



# What is New in NX4 for Integrated Simulation and Verification?

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# Scope of NX4 release



- UI Enhancements
- Save posted output
- Limit violations
- Limitless rotary axes
- Time-based display interpolation
- Kinematics data in machine model
- Arbitrary MCS
- Non-orthogonal and offset examples
- Part Mounting
- User Preferences
- Temporary blank
- Load options
- Support for linearization in controller
- Blanking/unblanking junctions
- Collision clearance distance
- Improved slider behavior with collision checking and IPW
- Active and inactive tools
- IPW Support for Mill-Turn Operations



# ISV UI Enhancements



**Simulation Options**

Display

Stationary  
 Earth  Part

History Buffer: 1000

Collision

Stop on Collision

In-Process Workpiece

Resolution: Normal  
Animation Accuracy: Coarse  
Color: [Color Selection]  
Translucency: [Slider]  
 Save as Component

Interpolation  
Max. Length Increment: 0.1600  
Max. Angular Increment: 0.5000  
 Display by Time  
Max. Time Increment: 1.0000

Display Axes Coordinates  
 Tool ABC  Machine  
 Tool IJK

Chordal Tolerance: 0.0040  
 Write Messages to Listing Window  
 Stop on Limit Violation  
 Cache NC Program

**Simulation Control Panel**

Tool DRILL  
0 rpm      9.8 ipm  
Time 00:07:23.1      Coolant Off

Machine Coordinates  
X 0.0000      B -57.000  
Y 6.5368      C 28.500  
Z -7.8490

NC Program  
N2 G91 G28 Z0.0  
:3 T00 M06  
N4 G00 G90 X0.0 Y0.0 B0.0 C0.0 S0 M03  
N5 G43 Z13. H00  
N6 G81 Z5. R13. F9.8  
N7 G80

Message    Collision

MTD:> Virtual NC Controller (d:\nx4phase\wi  
Operation:DRILLING  
Tool assembly for cutter \_SIM\_DRILL not fou  
Operation:DRILLING\_1

Single Step    Block

Speed: [Slider] 5 (range 1-10)

OK    Cancel



# Improved ISV panel



dynamic label shows current coordinate display option

**Simulation Control Panel**

Tool DRILL  
 0 rpm                      9.8 ipm  
 Time 00:07:23.1          Coolant Off

Machine Coordinates

|           |           |
|-----------|-----------|
| X 0.0000  | B -57.000 |
| Y 6.5368  | C 28.500  |
| Z -7.8490 |           |

NC Program

```

N2 G91 G28 Z0.0
:3 T00 M06
N4 G00 G90 X0.0 Y0.0 B0.0 C0.0 S0 M03
N5 G43 Z13. H00
N6 G81 Z5. R13. F9.8
N7 G80
  
```

Message    Collision

MTD: > Virtual NC Controller (d:\nx4phase\wi  
 Operation:DRILLING  
 Tool assembly for cutter \_SIM\_DRILL not fou  
 Operation:DRILLING\_1

Single Step    Block

Speed slider: 1 to 10, current value 5

OK    Cancel

Message    Collision

| Object 1 | Object 2 | Distance/S |
|----------|----------|------------|
| SPINDLE  | C_SLIDE  | 2.2081     |

