



## Six trends in architecture, engineering and construction

that are driving today's  
workstation choices



Advanced design and engineering tools, such as certified high-performance workstations and graphic cards, can not only boost user productivity and streamline workflows but also transform the client experience with powerful VR capabilities while providing distinct competitive advantages

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Although digitization is transforming just about every industry worldwide, its effects are especially evident in the architecture, engineering and construction (AEC) professions. Until about 40 years ago, paper drawings reigned, with miniature 3D scale models painstakingly built to help clients visualize what their substantial investments would bring. That's not to mention how AEC professionals used slide rules to perform the numerous architectural and engineering calculations required to design and engineer complex structures.

Back then, the AEC process, from concept through building construction and commissioning, was labor-intensive, highly iterative, time-consuming and error-prone. Then technology came into play, with terminal-based, computer-aided design (CAD) solutions that cost hundreds of thousands of dollars per seat license. Next up were workstation makers—such as Apollo Computer, founded in 1980—that grew fast by selling their much more powerful wares into engineering, graphics and scientific markets.

A watershed occurred in 1982, when Autodesk launched AutoCAD, which enables computer-aided design on desktop PCs for a small fraction of what previous CAD solutions cost. AutoCAD started the AEC industry on its way to today's 3D design capabilities, enormous computational power, and increasingly immersive visualization experiences that virtual reality (VR) and augmented reality (AR) now offer. When AutoCAD debuted, the IBM PC was barely a year old, so processing power and display capabilities were far from what they are today.

Array Technology, founded in 1985 and bought by AMD in 2006, introduced graphics accelerator cards to offload the burden of CAD graphics processing chores from the CPUs of host PCs. In 1998, Dell introduced its first Precision workstation, targeting the AEC market as well as other markets involving product development and animation. Together, these two companies offer AEC professionals the technology tools to stay ahead of their ever-rising client expectations and their competition.

## AEC 2.0: Revolutionizing how structures are designed and built

Today, these technologies have evolved to what was once considered supercomputing capabilities, and their advancements are accelerating. Workstations that were state-of-the-art just five years ago are being eclipsed by what's now available. Newer, multicore chipsets are clocking faster, with much greater data throughputs. Solid-state drives (SSDs) enable quick retrieval of the large data sets that 3D, VR and AR applications need to manipulate to do their magic. In effect, today's technologies are ushering the AEC industry into a new phase—what might be called AEC 2.0.

Even peripherals, such as the Dell Canvas touch screen display, are changing the creative experience for both users and AEC clients. The Dell Canvas is a great tool for drawing review and markup as it provides a large screen interface with touch and pen capabilities that mimics a traditional markup environment. One benefit is that design issues can be identified and changes made much sooner in a project's development phase, when they cost much less to execute.

Technological advancements like these are revolutionizing how the AEC industry develops and builds structures. AEC firms need to be ready to upgrade their toolsets to achieve better designs, easier collaboration among stakeholders, more productivity by their users, and the optimal performance of their structures throughout their life cycles. Three sets of users are especially affected:

- Architects
- Mechanical, electrical and plumbing (MEP) Engineers
- Visualization specialists



**Architects**, who must envision and design structures to meet the needs of their clients and, in the case of commercial projects, those of their users



**Mechanical, electrical and plumbing (MEP) engineers**, who must design and engineer the operational systems supporting the buildings being designed

