Autodesk University 2011 LEARN. CONNECT. EXPLORE.

Networking AutoCAD for Control and Speed

Robert Green – CAD-Manager.com

CM5921

Do you maintain AutoCAD platform tools for a bunch of users? Do you have to support branch offices? If so, this class will help you get your AutoCAD environment under optimal control via AutoLISP® customization, CUI customization, and a unique way of synchronizing networked content with the user's machine to achieve maximum speed. We will cover centrally located standards content such as palettes, CUIs, plotting files, databases, blocks, and other content using a combination of profiles, project folders, registry access, and AutoLISP to control it all. Particular attention will be paid to achieving maximum speed for the user. All concepts will be presented using a sample environment that you can alter to fit your company immediately after class. Whether you use plain AutoCAD, AutoCAD Civil 3D®, AutoCAD Architectural, or AutoCAD Mechanical, this class will give you the knowledge you need to finally get all your AutoCAD tools under centralized control with maximum speed.

Learning Objectives

At the end of this class, you will be able to:

- Use synchronization to keep all machines current
- Centralize standardization of key files
- Use customization to manage network resources
- Retain maximum user software performance

About the Speaker

Robert is head of the Robert Green Consulting Group, and a 16 year veteran speaker at Autodesk University. You have likely read his work in **Cadalyst** magazine, where he authors the "CAD Manager" column, or in his bi-monthly **CAD Manager's Newsletter**. He holds a degree in mechanical engineering from the Georgia Institute of Technology, and gained his CAD skills from 24 years of AutoCAD®, MicroStation®, and MCAD® software usage. Since starting his own company in 1991, Robert has performed consulting and teaching duties for private clients, and throughout the United States and Canada.

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Software Types and How to Configure Them

Your company depends on you to keep their CAD software running but how do you know whether you're getting optimal performance from the software you already own? I'll outline a process that you can use to evaluate what sort of software environment you operate in and give you some hints for achieving the optimal performance your company desires.

Achieving optimal software performance requires a total system view of all the components that affect your software's operation. Therefore I'll take some time to outline some basic network and hardware terminology that you'll need to understand.

Identifying Software Types

Even though there are dozens of CAD software platforms out there the good news is that they can all be loosely identified in terms of their operating parameters. By understanding these parameters you should be able to tackle the optimization of any software. As you read through the software types I'll outline think of the software you have and see if you can identify what type it would be.

Single File Mode Systems
These systems typically enable a single user to work on a single file at a time. As an example, AutoCAD is often used as a single file system since one user generates a single drawing as a result of their efforts.

Referenced File Mode Systems
These systems typically enable users to work on their own files with the files of other users attached as a background. As an example AutoCAD and MicroStation frequently make use of external reference files (XREFs) so users may leverage other user's work as background data.