collision tab gives clearance between components

new analyze icon button

options and reset icons match sync manager dialog

turn on IPW with single click

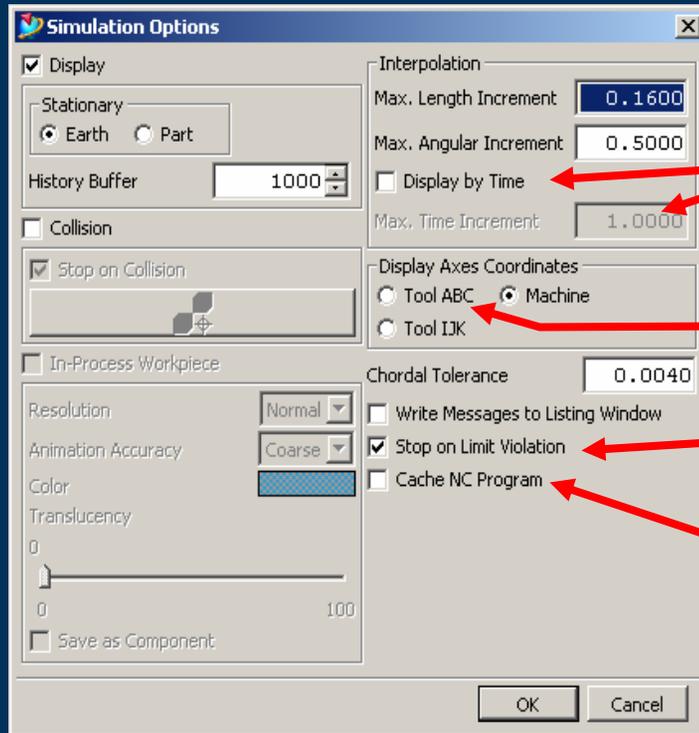
save posted output after simulating

display toolpath from main panel

smoother, more consistent slider when collision or IPW is on



# Improved Options dialog

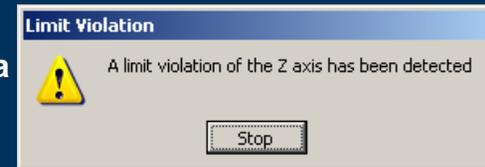


display frames at equally spaced time intervals (especially useful for twin spindle and twin turret lathes)

display XYZ of tooltip and ABC of rotary axes

turns on/off the display of a warning dialog

enables "save NC program" button

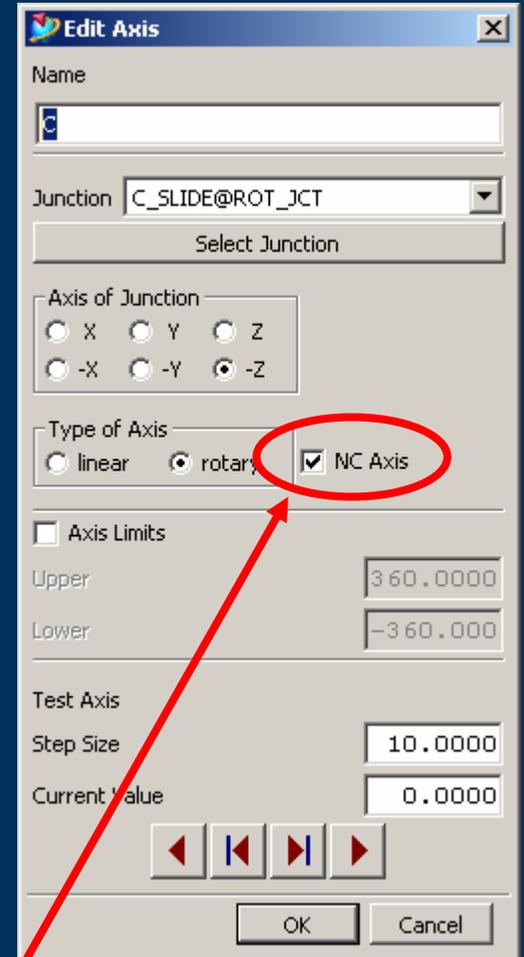
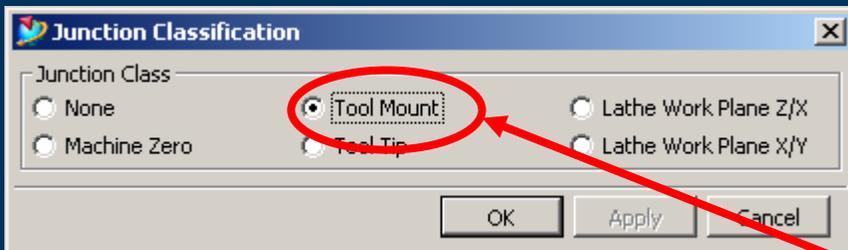




# Kinematics data in machine model



- Simulations are based totally on kinematics data defined in the machine tool model – even when posted outside NX. (we simulate exactly what we post)
- The position of the MCS is arbitrary for any 3, 4, 5 axis machine. (Not lathe).
- Names of kinematic components now based on classifications instead of names.
- Full utilization of the IKS solver. (provide working examples of Non-orthogonal & offset machines)
- New kinematic classifications allow you to conduct experiments in the configurator and immediately see the effect in simulation and posting.



These new classifications trigger full utilization of the new IKS



# Kinematics data in machine model (cont.)



- Rotary axes can now be defined without any limits.
- No need to specify “large” values
- New internal Simulation commands turn off interpolation to simulate the lack of limits.
- If a limitless rotary axis is wound up to 3600 degrees, and a tool change is encountered, Simulation no longer needs to unwind back to zero to perform the tool change.