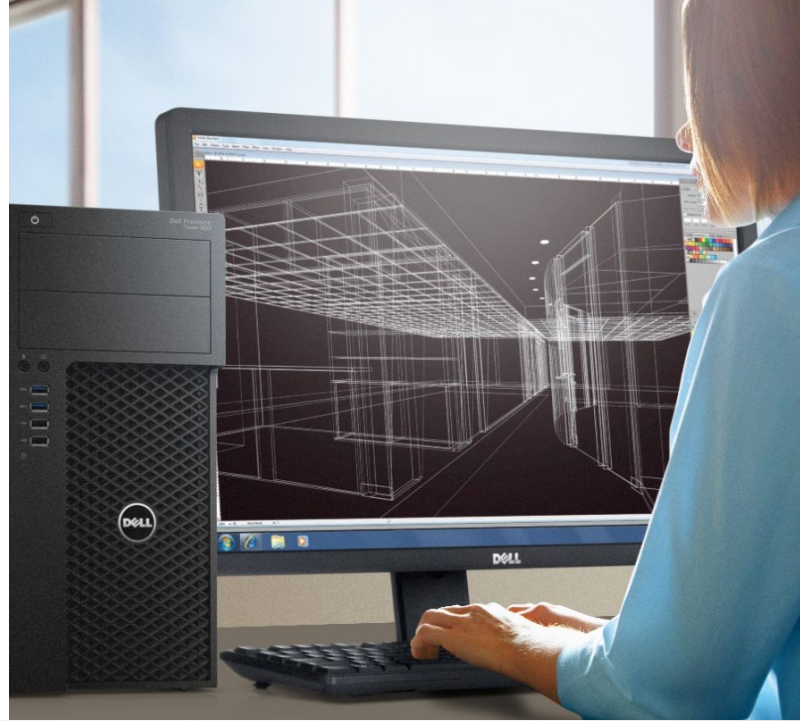


**Visualization specialists**, who must help their colleagues and clients experience planned structures, often before construction, using sophisticated photo-realistic rendering and AV/VR technologies for visualization

# Dell Precision Workstations

Dell Precision workstations offer a full portfolio of desktop, tower, all-in-one, rack and mobile form factors, plus scores of options for CPUs, storage types and graphics, including a wide variety of powerful AMD Radeon™ Pro professional graphics cards.

These powerful machines can deliver the right tools for any AEC job, and are optimized for the specific software applications that AEC professionals use most. They can be tailored to a diverse range of professional roles, workflows and environments.



Dell Precision workstations are renowned across the AEC industry for:



## Groundbreaking innovation

First VR- and AI-ready workstations. Creating new categories of options, including Canvas touch screen displays and 1U rack workstation configurations



## Mission-critical reliability

Featuring Dell Reliable Memory Technology and error-correcting code. Mil spec–tested. Highly secure and manageable



## Intelligent performance

Featuring Dell Precision Optimizer, machine learning, VR-ready mobiles and more



## Six trends that are driving today's workstation choices for AEC professionals

As AEC 2.0 unfolds, six trends have emerged that are impacting workstation selection and, to an extent, the types of professional graphics cards those workstations need. The six trends are:



### 1 Global markets driving competition

While most AEC firms are small organizations with fewer than 50 employees,<sup>1</sup> technology can enable them to extend the reach of their practice and client base just about anywhere in the world. But the key to succeeding in expanding their markets beyond local projects is to boost active collaboration across stakeholders—especially among clients.

Broadband connectivity has enabled easy and low-cost (or free) web conferencing, so CAD and computer-aided engineering (CAE) files can be shared, but bandwidth is still insufficient for VR experiences. That's why mobile workstations, with all the power of their desktop and tower cousins, can help AEC firms take virtual walk-through capabilities to their clients, wherever they may be—in their offices, on job sites or even conference rooms of hotels.

## Conquer your largest designs with AMD Professional Graphic Cards

AMD has long been a partner of Dell EMC in supplying their professional range of graphics cards for Dell Precision workstations.

The graphics processing units (GPUs) on AMD Radeon Pro professional cards are designed, engineered and manufactured to provide the greatest memory bandwidth possible, for a typical AEC firm's tight budgets.

Few things can slow-down user productivity more easily than running out of memory while manipulating objects in architectural and rendering software. Dell EMC and AMD work closely with AEC software vendors to ensure hardware is optimized to run software at peak performance, providing confidence and speed.

GPU speeds, measured in trillions of floating point operations per second (TFLOPS), remain a key consideration for today's architectural workflow. The larger the model detail, the more calculations must be completed by the card every time the user interacts or rotates the model. In this area, AMD cards are known for delivering among the best available price-performance options.

For extra user-confidence, AMD "has the most stable driver in the industry," according to QA Consultants who independently acknowledged following a series of comparison tests. QA consultants, with over 20 years of testing experience, found that AMD had a 11% lead on GPU vendor stability, compared to competitive graphics.



[www.AMD.com/AECinterviews](http://www.AMD.com/AECinterviews)



## 2 / Green-building initiatives

Designing, engineering and building structures to minimize their environmental impact and to be resource-efficient throughout their life cycles offer compelling economics. In fact, respondents to a 2017 global survey by the World Green Building Council report that green buildings have lower operating costs along with a 7 percent boost in building value compared to traditional structures.<sup>2</sup>

One leading AEC firm aims to go beyond performance-driven design to create regenerative buildings that produce more energy than they use. The trend toward green design is raising client expectations about buildings being dynamic, not static, assets.

