HERRERA ON HARDWARE: Does Your Workstation Need More CPU Cores or Faster CPU Clocks? Find the Right Balance

CAD MANAGER: Make a Compelling Purchase Case with ROI

CIRCLES AND LINES: No More Dull Dimensioning in AutoCAD

Fall 2015 | Vol. 32 No. 1 | $9.95

cadalyst

Get Productive with CAD and Get the Job Done.

www.cadalyst.com

Start Climbing

It's Time to Take Your CAD Career to the Next Level

SPECIAL EDITION

Professional Development Strategies for CAD Managers and Users

- Find training that suits your style
- Understand what your boss wants
- Become the expert your peers trust

Longitude Media

New 6TH Generation Core™i7 to 4.50GHz

CAD Laptop w/Quadro M3000M

As tested by Desktop Engineering our newest workstation scored record performance numbers against all contenders and is defined: "once again the best bang for your buck". Our CAD Laptop@ 4.2GHz & Quadro Video up to the M5000 are the most powerful ever. In Stock new **"Skylake"** based Workstations! Save $1000+ over "Boutique Box Builders" prices. Proudly Custom Built in the US & sided by a superior domestic technical support & the best warranty, for 25+ years Xi® Computers delivers the best performance and value.

NVIDIA PREFERRED SOLUTION PROVIDER

NVIDIA QUADRO

MTower PCIe	PowerGo XT	MTower 2P64X
- Intel® Core™i7-6700K to 4.5GHz	- Intel Core i5/i7 3.5-4.2GHz TB	- New E5-v3 Intel Xeon®Processor
- Intel Z170A C.S. PCIe 3.0	- 6/8MBCache 4Cores/8Threads	- 10/35MB L3Cache,C612 Chipset
- 16GB-DDR4 2666 to 3000MHz	- 8GB DDR4 2133MHz to 64GB	- 16GB DDR4-2133 ECC to256G
- NVIDIA®Quadro® K620 2GB 2H	- **New NVIDIA®Quadro® M3000M**	- NVIDIA®Quadro® M4000 8GB
- 250GB SSD Samsung® EVO	- 500GB SATA6 Hybrid 8GB SSD	- 256GB SSD M.2 PCIe 2150MB/s
- 74 in 1 Card Reader, USB 3.1	- 15.6/17.3" 1920x1080NR LED	- 74 in 1 Card Reader, USB 3.1
- Xi®MTower Ultra Silent Tower	- Speakers,Camera,Mike & Wi-Fi	- Xi®MTower 750/1200W Thor
- MS Windows® 7/10 Prof. -Linux®	- Microsoft® Windows® 7/10-64Bit	- MS Windows® 7/10 Pro-Linux®
4-Core i7-6700K 4.0GHz $ 1,699	**I5-6600K 3.9GHz GTX970 $1,959**	**1x6-C E5-1630v3 3.8GHzTB $2,799**
4-Core i7-6700K 4.5GHz $ 2,359	**i7-6700K 4.2GHz M3000M$2,699**	**2x12-C E5-2695v3 2.7GHz $8,159**

intel inside Xeon

intel inside CORE i7

Render-RT™water cooled personal HPC w/36 XEON®cores & NVIDIA®Tesla™K40 GPU Visit our website & configure yours now!

25th 1987-2012 Anniversary

Xi®Certified for **AutoCAD®2016, 3ds Max®, Inventor®, SolidWorks®, Maya®** & **Revit®.** Custom built in the US from 100+options to match your applications and your budget. Business Lease from $ 59/month.

www.xicomputer.com
1-800-432-0486

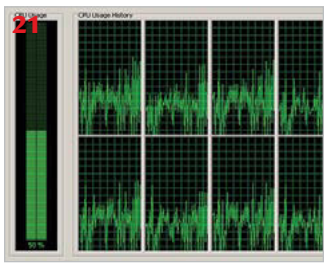
cadalyst contents

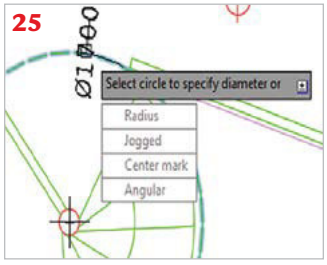
Fall 2015 www.cadalyst.com

Longitude Media

© iStockphoto.com/highdog

© iStockphoto.com/Halfpoint





SPECIAL EDITION: PROFESSIONAL DEVELOPMENT

COLUMNS

FUJITSU

shaping tomorrow with you

Fujitsu Workstations 25 Years of Innovations

Celebrate 25 Years of Workstation Innovation with Us!

80 years
Beyond the 80th

80 years of Fujitsu history

Fujitsu has been delivering innovation to make businesses more effective and productive for the past 80 years.

CELSIUS J550

Probably the fastest Small Form Factor (SFF) workstation

- Innovative 10-liter design
- Full-height graphics up to NVIDIA® Quadro® M2000
- Optional PCI slot
- Up to 8 monitors with NVIDIA® NVS™ graphics
- Whisper-quiet: 21 dB(A)

FUJITSU Workstations 25 Years

25 years workstation expertise

The first-ever desktop workstation in1995 was a pioneer of its era, and Fujitsu has never stopped innovating and enhancing the products since.

Discover more at:
fujitsu.com/us/products/computing/pc/workstations
Contact us on:
1-800-831-3183

NVIDIA®

Take Control of Your Future as a CAD Professional

If I quit learning, I quit earning! These words ring just as true today as they did 23 years ago.

"IT'S NOT JUST WHAT YOU EARN, it's what you *learn*," my father always told me. But as I progressed in my engineering and CAD career, I told Dad the rule had evolved into, "If I quit learning, I quit earning!" These words ring just as true today as they did 23 years ago, when I started consulting as a CAD manager.

In today's world of CAD technology, you really are only as good as your skill set, so it literally pays to sharpen and expand your CAD skills on a continual basis. Staying on top of the ever-changing palette of software tools used in today's rushed design environment requires purposeful planning and efficient time utilization on your part — two things this special edition of *Cadalyst* magazine is designed to help you with.

So what are the best techniques and methods to build your skill set, and further your career as you do so? Here are some of the topics addressed in this issue:

- **Training:** Scottie Barnes examines a variety of options for instructor-led and self-guided training (see p. 17).
- **Leadership in the Workplace:** Curt Moreno gives cogent advice on stepping up to the plate and gaining respect from your peers and superiors (see p. 19).
- **Career Optimization:** I'll be providing some broad career advice for all types of CAD professionals in "Make the Most of Your CAD Career" (see p. 8), as well as some specific advice for CAD managers in "Make Your Case for the Tools You Need to Succeed" (see p. 23).

Our goal is to give you the inspiration and resources to take charge of your career and build your technical and interpersonal skills, no matter how pressed for time or resources you are.

Benjamin Franklin was famously quoted as saying, "By failing to prepare, you are preparing to fail." Don't let that be your story! Take charge of your career before circumstances — or other people — chart your course for you. We hope this special edition of *Cadalyst* will help you do just that!

Robert Green
Contributing Editor

THE NEW MULTIFUNCTION SURECOLOR® T-SERIES

- Produce presentation-quality 24" x 36" color copy in under 40 seconds*
- High productivity with color scanning speeds up to 6" per second*
- Advanced image processing hardware for superb image quality
- Scan to file, email and remote SureColor T-Series multifunction printers
- Single-roll or Dual-roll models available in 36" and 44" print widths

Epson® SureColor T-Series

MFP Configuration Starting at $7,140† Single Roll

EPSON
EXCEED YOUR VISION

*Speeds are based upon print engine speed only. Total throughput times depend upon factors such as computer, file size, printer resolution, ink coverage, and networking.

†Estimated street price after instant rebate and dealer discount. Please visit epson.com/prorebates for details. Check with an Epson Professional Imaging Authorized Reseller for actual price, as dealer prices may vary.

Adobe PostScript 3

EPSON.COM/**PLOTTERINFO**

Volume 32 No. 1

cadalyst

www.cadalyst.com

Longitude Media

P.O. Box 832
Dover, MA 02030

Cadalyst (ISSN 0820-5450) and the logo appearing on the cover are registered trademarks of Longitude Media, LLC. Printed in the USA.

Cadalyst doesn't verify claims or other information appearing in advertisements in the publication and cannot take any responsibility for losses or other damages incurred by readers in reliance on such content.

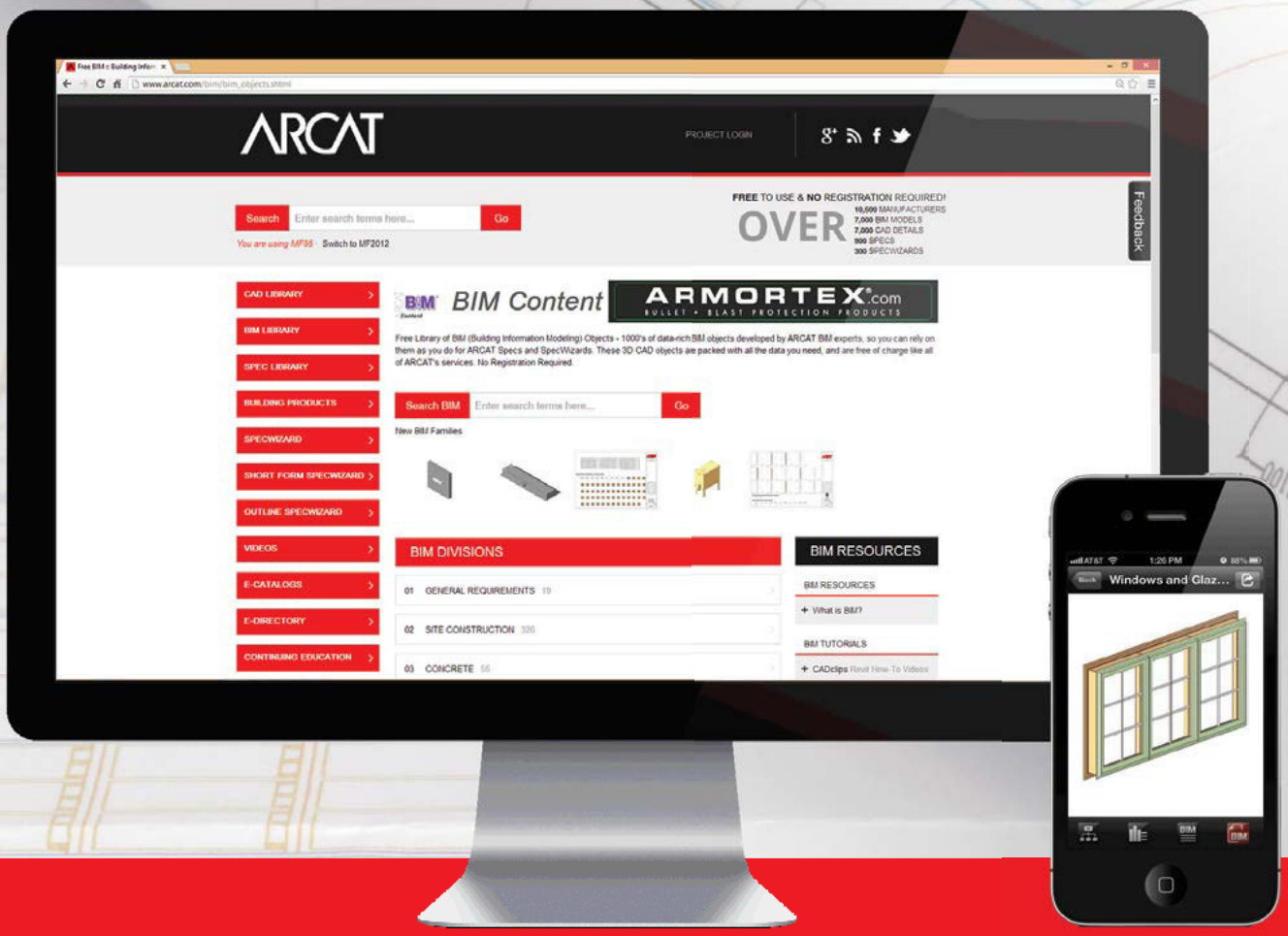
Customer Service Contact us at customerservice@longitudemedia.com. **Change of Address** Send requests to the e-mail address above. **Reprints** Article reprints from this issue, past issues, and digital content are available, and you can license Cadalyst content for use on your web site.