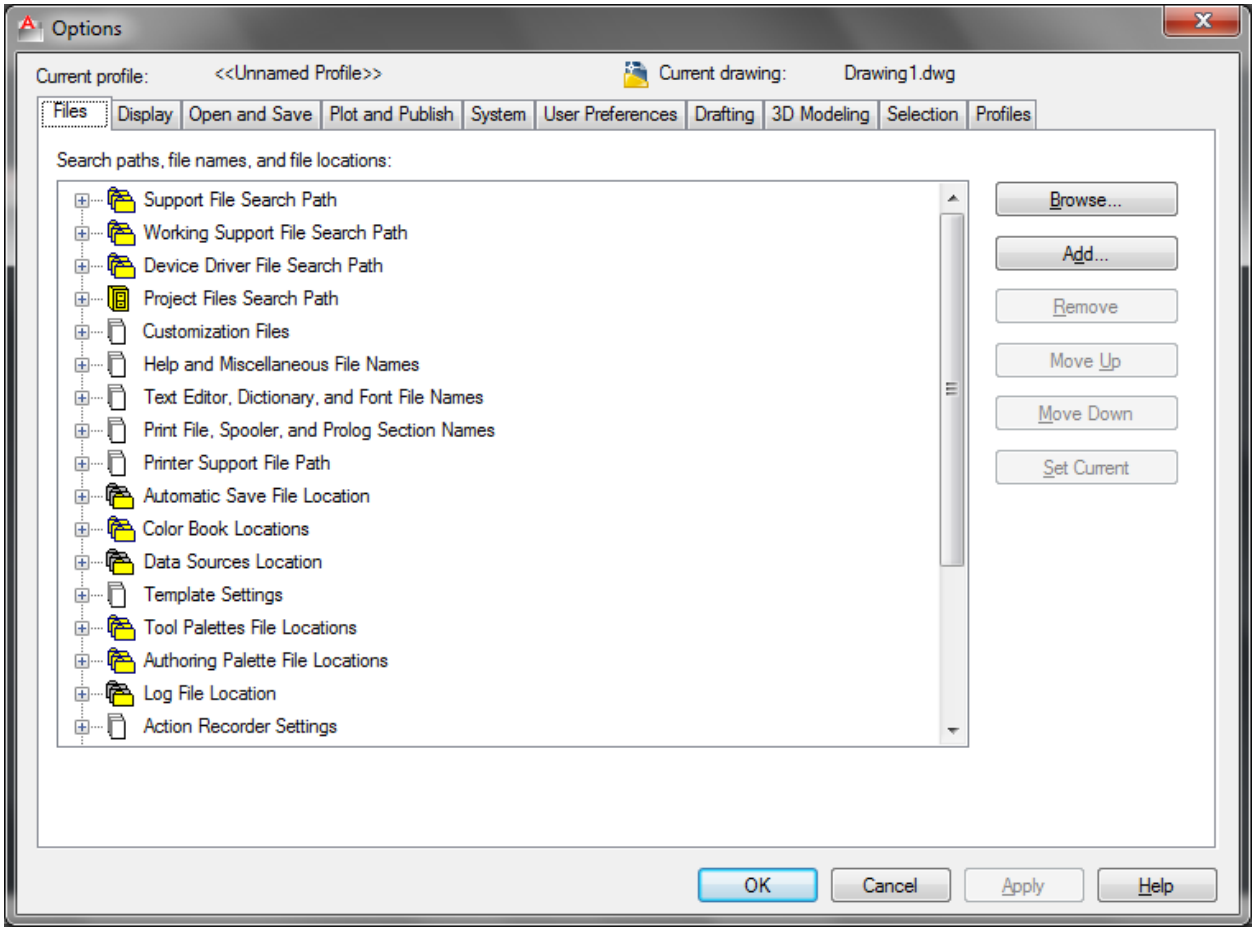
Collaborative Mode Systems
These systems take the referenced mode system to the next level by allow a team of users to collaboratively work with each other's data and see the changes other users make to the data as they go. As an example mechanical modeling systems like Solidworks or Inventor and building modeling systems like Revit are collaborative since small to large work teams all utilize data from various team members. AutoCAD can also be collaborative in environments where a large number of XREF or graphical attachments are used to tie team members together.

Now the challenge becomes harmonizing the type of software you use to the network environment you must work in. Achieving that harmonized balance has everything to do with how well the software will serve, or not serve, your users.

