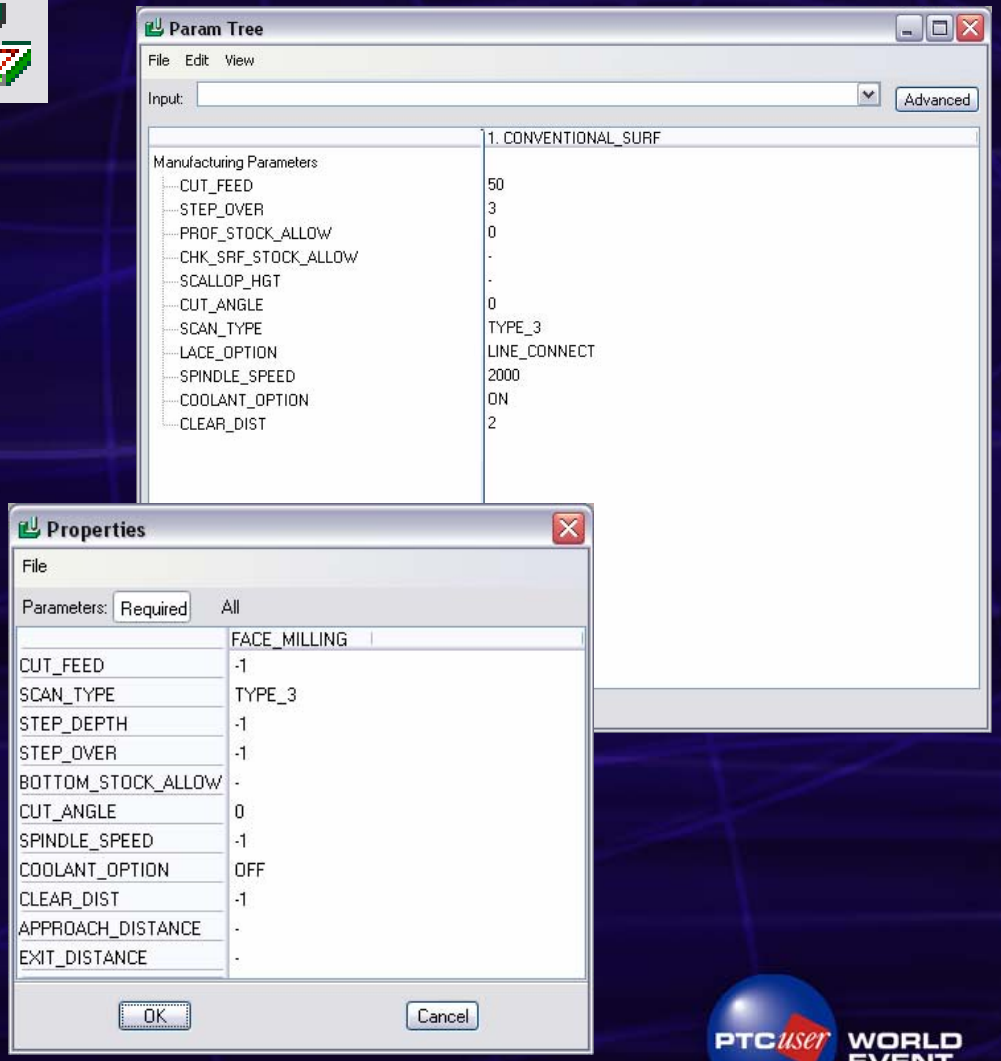
- Modifiers to Sequences include:
  - Lead in / out
  - Shakeaway tabs
  - Check Edges
  - Overhang
  - Multiple Tool (think long obround slots, use both round and rect.)
  - Remove Hits
  - Change Order
  - CL Command

Sheetmetal (3)

- Single part
- Automation (Nesting)
- Populate (Subroutines)
- Optimize
  - Control tool path after all parts are placed on the sheet.
    - Options for minimizing tool travel, tool change, etc.