Longitude Media, LLC, may share your personal information with our affiliates and with our partners, including our sponsors and advertisers, for marketing, advertising, and/or product/service offering purposes, and with others who are licensed to access your personal information by any of the foregoing. Also, we rent e-mail lists compiled from e-mail addresses gathered from our sites. If you do not want Longitude Media to make your contact information available to third parties for marketing purposes, you may opt out by notifying us at customerservice@longitudemedia.com or by writing to us at the address below.

Cadalyst is published by Longitude Media, LLC, P.O. Box 832, Dover, MA 02030. **POSTMASTER:** Send address changes to: Longitude Media, LLC, P.O. Box 832, Dover, MA 02030. Canadian GST number 840 033 278 RT0001. Publications Mail Agreement Number 40017597.

BIM Library

ARCAT has the most comprehensive collection of BIM objects you will find, available free of charge and without registration.



The ARCAT BIM Library is also accessible in the ARCAT app, with editing capabilities in the AutoCAD 360 app.

ARCAT

arcat.com | Available on the App Store | GET IT ON Google play | amazon apps Available at amazon appstore for Android | facebook

Fujitsu: 25 Years of Workstation Innovation

Cadalyst takes a look back at the company's history of delivering engineering breakthroughs and industry-first products for CAD/BIM/CAE applications.

Worldwide, Fujitsu is a leading provider of computer technologies for business, including workstations designed for CAD, building information modeling (BIM), simulation, media and entertainment, geographic information systems, and other demanding applications. Yet over its 25-year history, as the company has pursued the workstation markets in Europe, Asia, and Africa, the Fujitsu brand has remained largely unknown in the United States.

To help CAD professionals in the United States better understand the company, this overview provides insight into Fujitsu and its two-and-a-half decades of growth in the workstation market. Read on for a look at the company that invented the first Microsoft® Windows®/Intel®–based desktop workstation, created the mobile workstation market, and is responsible for numerous other technology breakthroughs and market firsts.

Getting to Know Fujitsu

With 159,000 employees in more than 100 countries, Fujitsu offers a wide-ranging portfolio of technology products, solutions, and services. The company develops and manufactures mobile workstations in Shimane, Japan, and desktop workstations and servers in Augsburg, Germany. Japanese strengths in high-tech are blended with German engineering excellence that results in state-of-the-art hardware and software development, from specification to the finished product.

In Augsburg, the entire desktop workstation and server development team works together on one campus, considered to be the most modern computer factory on the European continent. All key manufacturing disciplines — product management, product development, supply chain and quality, production, and third-line support — are housed under the Augsburg roof, and BIOS and motherboards are developed in-house. All this equates to a factory that has the flexibility to fulfill specific customer requirements, and it results in the highly reliable desktop and rack workstations and whisper-quiet desktops that are synonymous with the Fujitsu brand.

From the editors of
cadalyst
Sponsored by
FUJITSU

» *Fujitsu's facility in Augsburg, Germany, is considered to be the most modern computer factory on the European continent. Click to view the virtual factory tour.*

Maximum product performance is the focus there, and a high degree of pride reflects the quality of products produced. When it comes to workstation design, the development team adheres to four primary values:

- **Reliability** built on system quality, expertise, and excellence that has led to comprehensive ISV certifications. BIOS and mainboards are developed in-house, along with other components and modules developed with longevity in mind.
- **Human-centric** — that is, ergonomic, user-oriented products. Notably, desktop workstations are whisper quiet, delivering high performance without liquid cooling for even the most compute-intensive applications.
- **Innovation** in notable areas including thermal management and unique palm vein recognition technology for mobile workstation security.
- **Green** design principles guide materials specifications, packaging options, and energy-optimized manufacturing, which in turn have led to green product certifications and awards.

Fujitsu also offers customized hardware development and services for companies that integrate workstation components into their own hardware products. Because customized products are often expected to have longer lifecycles than the typical workstation, Fujitsu works to maximize longevity of components. Custom products and services is a key part of Fujitsu business.

25 Years of Engineering Feats and Industry Firsts

Fujitsu has built its reputation for engineering excellence over two-and-a-half decades in the workstation market. Following are highlights of that history.

1990

The seeds of the company were planted with the merger of Siemens and Nixdorf to form Siemens Nixdorf Informationssysteme AG (SNI, Siemens Nixdorf).

In 1991, the company released its first self-branded workstation, the UNIX®-based WX200, which included 8 MB of memory and a 168-MB hard drive, priced at $47,000. In 1992, it moved into the 3D graphics workstation arena in cooperation with Silicon Graphics® (SGI), and the partnership lasted until 1995.

The company sold MIPS®-based UNIX® workstations for five years, until new technologies appeared on the horizon that would turn the market upside down — and it was Fujitsu that led the way.

» At Fujitsu Forum 2015 in Munich, Germany, the company celebrated 25 years in the workstation market. On display were several models from throughout that history, including the CELSIUS 1 desktop workstation and the first CELSIUS Mobile workstation (shown stacked).

1995

The visionary team began to developing the CELSIUS 1. It would become the first personal workstation based on Intel architecture and the first to support the Microsoft Windows operating system — and at a much lower price than its UNIX®-based predecessors.

Industry first: Fujitsu develops the world's first Windows®/ Intel®–based workstation, revolutionizing the computing market.

Launched in November 1995, the CELSIUS 1 incorporated

- faster Intel CPUs (200-MHz Intel® Pentium® Pro),
- OpenGL® (available with Microsoft Windows NT), and
- new 3D graphics technology targeting the PCI™ interface (production boards based on 3D Labs® graphics acceleration technology).

Fujitsu, Intel, and Microsoft introduce the term "personal computer" in 1995.

» *Fujitsu's Wilhelm Geyer, director of workstation product management, emeritus, walks viewers through the company's 25 years of workstation technology innovation. Click here to view the video.*

1998 Company launches the second-generation CELSIUS 1000 and 2000, which were three times faster than the next-fastest Intel®-based machine, according to the SPEC performance benchmark. The third-generation CELSIUS 420 and 630, introduced a year later, were the fastest Intel® Pentium® III Processor (PIII) and PIII–Intel® Xeon® machines at the time.

1999 Company invents another new market category with the world's first mobile workstation, the CELSIUS Mobile. It included:

- a revolutionary magnesium chassis, detachable keyboard, and 15" display and
- a Mobile Intel® Pentium® II processor (400 MHz), up to 512 MB of memory, up to a 3-GB hard drive, 6+ hours of battery life (two batteries), stereo sound, integrated chip card reader, and ISV certification for leading applications (PTC Pro/ENGINEER®, Unigraphics® [UGS], SolidWorks®, and Nemetschek Allplan®).

Industry first: Fujitsu creates the first mobile workstation — and the mobile workstation market.

2001 Company launches second-generation CELSIUS Mobile 2.

2003 Company launches the first CELSIUS Mobile H.

2004 Company launches first AMD Opteron™–based workstation, offering 64-bit architecture support.

2011 Company launches the FUJITSU CELSIUS C620, the first 1U rack-mount workstation with professional graphics. The CELSIUS C series of rack workstations offers full workstation performance in a compact 1U, making it ideal for any type of remote graphics solution in the data center: Remote Access (1:1), GPU pass-through, or graphics virtualization (1:n). Later, with the addition of the new NVIDIA® GRID™ K2 graphics processor, graphics virtualization took hold.

Industry first: Fujitsu launches compact rack-mount workstation with professional graphics; CAD users are among the first to adopt it.

Industry first: Fujitsu marries palm vein authentication with the mobile workstation.

» *FUJITSU's CELSIUS H730 mobile workstation with PalmSecure palm vein recognition technology.*

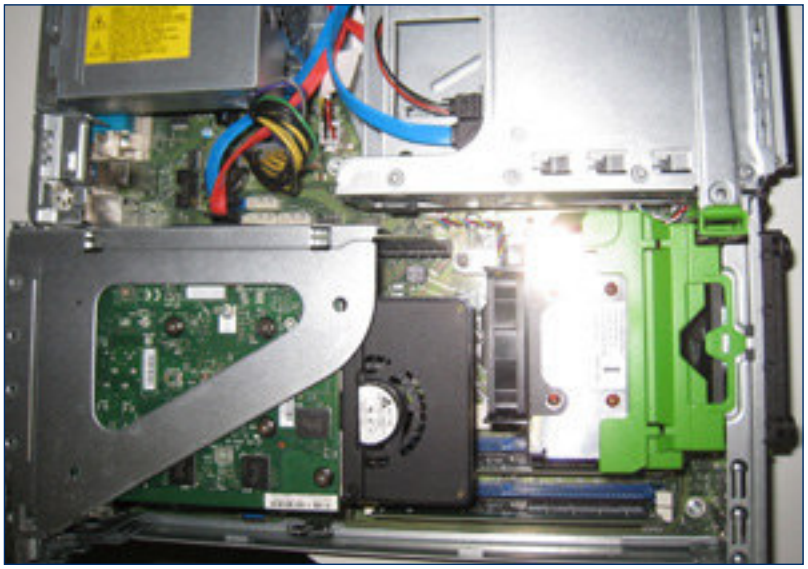
2013

Company introduces PalmSecure™ palm vein authentication on the NVIDIA Quadro®–equipped FUJITSU CELSIUS H730 mobile workstation for highly secure applications.

Industry first: Fujitsu delivers the performance of a full-size desktop workstation in the compact SFF footprint.

2015

Company launches the FUJITSU CELSIUS J550, the first small–form factor (SFF) desktop workstation with full-height graphics card, including the industry-leading NVIDIA Quadro® M2000.



» *A full-height professional graphics card, the NVIDIA Quadro® M2000, is shown inside the compact FUJITSU CELSIUS J550 SFF workstation.*

Looking Back, Looking Ahead

In addition to 25 years of workstation innovation, Fujitsu is celebrating 80 years of company history. Click here to view the video.

The Fujitsu workstation team has even more innovative workstation developments in the pipeline. Stay tuned! ❖

Make the Most of Your CAD Career

To excel at your job, you'll need to do much more than simply show up for work every day. Learn about the various factors that affect success in the workplace and make a plan for your future.

by Robert Green

Whether you're fresh out of school or you're a seasoned veteran, it always pays to think about maximizing your career potential. Long gone are the days when you could just punch out some redline markups in AutoCAD and call it a day. Today's engineering, architectural, and design environments require fluency in a wide array of software products and learning approaches. And, of course, your employer will evaluate you not only on the software you know, but on how you work with that software to get results.

So how can you maximize your CAD skill set, then leverage those skills to both benefit your career now and build advancement potential? The diagnostics and strategies in this article should help you answer those questions in the context of your individual circumstances. Here goes.

Where Are You Now?

First off, we must acknowledge that the definition of a "CAD career" varies from user to user. In most cases, your primary field of endeavor isn't CAD, but some sort of design process that uses CAD as a tool. Understanding what the CAD expectations are in your given career path requires some self-categorization on your part. To start planning, look over the following career profiles and decide which type of CAD user you are.

The designer: This person creates detailed product or building designs using a variety of CAD or building information modeling (BIM) tools, meaning he or she must be fully versed in the use of those tools. Often supporting

Voices *of Experience*

Members of the CAD Managers Unite! Facebook group share career development strategies they've found useful.

"**Much of career development starts with being willing to take on responsibility.** If you are prepared to take on a job that needs doing, and take the responsibility for its successes and failures, your company would be crazy not to encourage (promote) you."

— PAUL MUNFORD

"Never stop learning. Keep up with the technology and **constantly strive to understand what your employer wants from you**. Whenever I'm struggling with something regarding CAD/BIM/IT management, I have learned to ask myself, 'Does the boss care about this?' You would be surprised how many problems that immediately solves."

— MIG UEL

"**I took a speaking course that focused on giving presentations,** as well as a course in technical writing that allows me to communicate with management and nontechnical colleagues."

— TODD SHULER

"**Get involved in online communities, Twitter, or discussion forums.** There is no telling what you could learn. Go to Autodesk University, blog, and get your voice out there. This impresses current and prospective employers. It even got me promoted last year." — CHRIS BENNER

the project engineer/architect, the designer is responsible for getting working prints to manufacturing/construction. CAD fluency and speed are critical for this career profile.