The screenshot shows the 'Edit Axis' dialog box with the following settings:

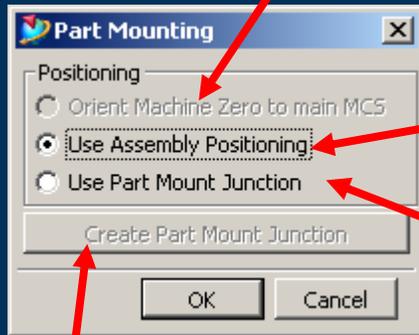
- Name: C
- Junction: C\_SLIDE@ROT\_JCT
- Axis of Junction: X, Y, Z, -X, -Y, -Z (radio buttons)
- Type of Axis: linear, rotary, NC Axis (checkboxes)
- Axis Limits:  (circled in red)
- Upper: 360.0000
- Lower: -360.0000
- Test Axis: Step Size (10.0000), Current Value (0.0000)



# Improved Part Mounting



If a Main MCS exists, position the machine with respect to it

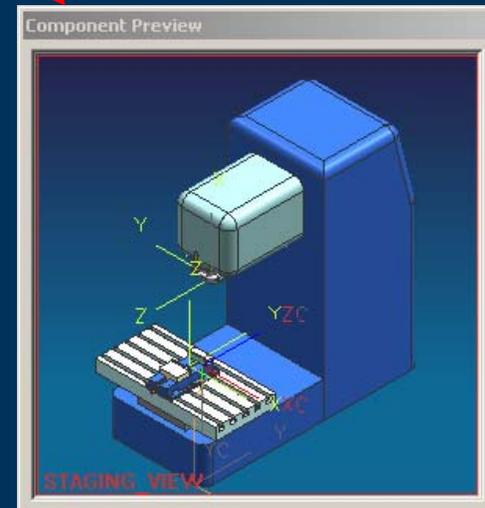
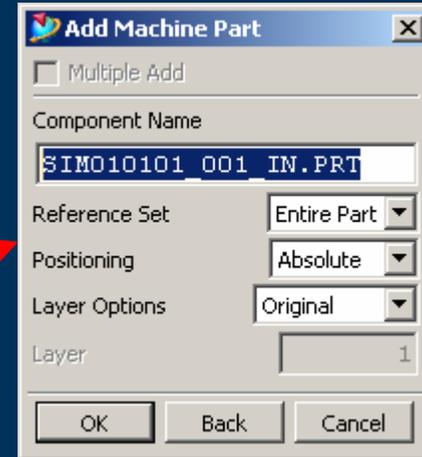


Use standard assembly positioning tools without visiting assembly navigator

Match Part Mount Junction on current and new machine

If Part Mount Junction does not exist in current machine, create one immediately

New Part Mounting tools give the user all the flexibility they need to mount the part on the machine tool in the manner they need





# User preferences



**Customer Defaults**

Defaults Level: User | Default Lock State: Unlocked | Part Units: Metric

General | Dynamic | IPW | Colors | 2D Colors | Auto Blank | Editor | ISV | **ISV Options**