Parameters

- Parameters are what defines *how* the geometry gets cut
  - *Step depth*
  - *Step over*
  - *Scan type*
  - *Etc.*
- Can have a dramatic effect on sequence
- Are context sensitive, based on sequence



Tools

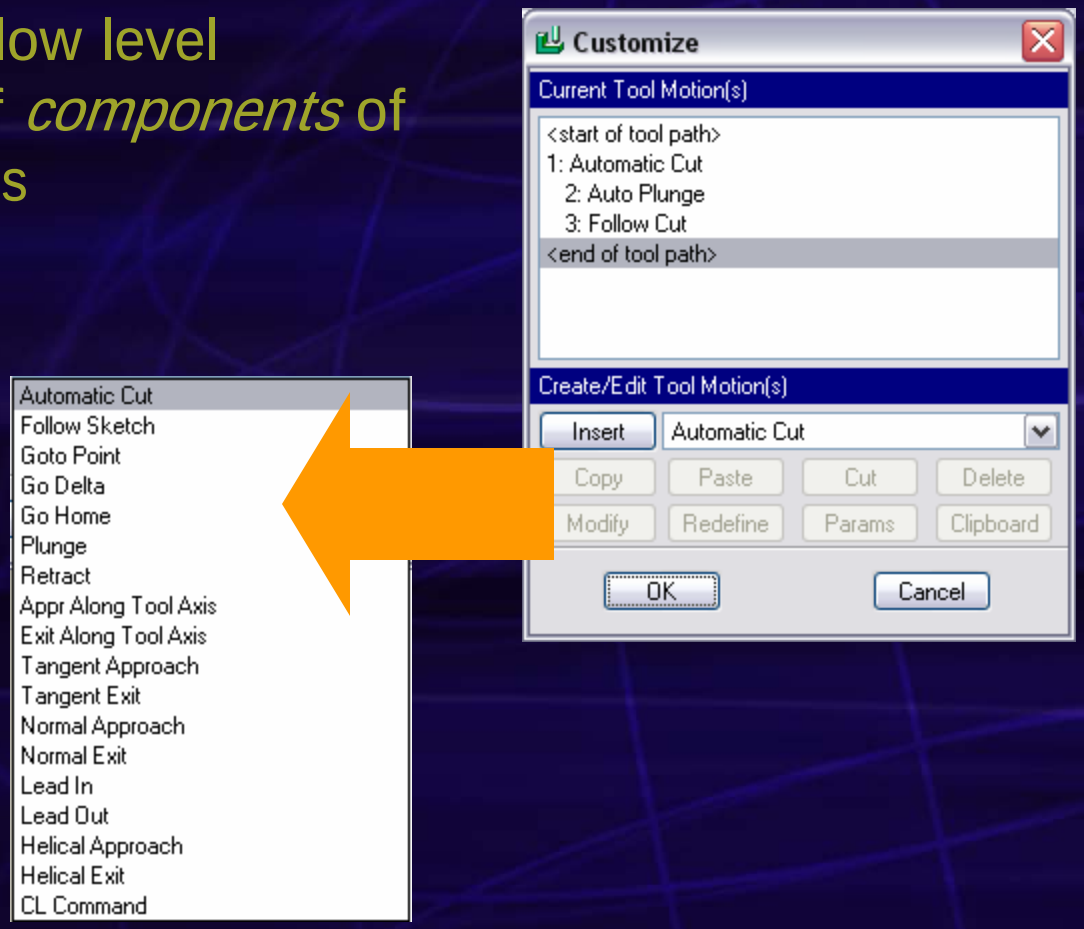
- Can be created on the fly or retrieved from library
- Can load parameters, based on material
  - Remember to specify material in the Operation
- 3 different types
  - Parameter based
  - Sketched
  - Solid part

Geometry

- Optionally selected from
  - Model
  - Sketched (think trajectory)
  - Manufacturing geometry
    - Selected
    - Created ‘on the fly’
- Don’t forget about imported and 2D legacy data!