The engineer/architect: The focus of this person's career likely isn't CAD per se, but to do the work, he or she must be knowledgeable about CAD tools and able to supervise team members who use them. CAD fluency and familiarity with analysis tools that use CAD models are required, but production-level speed is not as critical in this career path.

The project manager: This role is responsible for supervising subcontractors and internal teams. These users often aren't hands-on with CAD these days, but a solid working knowledge of CAD — particularly in terms of final file formats and data portability — is required in this career path.

The super user: People in this category must use CAD tools as part of their work, but a keen personal interest leads them to go beyond the typical level of CAD knowledge to learn everything there is to know about their tools. The super user, also known as a power user, is often consulted by other employees for technical support and guidance.

The CAD manager: This person's career has led him or her to become a technical leader in CAD tool implementation, with a focus on debugging, customization, purchasing, and training. The need for advanced skills in a wide range of CAD tools, along with the communicative skill set required to lead training sessions and work with senior management, make this position very demanding.

Solidify Your Current Position

Now that you've identified which type of CAD user you are, it is time to demonstrate mastery in that category. After all, you can't move on to the next step in your career until you've nailed down your current position. To do this, let's draw a few educated conclusions from the categories above and provide some action items that will help you achieve mastery in your current position.

All positions except the project manager require software fluency. Therefore, the more you learn about the software you use, the better off you'll be. Action items include self-study via books or online resources, as well as peer interaction to gain valuable tips and tricks from others.

Designers and super users should strive for fluency with their CAD tools, plus high speed of operation. These users should expand their knowledge of software features, but they must also learn to increase efficiency by paring down clicks and picks. Action items include thorough self-analysis to identify time-consuming processes, followed by software research to identify features and methods to use to become more efficient.

Engineers and architects should make sure their core CAD knowledge allows them to create models that accurately reflect the designs they work on, so supporting calculations will be accurate. Action items include learning more about calculation tools for design, streamlining design processes, coordinating discipline-based files (particularly in building information modeling environments), and gaining a working knowledge of clash detection tools.

CAD managers must develop the same skills of all the user types above, while building the communication skills of an expert trainer. Additional action items include conducting immersive self-learning via written materials and videos, gaining a working knowledge of IT and networks, and acquiring basic programming skills.

So, in summary, you should learn everything you can about the software you use, no matter which role you have. In addition, you need to specialize your skill set depending on your career track.

When You Stop Learning, You Stop Earning

Continued learning is such a crucial part of expanding your CAD skill set, so you'll need to find every way you can to learn more, in less time, and at reasonable costs. The article "Explore the World of CAD Training Options" (p. 17) highlights a variety of training providers.

But locating the resources is just the beginning! A disciplined, strategic approach using the following concepts will help you maximize your training experience.

Be independent. Don't expect your company to teach you everything. Go above and beyond your company's training program to better yourself on your own time.

Get started. If you want to learn a skill, you have to start somewhere, so dive in — it'll get easier as you keep at it. And if at first you fail, try again.

Add it up. Each five-minute video or seven-minute tutorial you take in contributes to a larger learning experience. In fact, five minutes of education every business day will yield 20 hours of training time per year.

Let productivity guide you. As you learn more, focus on topics that will help you in your job, and skip topics you'll never use. Your career will only advance as you demonstrate higher productivity!

Document it. If you turn in a weekly report or evaluation form to your boss, make sure he or she knows how much independent time you spend learning new skills and what those skills are. Believe me, that will call attention to your drive and work ethic!

Social Learning and Networking

It's amazing how much you can learn by simply hanging around with CAD users who have jobs similar to yours. Whether it takes place in software company forums, online user groups, Facebook groups, LinkedIn communities, or at in-person group meetings and conferences, there is power in social learning. Another benefit of social interaction is that you get to know new people and companies that could lead to future career opportunities for you.

As you get involved in these social opportunities, keep the following dos and don'ts in mind to maximize the value of the experience:

- **Do seek out your peers.** CAD managers will find more value in a group just for them than, say, a group for mechanical engineers.
- **Do search existing information.** Don't join a group and immediately start asking questions without doing your homework first. Do a search on previous posts, and often you'll find that your question has already been answered.
- **Do share your strategy.** If you need to pose a question to a forum or group, include a description of which solutions you've already tried or are thinking about trying. This helps other members help you.
- **Don't ask open-ended questions.** Posting a question like, "How do I plot?" on a CAD forum is never going to get a response — it's much too general, and there are far too many possible answers. Posting a specific query, such as, "What is the best method for capturing construction drawings to PDF files?" is much more likely to get a response.
- **Do help others.** Communities aren't one-way streets; members need to contribute expertise as well as benefit from

"The best way to develop is through self-education. **Determine what you would like to achieve, then get online and discover how other individuals are learning it** and developing their skills. Then make the time to study and fail. Yes, fail. You learn through your mistakes; be prepared to make them and learn from your limitations. Then develop solutions for those failures."

— BRIAN MYERS

"Take charge of your own career planning. Jobs are like steps along a garden path: Some are short, while others are long. Like everything else in life, change is constant, so **look beyond your current job and always be looking out for new opportunities.**" — ALEX LEPESKA

"Be self-determined; **don't rely on others to sort out your problems** or even understand them. Learn, practice, improve, share the knowledge, encourage, inspire, enjoy." — MARK PATON

"I've upgraded my education level several times. I started by going to a training class at a vocational school. One thing lead to another, and the next thing you know, I'm in college. I started going to an accredited school in my 30s and **even though the diplomas are Associate's degrees, they were well worth the time and effort.**" — MILT FITZ

it. And you never know — the user you help could be the person who helps you get your next job.

- **Don't be a chronic griper.** If all you do is complain — whether it's about your software or your coworkers or whatever — people in the group will view you as negative. They won't want to work with you, and that will hamper your future career prospects.

If you follow these guidelines, you won't just learn — you'll build professional acquaintances that will benefit your career immensely. Don't isolate yourself by learning in a bubble, get out there and build contacts as you learn. Trust me, it works.

What Does the Boss Want?

Years ago, I heard a senior manager complain to a group of CAD users, "We're not in business to fiddle around with CAD, we're here to design buildings!" As the manager continued, he made it very clear that he wanted his staff to focus on the building design process and spend less time noodling with software — a sentiment I hear from many senior management teams. As I've continued my work relationship with this company, I've noticed employees who've been promoted are the ones who focused on design, not CAD — just like the boss asked.

But since we all have to use CAD software to do our jobs, how can we meet the boss's desire to focus on design without spending needless time messing with software? The brief answer is: Make sure everything you learn — via whatever method you choose — supports the business goals of the company, and that your boss knows you understand his or her perspective.

To achieve this tough balance of CAD and business learning, here are some approaches each type of CAD user can consider:

All users must dedicate themselves to the concept that making software work to support fast project execution is their first priority. The core action item is to constantly ask the question, "How can we do things better?" and change software use accordingly.

Designers and super users should strive to find consistent means of working with each other to speed project execution and reduce the chance of software errors. Action items include ensuring interdepartmental CAD standards are complementary, helping the CAD manager implement and train all users on standards, and doing everything possible to minimize CAD rework.

Engineers and architects should examine how they interact with designers and super users as a project progresses to find optimization possibilities. Action items include conducting CAD reviews with users to address changes to standards and practices that could speed project execution, particularly in late stages of the project when changes happen frequently.

Project managers should consider the final output of the CAD process and make sure that everyone in the company understands what the requirements are. Action items include defining file formats, annotation standards, file submittal/archiving procedures, customer CAD standards, etc. Project managers should never allow these items to go undefined until the end of a project.

CAD managers must realize that process optimization and standardization are what the boss really wants, even though he or she may not know it. Action items include getting all users to embrace the power of standardization, so they can see the career benefits for everyone when software is used optimally.

Communication Is Always Key

As your career advances you'll almost always find that your ability, or inability, to communicate effectively has a huge impact on your success. No matter what career stage you're at today, it is critical to develop better communication skills. Here are some things to think about, along with a diagnostic question, for each type of user:

All users must make their written and spoken communication clear and jargon-free. If others can't understand you, why would they want to make you a crucial part of their projects?

Designers and super users need to provide strong written summaries of project status and problem resolutions, and be ready to clarify verbally when asked to do so. If you're the person working on a problem but you can't explain the problem to engineers, architects, or project managers, how can you expect to be entrusted with more responsibility?

Engineers and architects should write up summaries of project standards, procedures, and work methods in a way CAD users can understand. How can you expect people to work to your project standards if you can't define them clearly? Note: You can often work with the CAD manager to achieve these goals.

Project managers need to create clear CAD project requirement documents at the kickoff of every new project, and distribute them to all CAD users on the project. How can you expect to control project CAD costs if your team doesn't know what the rules are when the project starts?

CAD managers must strive to support all the communication items above while also building a standards training program. If you don't work to pull all the communication items together, who will?

Almost everyone can benefit from a technical writing course and/or a public speaking course. Despite what some people think, writing and speaking well aren't gifts — they are learned skills. And no matter how much software changes, your ability to communicate well will always advance your career.

What's Your Career Goal?

It isn't enough to simply say, "I will keep learning." You have to learn in a way that allows you to master your current job functionality while moving toward the next phase of your career. So the questions become, What is your goal? and How will you get there?

To decide your career path from a CAD point of view, go back through this article, but this time read it as your future self and assess which career category makes the most sense for you. Think about the learning you'll need to do, the skills you'll need to acquire, and which path interests you the most. That way you can start learning today with both short-term and long-term goals in mind.

Summing Up

Managing your CAD career is a long-term process that can lead you in directions you may never have considered. (Back when I was a mechanical engineer, I certainly never expected to become a CAD manager!) The best thing you can do is to execute a learning plan that makes you invaluable in your current position while building your chops for your next position. Hopefully the strategies in this article will help you do just that. All the best in your career endeavors.

Robert Green performs CAD programming and consulting throughout the United States and Canada. He is the author of *Expert CAD Management: The Complete Guide*. Reach him via his web site at www.cad-manager.com.

Straight Talk About Autodesk Subscription

Before you make your next software licensing decision, understand the facts behind the changes and your options going forward.

Autodesk is ending sales of perpetual software licenses beginning February 1, 2016, for most standalone products, and August 1, 2016, for Autodesk Design & Creation Suites. From those dates forward, all *new* licenses — including standalone and shared network options — will be available only by Desktop Subscription.

The plan sounds straightforward when boiled down to those terms, but uncertainty about existing perpetual licenses and subscriptions has left many Autodesk customers wondering if things will change for them and how to plan accordingly.

This four-page guide, developed by the editors of Cadalyst with the support of Autodesk, aims to clarify the licensing changes, dispel the myths and misconceptions, and present the options available to each type of Autodesk customer. We at Cadalyst want to provide you with the facts so you can make the best decisions when it comes to your Autodesk software licenses. Let's dive in.

What's Happening, Exactly?

The option to purchase new perpetual licenses for most Autodesk software is going away. If you have a perpetual license now or purchase one before the cut-off dates, you can continue to use the software in its current state for as long as you wish. After the cut-off dates, perpetual licenses for most products will not be sold by Autodesk or its Value Added Resellers.

Customers who have a perpetual license on Maintenance Subscription (or who add it by the cut-off dates) will have access to software updates and new releases, as well as other included benefits, for as long as they choose to keep the maintenance contract is active.

After the cut-off dates, the only way to purchase any new license of most Autodesk software products or suites will be via Desktop Subscription.

Now and going forward, customers can hold any combination of perpetual and subscription licenses.

How Does This Affect YOU?

Following is information and guidance regarding your options as an Autodesk customer under the licensing changes. The new policy applies to customers using all affected individual products and product suites in all countries globally where Autodesk software is available. (In fact, changes are already under way in parts of the Asia-Pacific.)

As stated in the Autodesk Perpetual License FAQ, "Throughout this period, Autodesk and our reseller partners will work with our customers to make this transition from perpetual licenses to subscription as smooth as possible, and to address exceptional situations accordingly."

Additional information about managing your Autodesk software licenses is available online in the Account Management section of the Autodesk Knowledge Network.

Useful Resources

Link to all the resources listed in this article — and more — from one location:
www.cadalyst.com/StraightTalk

New Perpetual License Deadlines

Autodesk will gradually stop selling perpetual licenses of most products; new licenses for these products will be available only via subscription. The last dates to purchase *new* perpetual licenses are as follows. See Autodesk.com for details about products affected. Perpetual license holders can continue to renew Maintenance Subscriptions for as long as they wish.