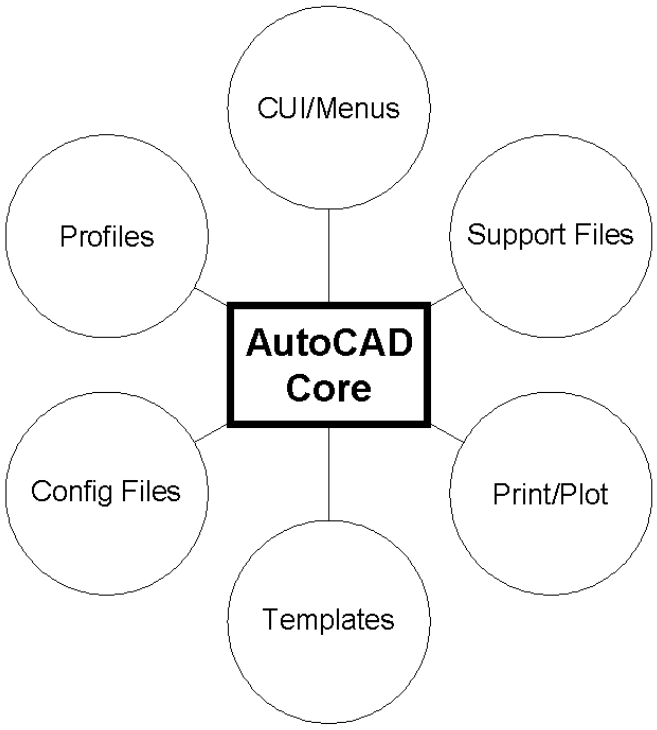
Networking Variables

The software you use is only part of the overall performance equation that must be understood. By analyzing the parameters of your network you'll understand the other main portion of the performance equation.

As you can see in the diagram below a CAD workstation is really a small component of the overall computing system in your company. The specific components that affect software operation and some pertinent statistics for each may be summarized as follows:


Options
Current profile: <<Unnamed Profile>>
Current drawing: Drawing1.dwg
Files
Display
Open and Save
Plot and Publish
System
User Preferences
Drafting
3D Modeling
Selection
Profiles
Search paths, file names, and file locations:
Support File Search Path
Working Support File Search Path
Device Driver File Search Path
Project Files Search Path
Customization Files
Help and Miscellaneous File Names
Text Editor, Dictionary, and Font File Names
Print File, Spooler, and Prolog Section Names
Printer Support File Path
Automatic Save File Location
Color Book Locations
Data Sources Location
Template Settings
Tool Palettes File Locations
Authoring Palette File Locations
Log File Location
Action Recorder Settings
Browse...
Add...
Remove
Move Up
Move Down
Set Current
OK
Cancel
Apply
Help

Local Machine
The machine that the CAD software actually runs on at the user's desktop. The local machine offers maximum speed since all its resources are available at the user's desktop rather than at the remote end of a network wire. The user's preference will always to be run software on their own machine because they will correctly perceive that it is fastest to do so.



Local Area Network (LAN) Connection
The network that ties the user's machine to the company's overall network. In more complex networking environments (like multiple branch offices with Internet support) the LAN is simply the first networking connection your machine sees. In smaller companies the LAN may be your only network connection. LAN connections are much, much slower at moving data than using your own machine so users will correctly perceive LANs as slowing them down. However, LANs facilitate communication between users, no matter how slow the connection is, and are thus required in collaborative environments.

Wide Area Network (WAN) Connection
WANs are simply LANs that cover bigger distances with the price of being substantially slower than LANs and glacial in speed compared to local machines. CAD users frequently experience severe performance degradation over WAN environments due to the combination of low connection speed and large CAD files being shared.

While WANs do enable collaboration over large geographic areas they frequently do so at rates of speed that makes them unworkable for CAD applications. No matter what IT departments may say, until you've had to wait 20 minutes for a background plan to load in your CAD application you just don't understand how slow WANs can really be.

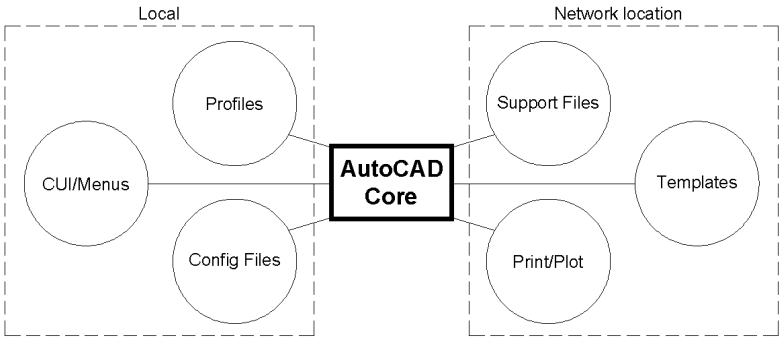
Internet Connection
Essentially the same as a WAN but the only way to facilitate traveling or at home team members.