Display

Stationary  
 Earth  Part

History Buffer: 1000

Collision

Stop on Collision

Collision Clearance: 1.0 mm Metric

In-Process Workpiece

Max. Length Increment: 5.0 mm Metric

Max. Angular Increment: 0.5 deg

Display by Time

Max. Time Increment: 0.01 sec

Display Axes Coordinates  
 Tool ABC  Tool IJK  Machine

Chordal Tolerance: 0.1 mm Metric

Write Message to Listing Window

Stop on Limit Violation

Cache NC Program

OK Apply Cancel



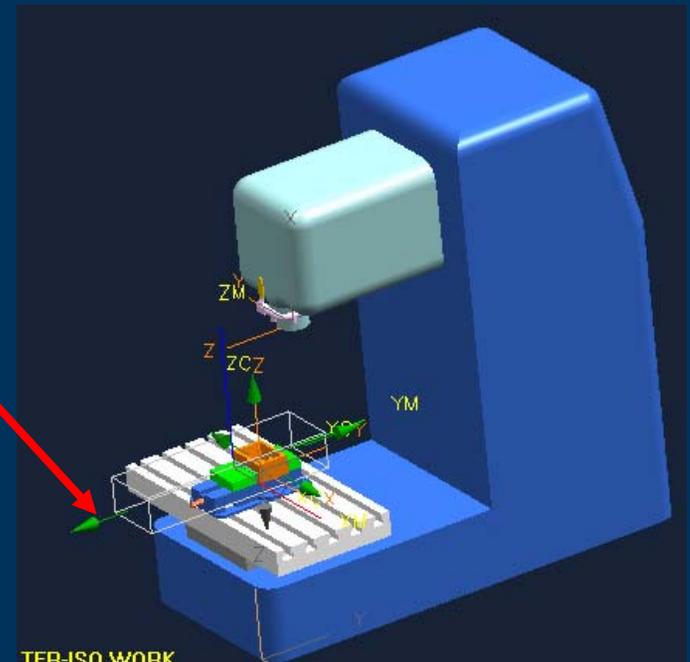
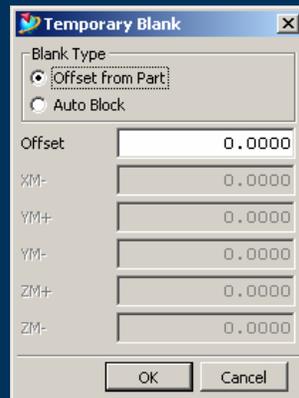
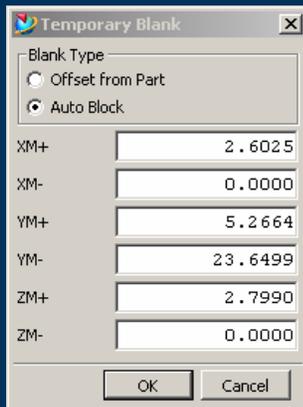
# Temporary Blank



Dialog appears if the user has not defined a blank in the CAM operation

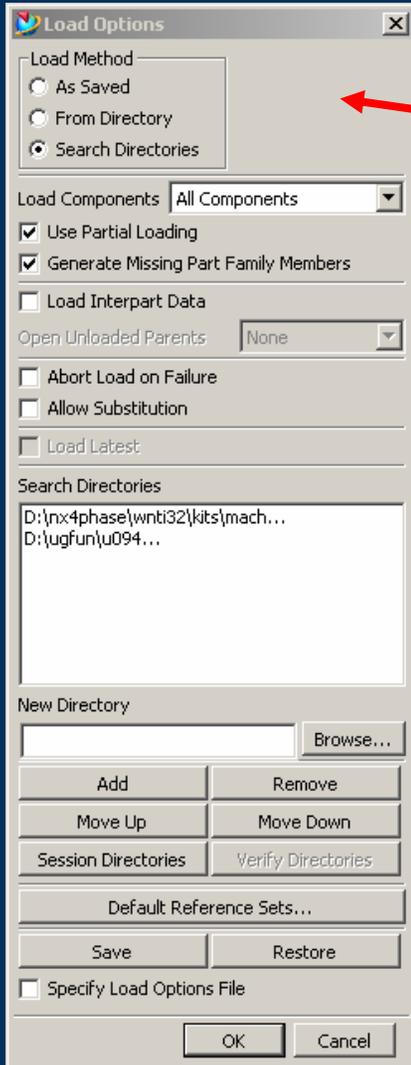
Temporary blank can be dynamically manipulated in graphics region

choice of block or part offset





# Load Options



- Standard way of loading an assembly (including a machine assembly) is to specify load options in gateway/assembly dialog.
- This could be a burden, especially for users who might want to look at machine tools without intimate knowledge of the assembly
- In NX4, load the machine assembly when switching to Manufacturing. ISV uses the installation directory combined with the Search Directories load method to load assemblies

**Loading assemblies of the machine tool including all the fixturing for the CAM operation is improved for users unfamiliar with the data**