January 31, 2016
Most individual desktop software products.

July 31, 2016
Autodesk Design & Creation Suites and additional individual desktop software products.

Desktop Subscription: Customer Perspectives

Terri Moore

Principal
moore+friesl

"At our architecture and design firm, we use Autodesk Revit LT via Desktop Subscription (DTS). We've also had Autodesk Inventor on perpetual license with Maintenance Subscription for about three years that we'll be converting to DTS next year. The perpetual license for Inventor worked because it is our core software in the business, but we also work on larger-scale projects, and that required adding Revit. Since our need for Revit is project specific, DTS was a great option. We could ramp up incredibly quickly per project while ensuring that we have the most up-to-date software; it's a very low-cost overhead up front; and we can easily say yes to work, knowing that we can compete with much larger firms and that the software will not be an issue."

If you are a perpetual license holder without Maintenance Subscription

Your existing perpetual licenses and those purchased by the cut-off dates will remain valid indefinitely when used in accordance with your perpetual license agreements. Upgrade versions for perpetually licensed products are not available.

You may add Maintenance Subscription to a perpetual license — before the cut-off dates — *if* it is the current version of the product. If your software is out of date, you must purchase a new perpetual license ahead of the cut-off to get current — or opt for Desktop Subscription. Note: The start date of a Maintenance Subscription contract is set to when you received your perpetual license, not to the date when you purchased the subscription.

More information is available on Autodesk's Perpetual License Changes and Perpetual License FAQ pages.

If you are a perpetual license holder with Maintenance Subscription

Autodesk is not eliminating Maintenance Subscription, and the license changes do not affect software licenses with valid Maintenance Subscription. As long as you continue to renew a Maintenance Subscription, you'll continue to receive all associated benefits. You may continue to renew Maintenance Subscription contracts for as long as you want and can lock in the price now with a multiyear contract. See the Maintenance Subscription FAQ for more information.

If you hold or are planning to acquire networked perpetual licenses

Existing network licensing options will remain in place until the cut-off dates. After that, customers who need to add licenses of individual software products to an existing network server deployment will have the option to purchase additional network term licenses as part of a new network subscription offering, expected to become available on February 1, 2016. To simplify license administration, these will run on the same license manager as the perpetual licenses.

After the cut-off dates, customers will no longer be able to convert a perpetual license to a shared network. Those who make the conversion prior to the cut-off dates will incur a one-time fee per license that is 25% of the retail price of a standalone perpetual license of that product.

Further information about network licensing, including the upcoming network subscription option, is detailed in the Network Licensing Changes FAQ.

If you have a Desktop Subscription

Desktop Subscription allows you to license Autodesk desktop software on a monthly, yearly, or multiyear term. It offers access to the latest software and product enhancements, technical support, and in some cases, access to select cloud services. Users can install Desktop Subscription software on multiple devices, as each

Myth Busting

Following are several misconceptions about Autodesk Desktop Subscription and the facts you need to know.

Myth: Desktop Subscription stores my software and data on the cloud.
Fact: The desktop software application delivered through Desktop Subscription, as well as associated user data, are stored on a local machine.

Myth: With Desktop Subscription, I don't get the full version of the software.
Fact: Desktop Subscription gives you access to the same full software version that you would get with a perpetual license.

Myth: Without an Internet connection, I can't use my Desktop Subscription software.
Fact: An Internet connection is required for the one-time activation of your software; after that, Desktop Subscription software will work offline for up to 30 days, at which point you must connect to the Internet to continue using the software. You'll receive a reminder seven days prior to having to reconnect.

Myth: If my subscription lapses, I'll lose access to all my data.
Fact: If your subscription lapses, you won't be able to open and edit your files, but you can use any free Autodesk file viewer to view the information.

Myth: On subscription, my software will upgrade to the latest version even if I'm not ready or my third-party apps are not yet compatible with the upgrade.
Fact: In the future, you'll have control over all aspects of the update process — if, when, and how frequent.

Wuillian Medrano

Owner
WM Consulting Service

"In my work as a BIM services provider, I have one license of the Building Design Suite via Desktop Subscription. Previously, I was getting by using an old version of CAD software, or I would use my customers' PCs or remote access their systems. The constant updating every year and incompatibility of some of the BIM programs made me choose Desktop Subscription as the best option. I like how the suite gives me access to a variety of construction software for one low price in case my clients require additional services. And having access to the additional software has made me consider expanding my services to other fields such as BIM coordination."

Val Sporleder

Interior Designer/Owner
1AD Studio

"I have Desktop Subscription for the AutoCAD Revit LT Suite. I am the single owner of an architectural design company and was not able to afford these programs before, so I wasn't using either. Now, the subscription price is at a point that, as a small business, I can afford. Having the two programs offered together as a suite has benefited me greatly also, as I can continue to learn Revit while doing the majority of my work in AutoCAD. Going forward, I believe another benefit will be getting new versions as they are available — although I'm concerned about having to learn the new features every year. Hopefully, this will be mitigated by a robust customer service department! I will need that!"

license follows the user and not the user's machine. Desktop Subscription terms will be unaffected by the licensing changes.

Desktop Subscription will be the only option for purchasing most new Autodesk software after the cut-off dates. Visit the Autodesk Store to see software available by Desktop Subscription and pricing; see the Desktop Subscription FAQ for more information.

If you're a Cloud Service Subscription customer

Autodesk BIM 360, PLM 360, Fusion 360, and other Cloud Service Subscription offerings purchased separately or included with Maintenance Subscription and Desktop Subscription will not be impacted.

If you're an enterprise, named account, or other large corporate customer

Enterprise customers who purchase under E-Flex or Multi-Flex will continue to receive new versions of products per those subscription benefits. Enterprise and named account customers who purchase outside of those programs will be affected by the policy change.

Customers with an Enterprise Business Agreement that includes perpetual rights to their software may exercise their rights to receive those perpetual licenses at the end of their agreement, or they may choose to renew those perpetual licenses under Maintenance Subscription at that time. Customers with a currently active Enterprise Business Agreement will be able to purchase new perpetual licenses, as permitted by the terms of their agreement.

Large companies could benefit from the upcoming network subscription (see above) or current offerings designed to meet the needs of organizations that hold numerous licenses. Contact your Autodesk account representative or Autodesk reseller to discuss your options.

If you're an education customer

Licensing changes do not affect students, teachers, and academic institutions worldwide that are eligible for free access to Autodesk software. These customers will continue to have free access to Educational Licenses.

What Happens

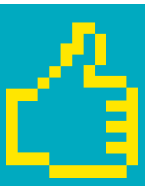
… if I want to crossgrade a product?

Autodesk will offer the product crossgrade — that is, a transfer from a current version of a product (under perpetual license with Maintenance Subscription) to the current version of a higher-valued product or suite for a fee — until the cut-off dates for perpetual license sales. For example, if you wish to crossgrade from AutoCAD to the Building Design Suite, you can do so through July 31, 2016. The perpetual license and current Subscription Maintenance agreement will transfer to the new software. You cannot crossgrade from a perpetual software license to Desktop Subscription.

… if I let Maintenance Subscription expire?

The first year you do not renew your Maintenance Subscription, your software will no longer be upgradable, but

You Might Like to Know



Desktop Subscription delivers benefits that just might simplify your workload.

Perk: Software licensing is made simple.
Subscription eliminates licensing headaches. You no longer have to manage serial numbers, get activation codes, or deal with license-activation errors. You don't have to transfer licenses between machines.

Perk: Software and settings follow you — not your desktop.
Users simply log in to any computer that has the software installed and go; your customizations follow you, too.

Perk: Software upgrades and training can be easier for IT — and users.
With Desktop Subscription, you have the option to update your software as new features become ready to deploy, avoiding the massive workflow disruption — and complex training — that typically accompany full version upgrades.

Perk: Need to clarify license status? There's a report for that.
Request a license report that lists all your software for all your contracts, including the release date and asset status of each software title. A release date of 2009 or newer and status of "Registered" indicates a title is eligible for upgrade before February 1, 2016. Fill out and submit the Software License and Activation Help form to request the report.

Perk: Expanded software access.
Desktop Subscription includes access to previous software versions as well as global use rights.

Will Your Company Be a Blockbuster or a Netflix?

by Andrew Anagnost
Senior Vice-President, Industry Strategy and Marketing, Autodesk

Change is hard. Actually making those changes — whether you're the consumer or the corporation — is even harder. Waves of change are happening with both software companies and their users. Customers are trying to adjust to how software businesses, well, do business now. It's hard to make the change from the familiar software licenses to the uncharted territory of subscription.

"How things are made is in a transition **the likes not seen** since the PC revolution."
— Andrew Anagnost

But subscription really isn't that uncharted — it's endemic now, from iPhones to Netflix. With my iPhone, I hit the button for an update, and it just works. Not so with most of the heavy-loading software delivered in annual releases. Why is it still being sold like a can of baked beans when you really want the fresh stuff? Thankfully, with subscription, that's going to change.

Opportunity Costs

Kodak missed the digital revolution, and, like aging photos, faded with time — despite the fact it actually invented the first digital camera in 1975. Meanwhile, new and dynamic product categories for cameras, printers, accessories, and more were born and continue to flourish.

Then there's Blockbuster. "Be kind, please rewind"? Not so much for this company, which collapsed under the forward-marching digital pressure of Netflix DVD mail delivery and on-demand streaming. Ultimately, the early subscribers of Netflix reaped long-term benefits, incredible deals, and an overall better relationship by getting on board in the beginning.

A similarly huge shift is under way in the world of design. I see it at the doorsteps of customers' businesses. From skyscrapers to consumer products, how things are made is in a transition the likes not seen since the PC revolution. It's far beyond what most are expecting. It's time to either disrupt or be disrupted. Those that survive are going to be like the fearless innovators who developed and commercialized digital cameras — not Kodak. Companies must ask themselves, "Am I a Blockbuster or a Netflix?"

How things are made … the way people work together … the access to technologies: It's all changing by the day. Those who embrace it will survive and thrive.

Moving Forward

The software industry isn't shifting just for the sake of change. This is a change that is simply a better experience for everyone, even with the growing pains. It's to create a better product, something tailored to customers. There will be less disruption: Say goodbye to hours, days, and even weeks wasted with massive updates and lost serial numbers.

But let's face it: This is a lot of change. The good news is that it can be gradual to suit any individual user's needs and situation. That's why customers of Autodesk, for one, can continue to renew their maintenance contracts for as long as they want. The company is always listening to how to improve the transition and setting out for the long road, not the short win.

it will continue to run in its current state for as long as you wish to use it. To obtain the latest version in the future, you'll need to purchase a Desktop Subscription.

… if I let Desktop Subscription expire?

When your Desktop Subscription lapses, your software will no longer work. You keep all files created using that product and can view (but not edit) them.

… if I don't have an Internet connection?

For customers who require use of software without ever connecting to the Internet, network subscription (see above) may be an option.

… if I need technical support under the new policy? Can I get it for an older software release?

Autodesk has no plans to change its product support policy. Customers using software under Subscription Maintenance remain entitled to support for versions up to three releases back. This will continue to be the case even after Autodesk stops selling upgrade versions.

Bottom Line

The right move for your company going forward depends on your unique circumstances and budget. Look closely at the new options and terms and determine the cost of each before you make a decision.

When comparing the cost of Maintenance Subscription versus Desktop Subscription, calculate the annual and total expenses over three- and five-year periods (or longer depending on how often you prefer to update your software). Add the cost of a new perpetual license if you don't already own it; omit the cost if you've paid that bill. If a multiyear subscription plan is an option, be sure to factor the discount into your overall calculations. You can obtain prices for each licensing option in the Autodesk Store or from your reseller for each software product and suite.

Using AutoCAD as an example, we can calculate that the cost of ownership of a perpetual license plus Maintenance Subscription over three years' time is higher than the cost of a three-year Desktop Subscription. However, the tables turn over a five-year period, when the cumulative cost of perpetual license plus Maintenance Subscription falls below the cumulative cost of Desktop Subscription.