Storing Data

So where should your CAD data actually reside in order to best support the software you have? Well, in all cases CAD data will be stored as a disk based file but the question is whether it will be on a user's machine, a network server or an Internet based server.
In all cases the data will be secure but the user's access to the data will be judged by how quickly they can load and work with the file. So when considering where to locate CAD data consider the connection speed between the user and the file and how that speed will impact the user.

Harmonizing Software with Networks
Now that all the terms are defined how do you know what software will work best in which network environment and why? To address these questions I'll present the software types and break them down using the network variables and draw conclusions for each. As you read through the various scenarios try to get a mental picture of your own software and network systems and decide which type of scenario you must deal with.

Local Machine
The machine that the CAD software actually runs on at the user's desktop. The local machine offers maximum speed since all its resources are available at the user's desktop rather than at the remote end of a network wire. The user's preference will always to be run software on their own machine because they will correctly perceive that it is fastest to do so.



Single File Mode Systems

Local Machine environments: The best place to actually run the CAD software since it offers highest speed for the user. CAD files may actually be stored here as well since no other user needs to collaboratively use the files. Be aware that placing CAD files on local machines means those files normally aren't backed up and are therefore much more prone to erasure or data loss.

LAN environments: In LAN environments you still want to run the CAD software on the local machine to take advantage of the speed if offers the user. However CAD files can be stored on the LAN to facilitate backups and file security. Common components like symbol libraries, drawing title sheets, stock parts, etc, should be stored on the LAN to enable sharing of those resources.

WAN environments: In WAN environments you still want to run the CAD software on the local machine to take advantage of the speed if offers the user. However CAD files can be stored on the WAN to facilitate backups and file security with the best case being storing the CAD files for each user at the server closest to them on the WAN. For instance, if you have users in London and others in Chicago, the London workers should have their work on the London server and the Chicago workers should have their files on the Chicago server. Doing so keeps file transfer delays minimal for most users yet still allows collaboration between offices as is needed. Like the LAN case, common components like symbol libraries, drawing title sheets, stock parts, etc, should be stored on the LAN to enable sharing of those resources.

Internet environments: In Internet environments you still want to run the CAD software on the local machine to take advantage of the speed if offers the user. However CAD files can be stored on an Internet server to facilitate access to the files without having to log into a LAN or WAN. The performance of the Internet is, of course, impossible to predict but will normally be on par with a WAN in terms of speed. Like the LAN and WAN cases, common components like symbol libraries, drawing title sheets, stock parts, etc, should be stored on the LAN to enable sharing of those resources.

Referenced File Mode Systems
These types of systems differ from single file mode systems in that you will have to use a LAN, WAN or Internet connection to facilitate the file sharing necessitated by the reference files. There simply won't be a way to make these types of software systems work using a local machine approach.
All the networking variables presented above exhibit the same characteristics for referenced file mode systems as outlined above.

True Collaborative Mode Systems
Again, these types of systems differ from single file mode systems in that you will have to use a LAN, WAN or Internet connection to facilitate the file sharing necessitated by the reference files. There simply won't be a way to make these types of software systems work using a local machine approach.

All the networking variables presented above exhibit the same characteristics for referenced file mode systems as outlined above with the added caution that network traffic goes up as more people collaborate over the network. And as network traffic goes up, speed drops and CAD users become less likely to enjoy using the collaborative benefits of the system.

The best way to avoid the slowdown of collaborative systems is to keep the data each user needs as "close" to them as possible by using the local office server to host the data. This approach takes more network planning but rewards the CAD user with a faster operating environment.

Tips for AutoCAD Environments

AutoCAD and AutoCAD LT are the most popular CAD systems in the world and most CAD managers have at least some AutoCAD seats to support. To manage the software you must first understand its key statistics:

System type
Single File or Reference File Mode

Software footprint
Typically 1 to 2 Gigabytes when installed

Given AutoCAD's single file nature and relatively small software footprint it is very adaptable in a variety of network environments. However the following recommendations reflect the best management of AutoCAD based systems I've seen in industry:

Software installation
Run AutoCAD from the local machine to gain maximum performance. Even though network versions are available they will slow user's speeds and impact their productivity. Installing software on the local machine has no detrimental effect on anyone and gives the CAD user the speed they crave.