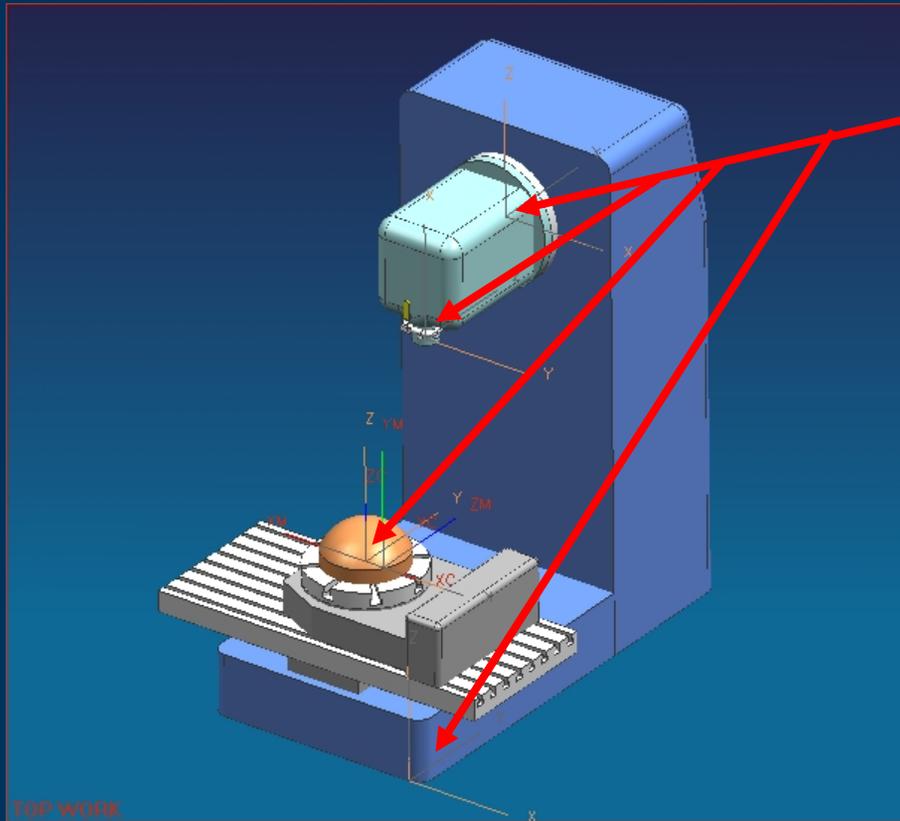
# Support Linearization in controller



- Linearization is a description of what the machine tool does BETWEEN the programmed points in the toolpath for 5 axis machines.
- For linearized motion (common to simultaneous cutting motions) the XYZ axes are moved to compensate for the rotary motion so that the tooltip is positioned along the line between the start and endpoints.
- The postprocessor can add points to the toolpath to create linearized toolpath, which we can simulate.
- However, some machine tools linearize the toolpath in the controller, which means we need to simulate this.
- In NX4 we have added a switch that is controlled from the driver to turn on and off linearization.



## ➤ Blanking/unblinking junctions



Ability to blank/unblank junctions on demand makes the Simulation environment less cluttered and easier to use.



## Other Items



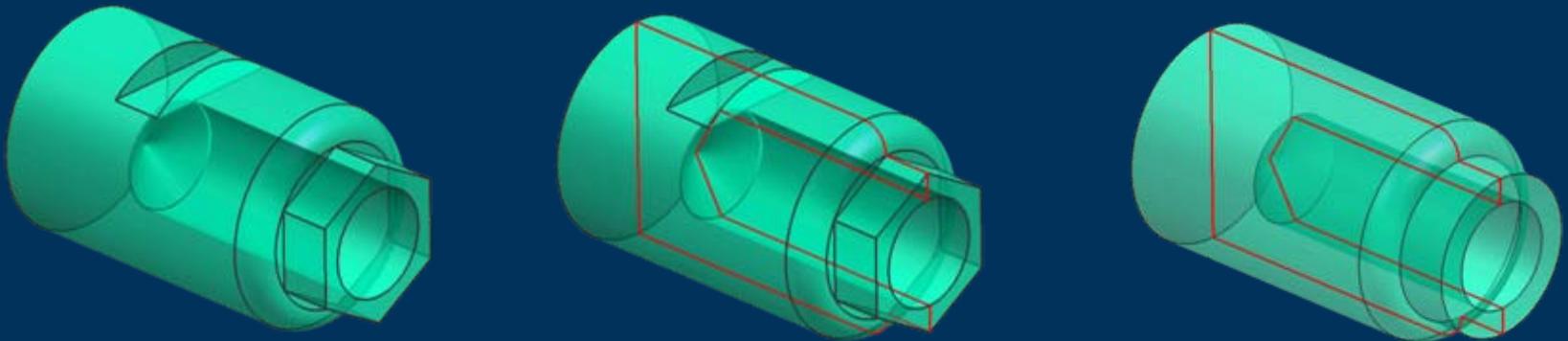
- Improved slider behavior with collision checking and IPW (performance)
- Differentiate between Active and inactive tools
- Arbitrary MCS location