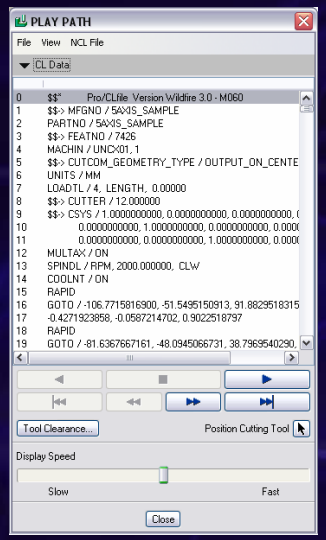
Customize

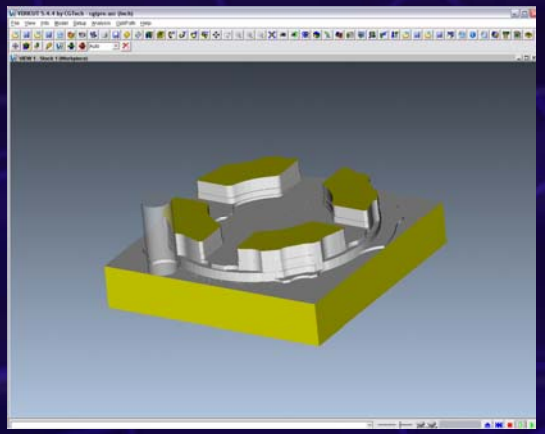
- Provides low level control of *components* of sequences

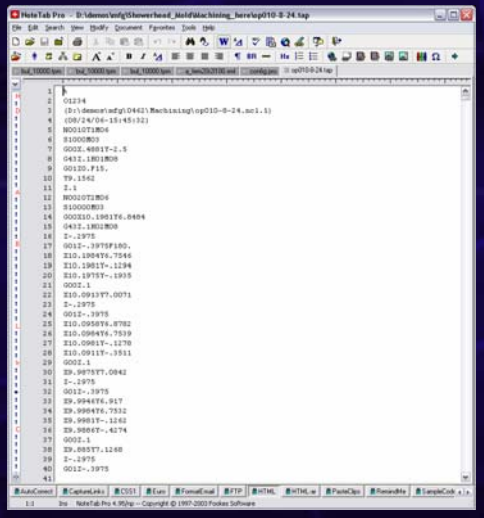


NCL Data

- Create
- Visualize
  - NC Check
  - Vericut
- Post Process
  - GPost







Documentation

- Standards
- Best Practices
- Process
- Tips & Tricks
- New Functionality / enhancements
- ‘Loop back’ to capture new automation as you develop it

config.pro for manufacturing

- Accuracy : it is strongly recommended to work with absolute accuracy enable.
  - **enable_absolute_accuracy yes**
  - **accuracy_lower_bound *number (small enough, 0.001 metric)***
  - It is also important to be sure that all the components and the assembly have the same accuracy
- CL File output :
  - for 3 axis it is recommended to have at least one digit more than the number of digits required in the NC tape.
  - **mfg_xyz_num_digits 4 *for metric (5 for inches)***
  - ***For 5 axis it is recommended to have at least 8 digits for I,J,K***
  - ***Mfg_ijk_num_digits 8***
- XML Import / Export : enable export and import on NC process in XML format
  - ***output_mfg_xml yes***
- *Remove arrow in the toolpath display*
  - ***cl_arrow_scale 0***

config.pro for manufacturing (con't)

- VERICUT : to improve export performance for mold machining (simple stock)
  - **vericut_stock_tolerance 1** ***(mm)***
  - **vericut_fixture_tolerance 1** ***(mm)***
  - **vericut_export_all_tools YES**
- Workpiece transparency default value
  - **mfg_workpiece_transparency .75** ***(75% transparent)***
- Mill Window : automatic creation of the mill window based in workpiece silhouette
  - **allow_workpiece_silhouette auto**
  - **Other options are**
    - No : no workpiece taken in account (default)
    - Yes : user select workpiece or ref model
    - Auto : workpiece silhouette only

config.pro for manufacturing (con't)

- Make job manager available (optional)
  - nc_jobman_visible yes
- Support for multi-tips tool
  - Allow_multiple_tips_tool yes
- Post-processor directory definition
  - gpostpp_dir *path* (path can be .\ for current directory)
- Important paths to define
  - Mfg_start_model_dir path to manufacturing start parts
  - pro_mf_param_dir NC sequence parameters library path
  - Pro_mf_tprm_dir Tool library path
  - Mfg_template_dir path to manufacturing template directory