Moving Forward

Before you make any licensing decision, be sure you fully understand the official terms of the policy change. Unofficial sources might be sharing inaccurate information; if you're unclear about any policy details or need help evaluating your options, consult the Autodesk web site, your Autodesk account representative, or your Autodesk reseller.

Armed with accurate information, and having thoroughly examined licensing options and costs, you'll be equipped to make the best possible decisions moving forward. ■

For a list of continuing education options, click here.

Explore the World of CAD Training Options

CAD and related software tools are more sophisticated and varied than ever — but fortunately, so are the resources available to help you master them.

by Scottie Barnes

© iStockphoto.com/Steve Debenport

CAD users know that change is a constant. On a typical workday, you may be introduced to new workflows, new software, new capabilities added to a familiar tool, or all of the above. In addition to annual or biannual updates, some software companies are now continually sharing updates in real time; major changes can occur overnight. In such a dynamic environment, a CAD professional who believes he or she can remain competitive merely by attending a yearly refresher course may be left in the dust.

Fortunately, opportunities abound to enhance skills and boost productivity; long gone are the days when a CAD user looking to learn had no options beyond printed software manuals. Training for CAD and related software tools is now available in a variety of formats, including online classes, in-person workshops, video tutorials, and more. Some providers even offer a baseline test to help users determine their strengths and weaknesses so they can customize their curriculum accordingly.

To better understand the available resources, let's look at a few examples of providers offering some of the most popular types of training. To see a broader list of options, go to www.cadalyst.com/ExploreCADTraining.

Free Peer-Created Videos

YouTube isn't the only source for user-created CAD tutorials. Autodesk Screencast (screencast.autodesk.com) is a free utility from the Autodesk Knowledge Network that enables Windows and Mac users to create user-narrated screen-capture video tutorials and share them online. In addition to recording the video and voice narration, the utility also records the presenter's actions as they are carried out (for supported Autodesk applications, including AutoCAD, Revit, Fusion 360, and Inventor), such as the commands, settings, and dialog boxes used. These events are then displayed on the interactive Screencast Timeline at the bottom of the video display. The site's ever-growing library of free tutorials is accessible to everyone.

Video Training by Subscription

Users rarely have a project that goes perfectly smoothly, where everything works exactly as the software developer designed it. In the real world, users spill their coffee, a command doesn't work, a saved piece of work disappears, a boss or co-worker interrupts, and things don't fit. That's the environment O'Reilly Media (www.infiniteskills.com) aims to recreate in its range of high-definition video-based training programs. The project-based training videos walk customers step-by-step through challenging real-world problems that are throwing kinks into the project.

Users can learn at their own speed on a desktop computer, iPad, or iPhone. The introductory portions of individual video courses are free; prices for full courses vary, but most are less than $100. Alternatively, a subscription of $25 per month or $250 per year purchases unlimited access to a complete library of more than 300 training courses. The library includes CAD, building information modeling (BIM), and animation titles, among others.

Another option for subscription-based video training comes from SolidProfessor (www.solidprofessor.com). Its online subscription service begins with a skills assessment to identify knowledge gaps, then suggests specific lessons or tutorials to address areas of weakness. Students can obtain tips and learn new methods each day.

This was the chosen solution for Honey Bee Manufacturing. The Canadian company had been using SolidWorks for more than 10 years and was using SolidProfessor to train new employees when it realized that some senior staff could use

a refresher course as well. So the company retrained everyone.

"We found that experienced users relied on the tools and features they had learned when they first began. We were regularly upgrading our software, but not our methods. So there were a lot of great features we were not using," said project engineer Joel Seerey. Honey Bee scheduled group training sessions in which staff watched videos, then discussed how the new features being taught could be incorporated into the company's workflow. "Viewing lessons taught by competent, trained instructors, then discussing how the lesson applied to our workflow, completely changed how we use the products," Seerey said. "Now we take advantage of every feature that we can. And with every product update, we send out the newest lessons and make sure no one is left behind."

SolidProfessor offers training for a variety of applications, including AutoCAD, Revit, Inventor, and Onshape. Pricing varies based on software title, but for individuals, monthly subscriptions start at $19 per month or $199 per year. SolidProfessor for SolidWorks starts at $399 per year. Schools and companies with teams of users receive special pricing based on their needs.

Autodesk Authorized Training Centers

To maximize the benefit from Autodesk Inventor, the engineers and technicians at RWE Power in Germany turned to CIDEON Systems (www.cideon-systems.com), one of many Autodesk Authorized Training Centers (ATC) around the world that offer highly customized onsite training. To locate an ATC near you, visit www.autodesk.com/atc.

Ralf Munch, an engineer of machine technology and CAD administrator, explained, "We've made steel construction design our main focus, and we've achieved a significant improvement in productivity as a result of our training sessions." He said the sessions helped his team learn to produce complex designs more simply and in a uniform way, helped meet RWE Power's need for improved data quality, and enabled users to work more quickly within the program. Before each workshop, an ATC trainer consults Munch and his colleagues about which components to use as practical examples. The trainer then devises a session that incorporates original designs.

With ATCs, participants work with instructors in a classroom setting using sample projects and exercises that emphasize practical, real-world applications. Customers who do not need this level of custom, onsite training can choose a more general class nearby that is appropriate for their skill level and meets at a time that works for their schedule. Users can also validate their product knowledge by taking a certification exam at a participating testing facility to become Autodesk Certified. Professional associations accept many ATC courses, and students can earn credits for mandatory continuing education classes and other professional development programs. Prices vary based on the number of participants and the type of training or level of customization and class frequency.

Blended Online Training

For those who struggle to take time away from the office, IMAGINiT Technologies (www.imaginit.com), an Autodesk ATC, recently added a blended online training program to its more traditional offerings. This format pairs instructor-led online lab sessions with self-paced learning, video demonstrations, and collaborative learning in which students engage one another to ask and answer questions through a shared screen.

"We spent a lot of time internally discussing ways to train a little more than 225 employees with a broad range of skill sets to increase our efficiency and productivity," explained Justin Tallmon, corporate CAD manager at Olsson Associates, an employee-owned firm emphasizing civil engineering. "With the blended learning format, users go at their own pace, but they typically spend about four hours on the program each day over a four-day period. This allows them the flexibility to keep projects moving forward and not impact ongoing project deadlines while they train."

Prices for individual blended learning courses vary based on the class content, duration, and skills being taught; those currently available range from $625 to $1,395. Options for customized curricula are available; pricing depends on such factors as the number of students, amount of customization required, and time frame for delivery.

Short Courses and Workshops

In addition to hosting conferences, workshops, and short courses around the world, product lifecycle management (PLM) specialist CIMdata (www.cimdata.com) customizes education programs for individual companies. Its workshops can be tailored to address elementary or advanced topics. Courses cover everything from executive short courses to certificate programs. Training formats range from classroom-based to e-learning, and from live online tutorials to customized onsite or online courses. The three– or five–day PLM Certificate Program costs $2,550 or $3,750, respectively; the PLM Executive short course is $925. (Group discounts are available.)

Technical School Courses and Degree Programs

ITT Technical Institute's School of Drafting and Design (www.itt-tech.edu/drafting-design.cfm) offers Associate's degree programs that introduce fundamental skills used in CAD positions. Graduates are prepared to pursue entry-level positions in mechanical drafting and design, BIM, architectural drafting, parametric modeling, and civil drafting, design, and structural detailing. With more than 130 campuses and online programs, instruction can be delivered through traditional, accelerated, and distance methodologies, and students can prepare for industry certification exams while earning their degrees. Tuition rates range from $426 to $529 per credit hour, and a typical full-time student takes between 12 and 13.5 credit hours per quarter.

After graduation, these newly minted professionals can keep their technical skills sharp by auditing courses online, taking refresher courses, and obtaining online service assistance when faced with technical challenges.

Keep On Learning

Everyone — even the most experienced and talented users — needs frequent training to reach their full potential. Whether you're fortunate enough to have most of your needs met through trainings held in your workplace or you need to track down all your training on your own, the important thing is to find a method that works for you. Invest the time and effort to become a lifelong learner; your career will thank you!

Founding editor of *GeoIntelligence* and former editor in chief of *Geospatial Solutions* and *GPS World*, **Scottie Barnes** has covered evolving technologies for more than 20 years.

Level Up: Become a Power User

All CAD users need a workplace guru they can rely on. With these ten simple tips — and some dedicated effort — you can become that person.

by Curt Moreno

© iStockphoto.com/Halfpoint

Here's a scenario that every CAD user has encountered: You're at the office, working hard to get a project out the door before the deadline. Then you run into an unexpected problem. Maybe you can't get a component of your drawing to work as it should, or your rendering is not coming out the way you expected. Perhaps it's something as common as the printer acting up again.

Whatever the issue is, you need help — and you need it right away. Hopefully, you have a power user nearby that you can turn to.

What Is a Power User?

In the technical world, users of CAD and other technologies can be envisioned as a sort of pyramid, with a large population of neophytes at the bottom that narrows as experience and expertise increase. At the top of this pyramid are the power users: an elite group of workplace superheroes whose knowledge and experience enable them to be more productive and efficient than the average user, and also to assist others.

Being a power user does not necessarily mean that you hold a special job title. In fact, it is quite often the opposite. Whereas official titles and positions are determined by your company's management, the unofficial title of *power user* is bestowed organically. Through a natural determination of who needs help and who can provide it, the CAD production staff (or any other work group) learns who is the best choice to call upon when a member of the group needs assistance. Simply put, a power user (sometimes known as a *super user*) is the person everyone turns to for help.

Doing More and Getting More

On the surface, it may seem that there is no benefit to being a power user. Helping others can be a full-time job, and you already have one of those! In addition, being a power user does not necessarily translate into a more desirable position or better pay. So why would anyone want to take on this role?

The reality is that being a power user is a byproduct of a person's natural (or developed) aptitude and desire to master a process, a piece of software, or some other aspect of their work. Simply by being the sort of person who works to master a task, the nascent power user has begun the process of self-selection. As this type of user progresses and amasses more knowledge and experience, his or her reputation as a reliable resource grows, making a power user a valuable resource in any workplace — and therein lies a chief benefit.

On a very simple level, power users produce more value than their peers, as a result of their expanded wealth of knowledge in a certain area. They are better able to utilize the tools provided by their employer, and therefore are more productive than less-experienced coworkers who are using the same tools.

But the value proposition goes further: A power user is also a force multiplier. A single power user can raise the level of output in any group of workers with an average skill set by providing peer support, encouragement, and training. This helps everyone in the work group to be more productive, efficient, and innovative.

However, don't think that this is all a one-way stream of value. The power user earns recognition, appreciation, and satisfaction from helping others. Power users also commonly enjoy the benefits of advancement and promotion, as well as job security. Almost all employers are willing to invest more in a power user in terms of wages and benefits, since the added productivity they encourage brings added value to the company. In addition to money, employers are also often more willing to purchase better tools if the power user requests them. New software, faster computers, and expanded ranges of plotters and printers are assets employers are willing to invest in to support increased production.

Naturally, those are things that benefit the entire production staff, thus further elevating production and the standing of the power user. It's quite the positive cycle — and it all begins with the power user.

Who Can Become a Power User?

Some people think that power users are born, not made, but that's not the whole story. The truth of the matter is that it takes hard work and persistence to become an expert in a given subject area, even if you're naturally gifted in a particular discipline.

The good news is that there are no secret societies to join or handshakes to learn; all you have to do is take advantage of the opportunities given to you. Here are ten simple ways to get started.

Look for Learning Opportunities

1 Take advantage of the tutorials. Professional CAD software typically comes with a set of very comprehensive tutorials. Developers incur significant costs in creating and updating these lessons, but most users never even look at them. As an aspiring power user, these excellent learning resources can be your secret weapon!

2 Tune in to YouTube. Admittedly, not every software program comes with top-notch tutorials, and sometimes the lessons may not address a topic in the way that you need. In that case, you'll need tutorial backup, and there is no better free source of video tutorials than YouTube. Don't overlook this incredible resource.

3 Turn to professionals. Learning more than the standard functions of any process means that you are going to go where few people tread. That also means that your level of knowledge will eventually surpass free resources such as user-created videos. Fortunately, the CAD industry is full of talented professional trainers and extensive paid resources, from online learning services such as Lynda.com and Global eTraining to in-person teachers. Don't shy away from enlisting the help of subject-matter experts, even if you have to use your own funds to do so.