# IPW Support for Mill-Turn Operations



- ▶ Share IPW between milling, drilling and turning operations
- ▶ Automatically convert spinning to non-spinning IPW and vice versa when switching between milling/drilling and turning operations
- ▶ On-demand display of spinning and non-spinning IPW shapes

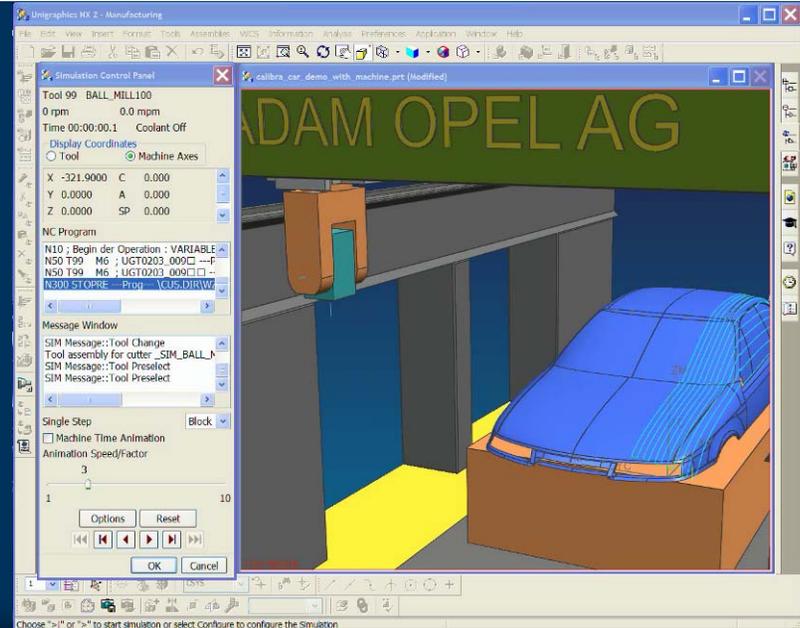
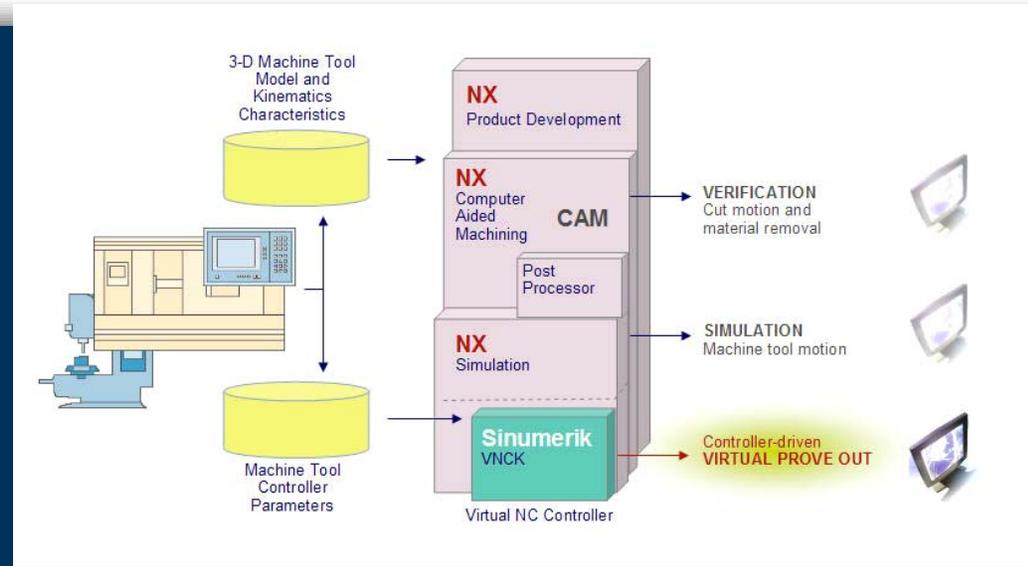




# New ISV Module--- Controller Driven Simulation



- ▶ Driven by a virtual NC kernel (VNCK) provided by Siemens
- ▶ Accurate representation of machine tool kinematics and controller configurations
- ▶ Support of controller specific features such as NURBS and canned drilling cycles
- ▶ Accurate acc/dec and cycle times





[www.ugs.com](http://www.ugs.com)

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