File storage
Store files on local machines if you are sure you can provide backup or security for those files, otherwise use LAN storage of files. Stay away from WAN or Internet storage of files unless specifically required by your business model as access speed in these environments is extremely slow.

Since AutoCAD is so prevalent and since you probably have more seats of AutoCAD that the other software applications in your company, getting AutoCAD optimally configured and consistent for multiple users is crucial.

By setting up AutoCAD on a few power user machines and getting the software working to everyone's satisfaction you can form the basis for a standard installation. You can then use AutoCAD's profiles, which are really just registry files, to copy the correct configuration to multiple machines to achieve maximum standardization.

Load Your Code from ACADDOC.LSP

Since the ACADDOC.LSP is automatically loaded at AutoCAD's startup you can simply insert a line into your ACADDOC.LSP file that loads the program remotely like this:

```
(load "c:\\mydirectory\\myprogram.lsp")
```

Where the MYDIRECTORY and MYPROGRAM parameters are simply replaced with the appropriate values. Note the \\ characters required for pathing!

Centralizing Your Code

In this case we wish to load an external AutoLISP file with our utility code in it (called STARTUP.LSP) which resides on a network drive. The contents of the ADADDOC.LSP would look like this:

```
(if (findfile "x:\\autolisp\\startup.lsp")  ; findfile verifies that the file exists
  (load "x:\\autolisp\\startup.lsp"))
)
```

Now you've got a way to load files from a remote network location so the programs can be maintained in one place! This is the best way to load programs (especially if you're a CAD manager) because you never have to visit the user's machine to modify your utilities – just change the STARTUP.LSP on the network drive!

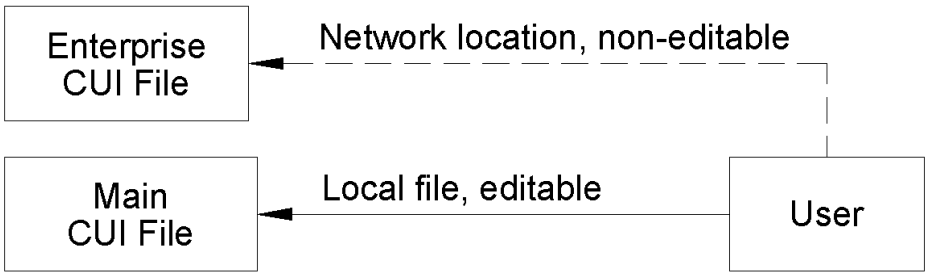
Control the Command Line

Now define your own command shortcuts and undefined commands to further unify the user base.

See my **CP5922 AutoLISP Productivity Power** course for much more detail.

CUI's

So how could we get the benefit of an Enterprise CUI without the hassles? Perhaps you could make sure everybody works from the same CUI by keeping a correct local copy on their C drive.

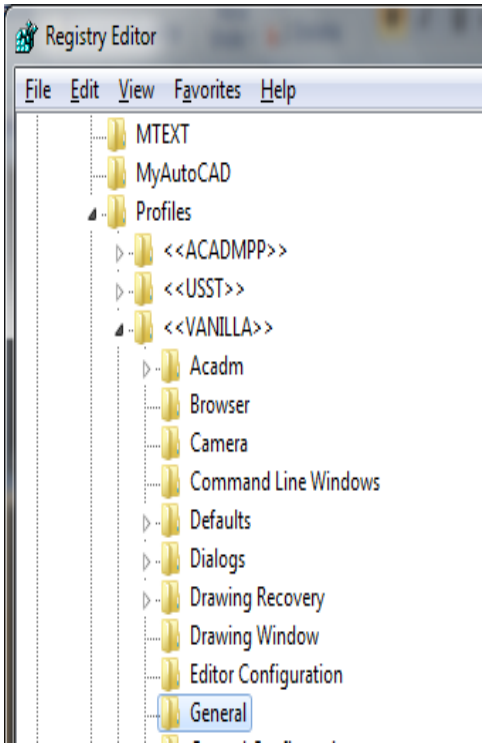


Bypassing Profiles

One of the biggest problems with managing AutoCAD is that you have to work with profiles. Profiles are hard to update and users can always mess with them so no matter how hard you try to manage them you always seem to fall behind.