By being both knowledgeable and approachable, you will ensure that your **coworkers can benefit** from your position as the power user of the office.

Work Well with Others

4 Embrace challenges. Whether or not they are power users themselves, your coworkers are a great source of learning opportunities. When your coworkers need help it can often stretch the limits of your knowledge, forcing you to experiment and explore new solution avenues. Much like your muscles, your brain needs to be taxed to become stronger.

5 Ask questions. It is crucially important to keep asking questions — even in subject areas you think you've already mastered. There are multiple ways to accomplish any task, and asking questions is the key to learning these alternative techniques.

6 Become an expert volunteer. You can garner a good deal of experience by just doing your everyday job, but it takes more than that to be a power user. An excellent way to broaden your range of experience and learn new things is to volunteer for other projects. Whether at work, as a freelancer, or as part of a volunteer organization, look for opportunities to gain experience in your particular area of expertise. As an additional benefit, repeated volunteering will spread your reputation for being talented and helpful.

Keep Cool When the Pressure Is On

7 Make a note of it. In the organizational guide *Getting Things Done,* author David Allen explains that your brain is not a very good place to keep things, especially nuanced details like technical processes or tips. So make a habit of keeping notes, and don't be embarrassed to refer to them. Also, don't let pressure prevent you from making a note about a newly discovered tool or feature. Excellent, multiplatform note-taking apps such as Evernote, OneNote, and Google Keep are available at little or no cost.

8 When in doubt, click around. What if you look into another user's software problem and find that you are stumped also? It might sound silly, but when I find myself in this situation, I just start clicking on every tool that even vaguely tickles the "here is the answer" portion of my brain. In the absence of a definite answer, even a possible answer has merit. One thing is for sure: *Not* clicking is not going to solve anything!

9 Stay calm. If you panic in reaction to a problem, it will be difficult to draw on the deepest wells of your knowledge, and that will just make you even more anxious. A calm demeanor helps to keep your mind in working order. And if you can keep your composure, the person you are trying to help will be more likely to also remain calm as well.

10 Maintain a helpful attitude. Consider this scenario: You work hard for years to gain a level of expertise that no one else in your office can match. But every time someone asks you a question, you roll your eyes or make that person feel foolish. Who would want to work with you? No one, that's who. Instead, always be happy to help, even when you are busy. Explain things slowly, and never frown when you have to repeat yourself. By being both knowledgeable and approachable, you will ensure that your coworkers can benefit from your position as the power user of the office.

In short, if you dedicate yourself to continued learning and help others as others have helped you, you will be on the path to becoming a power user. That will eventually translate into greater productivity for your office, improved camaraderie and morale for your production group, and increased recognition and better opportunities for you. With great power comes great responsibility — but also great rewards!

Curt Moreno is a Houston, Texas–based CAD coordinator, writer, and highly rated Autodesk University speaker who has been using AutoCAD since 1990. Reach him via his web site, www.kungfudrafter.com, or follow @wkfd on Twitter.

More CPU Cores or Faster CPU Clocks?

To best address the demands of a modern CAD workflow, look for a balance of CPU core count and clock rate in your next CAD workstation.

Which do you think is better for processing common CAD workloads: more central processing unit (CPU) cores or faster CPU cores? It's a debate we never had prior to the advent of multicore CPU architectures. But now that multicore CPUs are the rule — and multi-threaded applications are not — it's a debate that's worthwhile. The best combination of CPU core count and clock rate for your next CAD workstation depends on a variety of factors, from the applications you use to the tasks you most frequently stress — and your budget, of course.

by **ALEX HERRERA**

This topic has been addressed in many places over the years, including this column, but mostly with qualitative arguments and little in the way of demonstrative results. To rectify that situation, I'll provide some concrete examples and a bit of experimental data that more clearly illustrate how common CAD computing workloads behave differently — and thereby perform differently — when run on CPUs that favor faster cores versus CPUs that favor more cores.

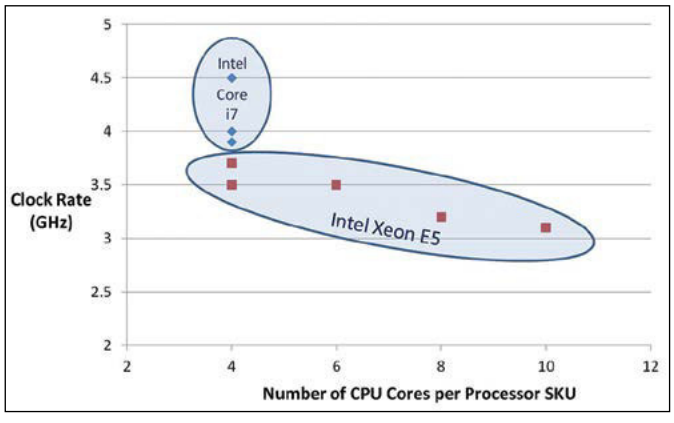
Why Multiple Cores Instead of Maximum Frequency?

We're about a decade into the era of multicore processors, and it's worth recapping the rationale that drove the industry to make the very intentional, dramatic shift away from pursuing big gains in clock rate (the frequency at which the processor runs) and instead focus on creating more cores per processor. There were two primary reasons: First, chasing instruction-level parallelism was becoming too difficult. For years, CPU designers added or enhanced superscalar techniques to speed the processing of a single thread of execution. By the turn of the century, all the low-hanging superscalar fruit had long been picked. Increasing throughput by architectural means had extended well beyond the point of diminishing returns, so even modest gains required big tradeoffs in complexity and cost.

Second, and more critically, with frequencies so high (in combination with related issues, such as pipeline lengths growing so deep) and silicon transistor dimensions so small, chips were simply becoming too hot to operate reliably. The faster a chip runs, the more power it consumes and the more heat it produces. With the power trajectory chips were on at the time, they would have eventually become impossible to cool. As a result, by the mid-2000s, the frequency-first design strategy for CPUs had ended. Rather than build more complex, faster-clocked monolithic processors, virtually every vendor on the planet changed course to create a more modest and manageable core, and then instantiate that core multiple times in a single processor chip.

Today, a CAD buyer looking to configure a workstation has many CPU models or stock-keeping units (SKUs) to choose from — some that offer higher clock rate and fewer cores, some with lower clock rate but more cores, and some that are a compromise between the two. For example, Intel's current-generation Core i7 brand CPU SKUs (appropriate for high-performance PCs and workstations) tend to focus on configurations with four cores, but span a range of frequencies from around 3.5 to 4.5 GHz. Meanwhile, Intel's Xeon E5 CPU SKUs that best fit workstation applications offer options with many more cores (up to 10 and beyond), but tend to do so with somewhat more modest clock frequencies for purposes of thermal management and emphasizing reliability (**figure 1**).

Today's lengthy menu of processor options begs the question: Should a CAD user configuring a new machine select a CPU with the highest frequency, the most cores, or one that offers a balance of the



Graph based on data from Intel.com

Figure 1. Intel Core i7 and Xeon E5 CPU SKUs offer a range of clock rates and core counts that are most appropriate for CAD workstations.

two? Well, for the majority of CAD workflows, the right answer — as it so often is in hardware design — is balance. But to show why, let's first take a look at the arguments for the other two options.

The Case for More Cores

That conscious switch in CPU design strategy and tactics, away from the fringe of max-GHz clock rate and toward multiple-core architectures, made perfect sense. However, it also meant a fundamental difference in how applications would benefit when running on a new generation of microprocessor. For the first time, applications didn't get the typical, automatic 30% or 40% boost in speed when running the same binary code on the next generation of CPU. Rather, the boost they got depended heavily on how well those applications could break up code into independent, parallel sequences of instructions, or *threads*, to run effectively in parallel on multiple cores.

Some common CAD-relevant algorithms (and resulting code) could multithread well, but the unfortunate truth is, many others couldn't. Worse, they still can't. Engineering simulations, for example, tend to offer higher degrees of parallelism for independent software vendors (ISVs) to exploit. Other tasks, however — such as modeling and real-time graphics processing unit (GPU) rendering — don't.

To illustrate the degree to which some common CAD computing tasks can leverage multiple CPU cores, we ran some test cases on a Lenovo ThinkStation C30 workstation outfitted with two Xeon processors, each of which contains eight physical cores. In addition, each physical core can support two concurrent threads through Intel's HyperThreading technology. That adds up to a total of 16 physical cores and 16 additional "logical" cores.

Running a common engineering simulation tool, such as computational fluid dynamics (CFD) solver Rodinia (from SPEC's SPECwpc benchmark), we see how an effectively multithreaded algorithm can keep many cores occupied (**figure 2**). In fact, Rodinia showed best-case efficiency, with all cores from both our Xeon-based workstations maxed out at near 100% utility — note the green line pinned to the top of each core's usage history chart.

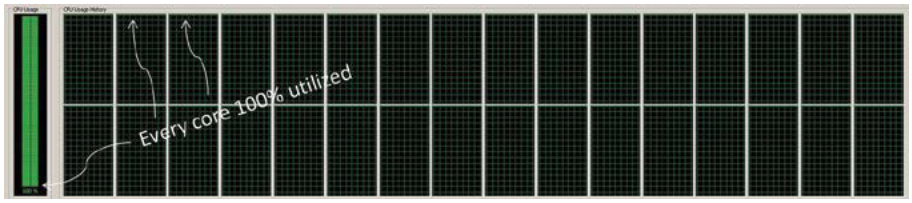


Figure 2. CFD solver Rodinia (in SPECwpc) illustrates a best-case example of multicore utilization.

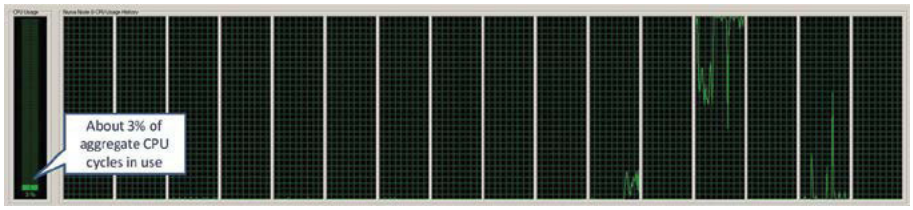


Figure 3. Rendering via GPU-driven 3D graphics has historically not benefited from multicore CPU use.

A Case for Maximum Clock Rate

Despite today's overarching focus on multicore architectures, processor vendors such as Intel haven't given up on improving single-thread performance. But rather than looking for, say, a 50% improvement in single-thread execution moving from one generation to the next, designers are targeting an estimated 10% improvement per core, then grabbing another performance bump with the addition of more cores.

CPU vendors continue to pay attention to single-thread performance for a good reason, one that is especially evident in typical CAD computing. Though several common CAD algorithms are able to effectively execute multiple threads on multiple cores, as the Rodinia test case illustrates, there remain critical tasks in CAD workflows that simply aren't. On the contrary, they remain primarily single-threaded in nature, making the case for a single core that can execute at the fastest possible clock rate.

The solving process in the parametric modeling that forms the foundation of most CAD workflows is fundamentally linear in nature, and therefore offers few opportunities to cut execution times with multiple threads.

> For common CAD tasks, single-thread performance matters, and **the simplest way** to increase that performance is to **turn up the clock rate.**

Another example is the GPU-driven 3D rendering we rely on most often in interactive design work (not to be confused with software-based rendering, which does run well on multiple CPUs). Running Cadalyst's AutoCAD-based benchmark test (C2015), we see the vast majority of work being performed by one core, resulting in a low utilization — about 3% — when considering all available cycles from all cores (**figure 3**). Other GPU-focused rendering tasks, such as the SPECviewperf viewset for CATIA, show a similar CPU usage profile.

For such all-too-common CAD tasks, single-thread performance matters, and the simplest way to increase that performance is to turn up the clock rate. Intel Xeon processors, targeting high-reliability workstations and servers, tend to run up to about 3.7 GHz, while the highest-clocked Intel Core i7 brand processors push a bit higher, maxing out around 4.5 GHz.

Consider also that Intel's specified clock rates for these products are nominal, and Intel does allow vendors to drive Core-brand CPUs to even higher rates. While most high-volume vendors such as HP, Dell, and Lenovo tend to shy away from overclocking, smaller suppliers such as BOXX, Maingear, @Xi Computer, and Digital Storm do overclock CPUs to further accelerate single thread–focused tasks by another 10% or so.