In choosing workstations to design and engineer green buildings, AEC professionals understand that computational power is critical for executing all the calculations necessary. Users will want to maximize their GPU hardware acceleration or CPU core count, starting with a single-socket and moving to a dual-socket architecture for even greater performance.

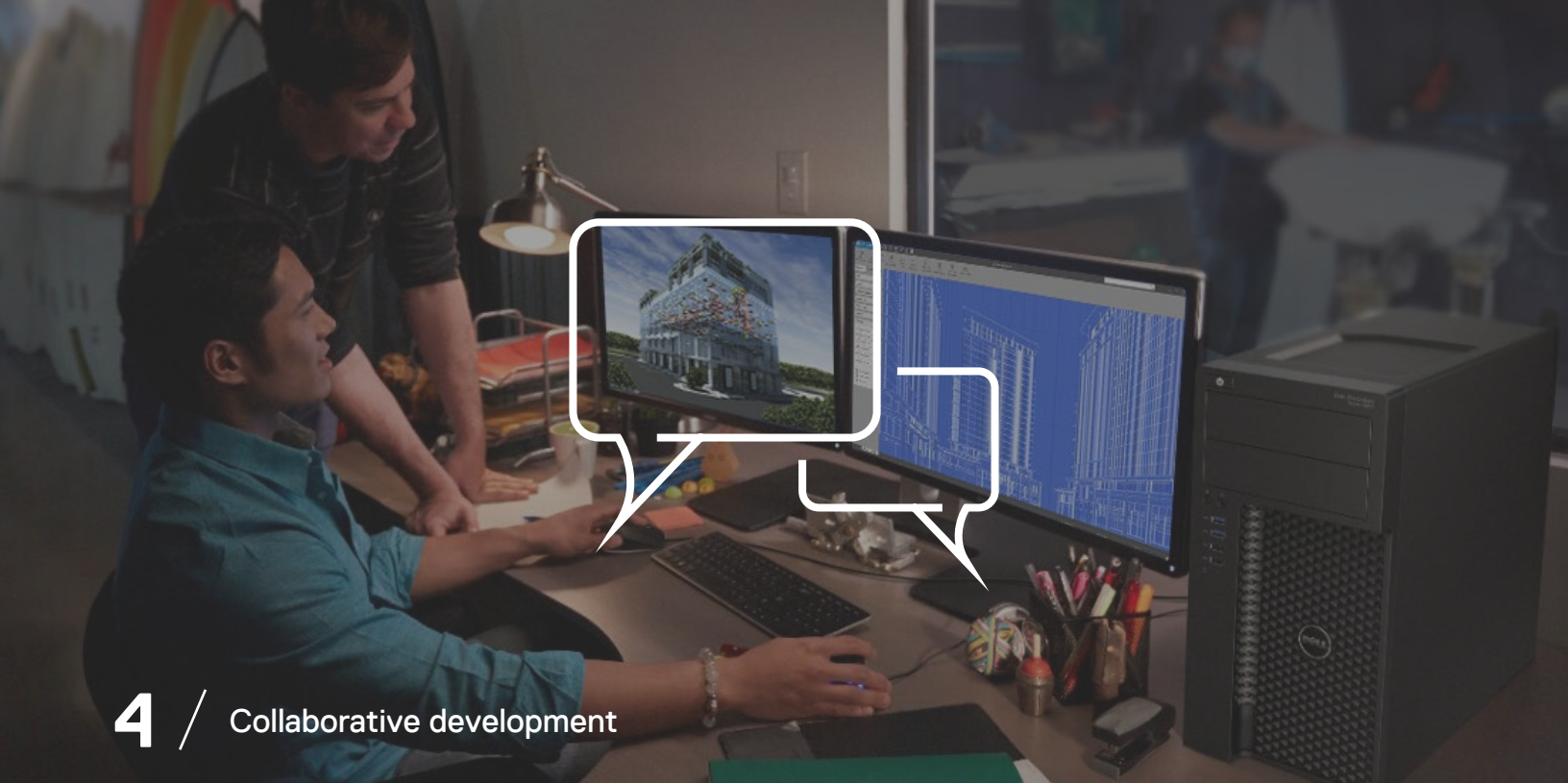


## 3 / Visualization capabilities

Virtual reality (VR) is changing and accelerating AEC development cycles. Architects and their MEP engineering colleagues as well as their clients can use VR to conduct virtual walk-throughs of buildings in the planning stages. This way, reviews can be more complete with higher-quality feedback, resulting in fewer iterations and revisions to plans.