The solution? Don't worry about profiles, use AutoLISP instead.

The techniques you'll need are registry reads and writes but mainly writes to put the values you want into the user's current profile.



Step 1: Setup a profile that works (I suggest starting with <<VANILLA>>) and then find it using the registry editor application REGEDIT.

Step 2: Next you'll find the specific key that controls the parameter you wish to modify. (In our case it'll be the folder that controls where printer configurations are found.)

Step 3: Note the EXACT spelling and case of the key:

PrinterConfigDir

Note: *If you don't get this right nothing will work!*

Pickstyle	REG_DWORD	0x00000001 (1)
PlotLogPath	REG_EXPAND_SZ	%USERPROFILE%\appdata\local\autodesk\autocad r
PlotToFilePath	REG_EXPAND_SZ	%USERPROFILE%\documents
PrinterConfigDir	REG_EXPAND_SZ	%USERPROFILE%\appdata\roaming\autodesk\autoc
PrinterDescDir	REG_EXPAND_SZ	%USERPROFILE%\appdata\roaming\autodesk\autoc
PrinterStyleSheetDir	REG_EXPAND_SZ	%USERPROFILE%\appdata\roaming\autodesk\autoc
ProfileStorage	REG_EXPAND_SZ	%USERPROFILE%\appdata\roaming\autodesk\autoc
RegisteredToolsPath	REG_EXPAND_SZ	%RoamableRootFolder%\Support\RegisteredTools
Scrollbars	REG_DWORD	0x00000001 (1)

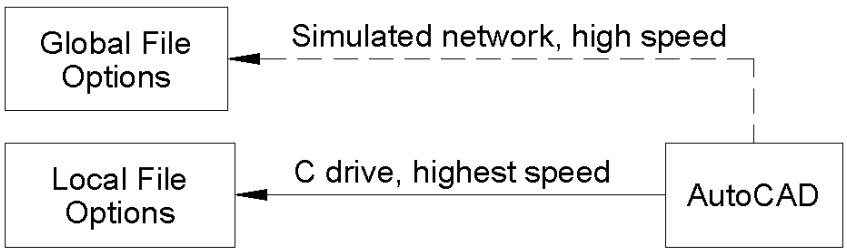
Step 4: Override the current profile with an appropriate AutoLISP statement like this:

(setenv "PrinterConfigDir" "C:||TEMP||acad||Plotters") ; local drive folder

or this:

(setenv "PrinterConfigDir" "Z:||acad||Plotters") ; network drive folder

Question: Why would we ever want to use a local folder instead of a network folder?



Synchronize from Network to C:

To avoid any sort of network permission issues, slowdowns or differences in mapped drive designations you can always maintain a copy of all the latest files on the network then synch them down to the user's C:\TEMP which everyone already has access to.

Here's the trick:

> *ROBOCOPY – A really cool file synch tool that comes with all 64 bit versions of Windows and may be downloaded for 32 bit versions.*

Used like this ROBOCOPY will copy everything from a server folder to the C:\TEMP folder

> *ROBOCOPY \\SERVER\FOLDER C:\TEMP /E*

Where:

> \\SERVER\FOLDER is the UNC path that is being copied FROM
> C:\TEMP is the directory being copied TO
> The /E argument means all subdirectories and files are copied even if they are empty

Now we'll make it happen via AutoLISP like this:

```
(command "shell" "robocopy \\\\server\\folder c:\\temp /e")
```

Updated Materials and PowerPoints

You can download the updated course guide (with any additional notes or corrections) for this presentation at my web site www.CAD-Manager.com/au2011 or at the AU web site.

I will send you a PDF copy of the session PowerPoint presentation if you request it. Just send an email to me at **rgreen@CAD-Manager.com** and be sure to put the course title in the subject line so I'll know which class you want.