CAD Caveats

Now that we understand different performance profiles of a modern processor in the context of CAD workloads with varying degrees of threading, let's touch on a few caveats. First, every user's situation comprises a unique set of workloads and emphases on tasks — and while it's reasonable to present a typical case for CAD in general, how well a particular combination of core count and frequency will handle each user will vary.

Second, achievable CPU utilization is improving steadily as computing platforms continue to progress, with subsequent generations of hardware, applications, and supporting software. For example, remember the aforementioned reference to how GPU rendering does not currently leverage multiple cores effectively? Well, that will start

Herrera on Hardware *continued on page 26.*

To Get the Tools You Need, Learn the Right Way to Ask Management

You've got to secure better hardware and software resources for your users — but how? And which items should top your priority list?

We all know the drill: Hurry up, do more, use more advanced software — but do it all on old computers, with no training budget. This time-tested recipe for CAD management failure seems to be even more common in today's business environment, where tight budgets put pressure on everyone to do things on the cheap. And absent any input from the CAD manager, you can be sure that nothing will change for the better.

by **ROBERT GREEN**

In this edition of the CAD Manager column, I'll examine the key resources you must push for to be successful, and ways to present your case to senior management so they'll take you seriously. Along the way, conversation-starter tips will give you examples of how to approach your boss and other members of upper management. Here goes.

What Should You Push For?

All companies have slightly different needs, but at minimum, all CAD managers need the following resources if they want to deliver CAD success for their company:

- **Modern workstations** to power through compute-intensive CAD tasks.
- **Fast local-area and wide-area networks (LAN and WAN)**, so users can work effectively with remote teams without enduring long file load times.
- **CAD management involvement in IT policy** to properly represent CAD users' needs.
- **The clout to implement standards.** Standards are crucial to put streamlined work processes in place, but standards are pointless if nobody follows them. Only with senior management's backing can CAD managers achieve the clout they need to make standards enforceable.
- **A training program.** For users to get great results and follow standards, they have to be trained on a continual basis. CAD managers simply must have the resources to train their users.

You may want to add more items to your personal list, but don't forget to push for these essentials.

Conversation starter: *"Think of these critical system components like the mechanical systems in a car: engine, suspension, electronics, etc. If we ignore any one of these systems for long, the car simply won't work anymore." By providing a concrete analogy based on a familiar physical system, your boss will understand the point you're trying to make even if he or she doesn't understand much about the CAD subject matter at hand.*

ROI: How to Ask Your Boss

Now that we've got a list of what we need to push for and an analogy to use for starting the conversation, we need a strategy for asking our boss to fund our requests. At the risk of sounding like an accountant, I'll go ahead and assert this truism: The only reason your senior management team will ever purchase (invest in) anything is if they have a reasonable expectation of making a profit (return) from it. They don't much care about the technology, the buzzwords, the bits, or the bytes; they care about profitable operation.

This return on investment (ROI) logic permeates everything business owners do, but unfortunately, many CAD managers haven't mastered the simple, yet profound concept of ROI. That stops now.

A workstation-based ROI example. Since obtaining new workstations is always high on the CAD manager's priority list, let's take a look at a real-world example of how to ask for new workstations by using ROI:

> *Sam struggles to produce renderings from CAD models because his workstation often locks up and/or experiences graphics glitches. Each project Sam does requires 4 hours of labor to create renderings, and he does about 20 projects per year. A new workstation that costs $1,895 will cut Sam's time from 4 hours to 1 hour per project due to faster processing, better graphics, and elimination of lockups.*

Obviously there are big time savings to be had if we can purchase the new workstation, but the boss has rejected the idea thus far because $1,895 is "too much money." So how can I make a convincing case for the expenditure? Start with this simple equation:

$$\text{ROI} = \frac{\text{Savings}}{\text{Costs}}$$

Using Sam's labor rate (let's say $45/hr), we can compute the savings in his first year of using the new workstation:

Savings = Savings Per Project × Projects Per Year × Sam's Labor Rate
= 3 hrs/project × 20 projects/year × $45/hr
= $2,700/year

Now let's compute the costs. I'll assume your CAD management labor rate is $60/hour, and that it'll take you 2 hours to set up the new workstation so Sam can use it effectively.

Costs = Workstation Cost + CAD Manager Setup Cost
= $1,895 + (2 hours × $60/hr)
= $2,015

Now, by definition, the ROI is:

$$\text{ROI} = \frac{\$2{,}700}{\$2{,}015} = 134\%$$

So if we invest $2,015, we can save $2,700 in just one year. Not only will the workstation pay for itself in less than a year, we'll continue to save money in following years! In fact, in three years, a $2,015 workstation installation can save us $8,100 in labor costs.

Conversation starter: *"You'd be amazed by how much engineering time we lose around here because of faulty old computers. Let me show you an ROI computation I did on Sam's workflow." The conversation will now proceed with finance as the focus — not technobabble — and your boss will be much more likely to deal with your request.*

Completing Our List

Now that you know how to frame a request in terms of ROI, let's go through the remaining items in our "what to push for" list with an emphasis on how to quantify the savings and costs you'll need to make an ROI-based argument.

Fast networks (LAN and WAN). These days, many CAD tools connect users over wide-area networks (WANs), so the speed of the WAN is crucial in providing a good work environment for everyone. By talking to your users, you can collect data to document how much time they spend waiting for files to open and save, and how many times work processes have to be restarted due to WAN issues. Add up all the time and multiply it by an average hourly rate, and you'll be shocked by how much is lost. If you can negate this time loss with a better network, your company will save a ton of money.

Conversation starter: *"We performed a study to determine how much time we lose to network problems; here are the results."*

Your management may now choose to get your IT department involved in specifying network upgrades to address the problem; their cost estimates, combined with your savings computations, will yield an ROI. While you may not totally control the process, you will at least control the dialogue and place the focus where it should be: on a productive work environment for users.

A voice in IT policy. If CAD managers are involved in IT decision-making from the get-go, scenarios like the one I outlined above should never happen in the first place. The ROI benefit of including CAD management in IT decision-making comes from time and money saved by preventing bad purchases or configurations.

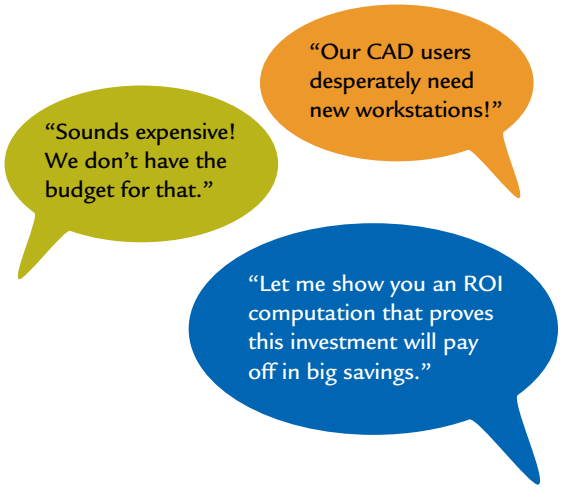
Conversation starter: *Tell your IT manager, "I'd like to help support the IT needs of CAD users. If there's anything I can do, let me know!"*

Clout to implement standards. Standards promote consistent, error-free work processes, so it stands to reason that a lack of standards contributes to errors and rework. All you have to do is figure out how much time you're spending fixing CAD-related issues because somebody didn't follow the standards! You probably have a good idea of how much time is involved, so all you have to do is total everything and multiply it by your labor rate to get a sense of how much you could save just by having great standards.

Conversation starter: *Go to your boss and say, "I've got the results of our standards deviation analysis, and you won't believe how much we're losing in rework costs. If senior management would make standards a priority and set a tone of enforcement, we could really turn things around — and it won't cost us anything to do it!"*

Once your management understands the financial impact they can have simply by sending a strong message to CAD users to "follow the rules," they'll be falling all over themselves to help you. And since ROI is just savings divided by costs, you can see that this very low-cost approach to generating savings yields an almost infinite ROI.

A training program. Once management mandates standards compliance, you'll need to train users to apply the standards they've been ignoring for so long. The only way to claim positive ROI on a standards training program is to make a reasoned — if not numerical — argument that people will start working to the standard much more quickly if they are trained. If left to flounder on their own, users will waste a great deal of time. (This logic applies to standards and nearly all other software-related training, by the way.)



Conversation starter: *Tell your boss, "Thank you so much for making standards a priority. I'd like to set up some brief training classes to show everyone how we're going to use the standards. I will keep them on point and make sure everybody is trained in how to work the right way in the least amount of time possible."*

If management complains about training consuming user time and being nonbillable, simply remind them how much money is being lost due to the anarchy that results from a lack of standards, and explain that people can only work the right way if you tell them what the right way is.

Summing Up

CAD management is tough enough when you have the right tools; it's almost impossible when you don't. By pushing for the essentials and supporting your requests with strong business logic and ROI numbers, you'll have the best shot at getting the tools you need.

Robert Green performs CAD programming and consulting throughout the United States and Canada. He is the author of *Expert CAD Management: The Complete Guide*. Reach him via his web site at www.cad-manager.com.

AutoCAD 2016 Introduces Smarter Dimensioning Tools

Do you think of dimensioning as a dreary task? With these time-saving new tools, you might start looking forward to it.

It's not like any of us CAD users get excited about dimensioning, right? I know I certainly don't! And while dimensioning is a necessary part of documenting our designs, it has been tedious at best in AutoCAD, requiring a myriad of clicks and picks.

If you feel the same way, then I have good news for you — AutoCAD is now smart enough to recognize objects and display potential dimensions. Simply move your cursor over an object until the correct dimension displays, then click to acknowledge and place the dimension! Let's dive deeper into the details of how this works.

by **LYNN ALLEN**

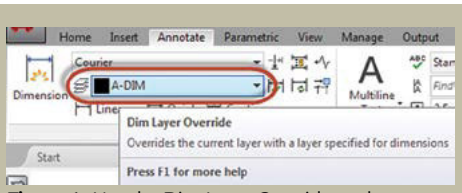


Figure 1. Use the Dim Layer Override tool to set a default layer for dimensioning.

Figure 2. The new Dimension tool can be found on the Home and Annotate tabs of the ribbon.

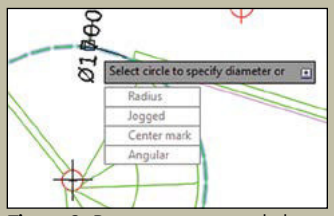


Figure 3. Prompts appear to help you get the perfect dimension.

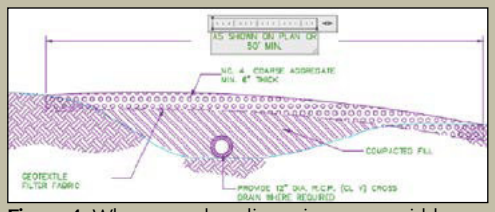


Figure 4. When you select dimension text, a width adjustment control appears above your selection, making it easy to wrap text.

Set a Default Dimensioning Layer

No more forgetting to set your current layer for dimensioning — you can set it once and forget about it! Similar to the Hatch Override tool, you can use the new layer drop-down menu found on the Annotate tab of the ribbon to set a Dim Layer Override (**figure 1**). Whenever you use the new Dimension tool, your dimensions will land on this override layer, regardless of your current layer.

For those of you who prefer to type, there is a new DIMLAYER system variable that you can type in directly. This means you can also set this override in script files and AutoLISP routines. If you key in a layer that doesn't exist, DIMLAYER will create that layer for you, using the standard defaults.

Note: Dim Layer Override only applies to new dimensions using the new dimensioning tool. If you revert back to old habits and use the legacy dimensioning tools, the dimensions will not land on this default layer!

One-Stop Shop for Dimensioning

The new (and awesome) Dimension tool (**figure 2**) can be found on the Home and Annotate tabs of the ribbon. You can also access it by simply keying in DIM at the Command prompt. You AutoCAD veterans may remember the DIM command from the early AutoCAD years; well, it's back with a (very productive) vengeance. While in this updated DIM command, you can dimension continually; an extra press of the Enter or Escape key will get you out and back to the Command prompt.

With your object snaps off, you can hover over lines, polylines, arcs, circles, etc. and see immediate dimension previews. When the preview displays the dimension you desire, simply pick once to select, and then pick once more to place the dimension line in the desired location, no more questions asked!

If you prefer, you can leave your object snaps on and manually select where you'd like the dimension extension lines to go. Then it's simply one more pick to place the dimension line.

As you are dimensioning, you will see a variety of command options appear that allow you to customize your dimension (**figure 3**). Perhaps AutoCAD is placing a Radial dimension and you'd prefer Diameter; in that case, just indicate it at the Command line (or by selecting with your input device).

And if you're wondering how you're going to get Angular dimensions, relax, it's easy. Simply select two nonparallel lines and AutoCAD will assume you want an Angular dimension; just place and you're done!

While the new DIM mode lets you dimension continually without re-entering the command, it should be noted that all added dimensions fall under one command sequence. If you return to the Command line (with an Enter or Cancel) and execute an Undo, all dimensions created in the last DIM sequence will be deleted! If you want

to Undo just the last dimension, you'll need to execute Undo while still in DIM mode.

There's one last dimension improvement that warrants a friendly reminder: Dimension text is now easily wrapped and controlled with the new width sizing control (**figure 4, p. 25**). Simply drag the arrows to the desired width.

The new Dimension tool in AutoCAD 2016 is so easy to use, you'll be up and running in no time. Ditch the old tools and switch to this shinier, more productive means of getting your dreary dimension tasks done. Who knows — you might just start to look forward to dimensioning! Until next time, happy AutoCAD-ing!

Lynn Allen, Autodesk technical evangelist, speaks to more than 30,000 users worldwide each year. She has written Cadalyst's "Circles and Lines" column since 1993 and is the creator of Cadalyst's popular AutoCAD video tips. Follow her on Twitter at @Lynn_Allen or e-mail her at lynn.allen@autodesk.com.

Herrera on Hardware *continued from page 22*

changing now. The DirectX 12 application programming interface (API) released in Windows 10, for example, is the first version of the API to effectively leverage multiple CPU cores to help ensure GPU-driven rendering won't be throttled by the CPU (**figure 4**).

Third, and perhaps most importantly, the CPU isn't the only performance-critical component in the system, and throughput can often be throttled somewhere else — graphics, memory, or storage, for example. Common tasks such as performing a walkthrough of a virtual skyscraper or rotating and zooming around a 3D model of an engine are just as likely to choke your GPU as your CPU, if not more so. Similarly, reading model data from disk is something that multiple cores could team up on, but the read rate of the drive (or drive interface) would most likely limit bandwidth far below what the CPU cores could handle.

In those cases where the CPU isn't the bottleneck, it probably won't matter whether one CPU with more cores is running the application more efficiently than another CPU with higher frequency, or vice versa. For example, check out the CPU utilization running another numerical solver, Calculix (**figure 5**), used primarily for finite-element analysis (FEA). We still see very effective multithreading, with all cores similarly busy (at least averaged over time). But utilization is nowhere near the 100% of the previously introduced, best-case Rodinia simulation. It's instead closer to 50%, as performance is being throttled elsewhere in the system; in this case, it appears to be memory.

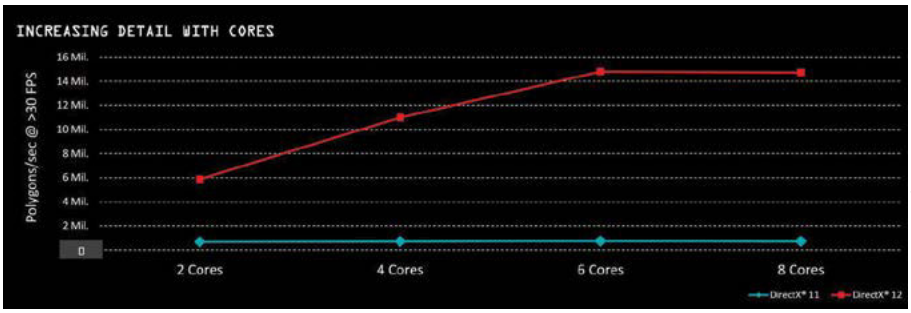


Image courtesy of AMD

Figure 4. DirectX 12, shipping in Windows 10, is the first DirectX API to effectively leverage multiple CPU cores for GPU-rendered graphics.

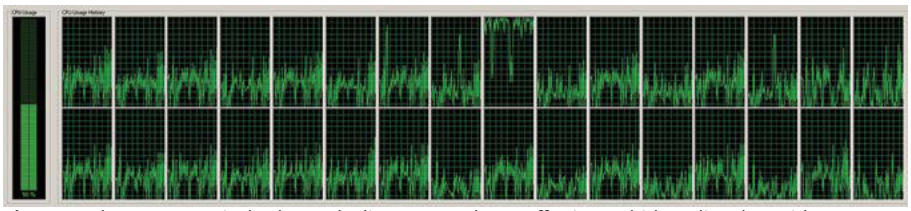


Figure 5. The FEA numerical solver Calculix test case shows effective multithreading, but with performance throttled elsewhere in system.

Another Good Argument for More Cores: You

Having said all that, it's worth considering that the most effective multitasking component in today's CAD workflow is you, the user. Outfit a CAD professional with several high-resolution displays to help manage the workflow and invariably, he or she will find ways to juggle multiple computing jobs — perhaps modeling in one window, while running a simulation in another, and using a third for office applications, browsers, and e-mail. The fact that several are running in parallel takes advantage of multiple computing cores in the system to improve the ultimate metric that matters: productivity.

The Best Answer Is Balance

At this point, I reach two basic conclusions. First, a modern CAD workflow will include some tasks that run better on one or two high-frequency cores, along with others that perform better on a larger array of cores with more modest frequency. And second, because of this, it's simply not possible to choose a CPU that will provide the best performance under all possible circumstances.

Still, while it's hardly a perfect exercise, it's worth spending time to think about which CPU is best equipped to run the various types of code and workloads you most frequently run, and, of course, what your budget allows.

Here's where we get to that bottom line of balance: With common CAD tasks representing both efficiently multithreaded code and fundamentally single-threaded code, and with a host of other variables in the equation dictating overall, realized system-level performance, the only reasonable choice is to select a CPU that achieves a good balance of core frequency and core count without breaking the bank. To make the selection process more manageable, you'll find Intel and workstation developers have already filtered reasonable Intel Core and Intel Xeon options down to a handful, itemized on any vendor's datasheet or online configuration tool.

Today, four cores (quad-core) is a sensible lower limit, and eight a reasonable upper limit. If you find your time is almost exclusively spent modeling with small to mid-size models, then a quad-core CPU with a higher frequency would be a fine choice.

You might even consider an overclocked, liquid-cooled model. And, if you find yourself often waiting for simulations, particularly with larger, more complex models, then a higher–core count CPU could be a wiser option. Either way, paying attention to the CPU options a workstation vendor offers, considered in the context of your own workflow, will pay long-term dividends by helping you finish the job in the shortest time possible.

With more than 30 years of engineering, marketing, and management experience in the semiconductor industry, **Alex Herrera** is a consultant focusing on high-performance graphics and workstations.

msi

NVIDIA QUADRO

- LATEST 6TH GEN INTEL® CORE™ i7 & XEON® PROCESSOR
- PROFESSIONAL NVIDIA® QUADRO® M5000M GRAPHICS SOLUTION
- DDR4 MEMORY UPTO 64GB W/ ECC SUPPORT
- PCI-E GEN 3 X 4 SSD STORAGE SOLUTION

WORKSTATION WT72

ISV CERTIFIED BY ››

CERTIFIED Solution Partner SOLIDWORKS · PTC® · AUTODESK. · Adobe™

MEET US AT

AUTODESK UNIVERSITY 2015 BOOTH #1149

DECEMBER 1-3, 2015 | LAS VEGAS | NV

MSI MOBILE WORKSTATIONS

DESKTOP PERFORMANCE IN A PORTABLE PACKAGE

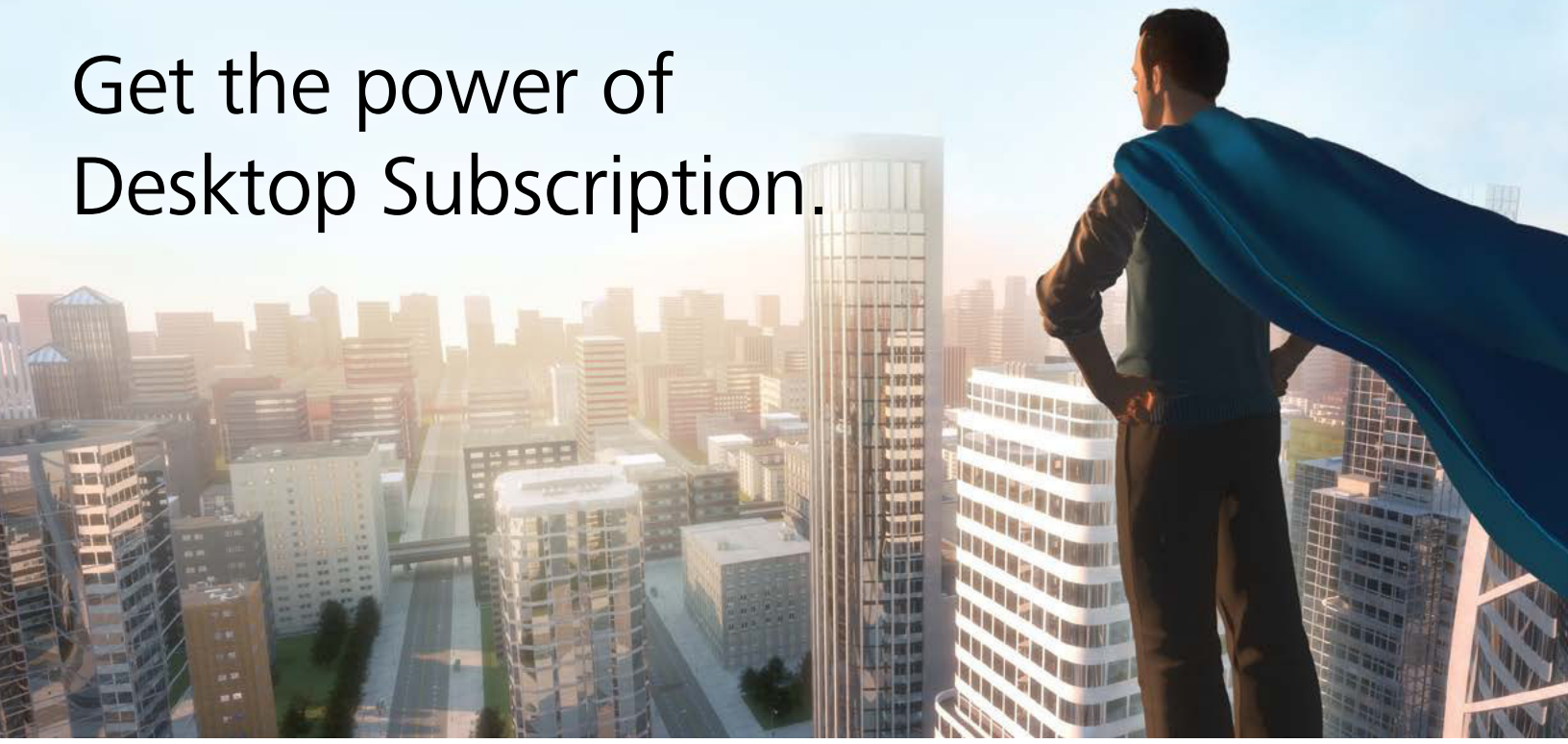
FIND OUT MORE:

us.msi.com/product/workstation/

AUTODESK.

DO GREAT THINGS.

Get the power of Desktop Subscription.



Discover the many benefits of Desktop Subscription.

The Latest and Greatest Software

As a Subscription customer, you'll have access to the most up-to-date Autodesk design and creation tools as they're released!

What You Need, When You Need It

With Subscription, you can easily scale up or down to fit your organization's changing needs. Select from monthly, quarterly, annual or multi-year terms.

Lower Cost of Entry

Get the Autodesk software you need at a lower up-front cost.

Quick and Easy Troubleshooting

Your Desktop Subscription gives you access to a range of technical support options to minimize delays and downtime.

Learn more at www.autodesk.com/subscription