What's more, design issues can be flushed out earlier in the development stage, costing less to remedy than later when MEP is being layered on or, worse, after construction has started. Six Sigma quality systems spawned the "Rule of Tens" that suggests the cost for an unidentified error increases by a factor of 10 from one value-added level to the next.

Powerful professional workstations with equally powerful graphics cards are required to provide these needed VR capabilities. Dell Precision 7000 Series 17-inch mobile workstations with AMD Radeon Pro graphic accelerators were the world's first VR-ready laptops, enabling AEC professionals to take VR capabilities to their clients' offices or building sites to share with their construction partners. Radeon™ Pro graphics are optimized and certified for over 100 key softwares via a rigorous testing process.



## 4 / Collaborative development

Technology, especially real-time rendering, is enabling collaborative stakeholder interaction like never before, both in person and at a distance. This can help compress the traditional iterative cycles involved in designing, engineering, building and commissioning structures—and possibly eliminate some of the cycles, too. Real-time sharing and manipulation of CAD and CAE files as well as documentation can also streamline project development and execution.

In years to come, as AEC teams continue to use CAD and CAE in their work, a machine-learning application driven by artificial intelligence (AI) algorithms on their workstations can make real-time suggestions about the most efficient designs, given parameters of available components, costs, construction feasibility, and lifecycle serviceability and support.

The results of more collaborative development and AI-driven machine learning? Better-performing structures built more quickly, with fewer changes and, potentially, less cost.

Because of the amount of interactivity that occurs with collaborative development, the best performance—typically measured in frames per second—comes primarily from using hardware acceleration, such as OpenCL™ and OpenGL enabled graphics cards. Dynamic clocking of CPUs, like the “turbo” mode provided by Dell Precision workstations, can help by boosting a CPU’s frequency as much as five times from an 800 MHz baseline to close to its 4 GHz theoretical specification.<sup>3</sup>

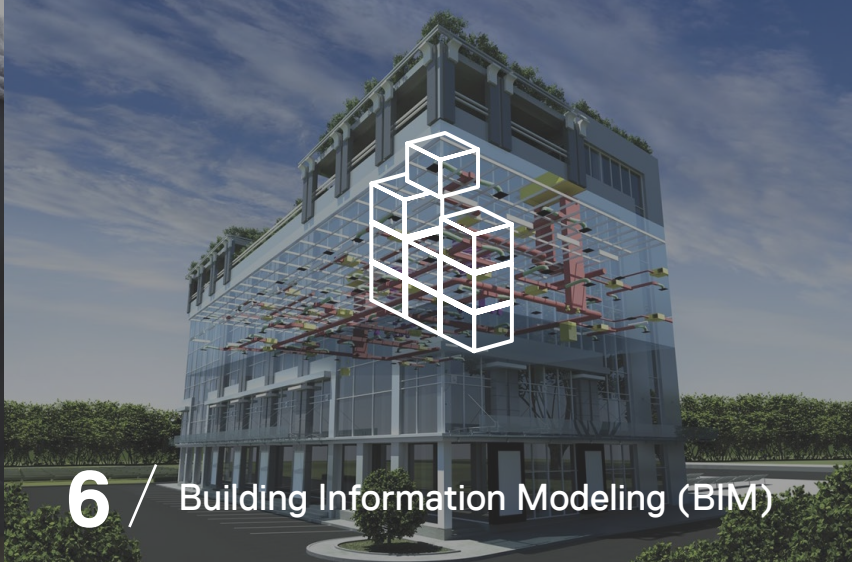


## 5 / Anywhere/anytime mobility

AEC professionals have traditionally been desk-bound, but getting out into the field and taking drawings and simulations to clients and construction sites require uncompromised mobile technology that doesn't fall short on performance. Busy clients appreciate the convenience of having their AEC professionals come to them with everything needed to conduct a comprehensive project review and even a virtual walk-through of the project.

Although powerful mobile workstations such as the Dell Precision 7000 Series models with AMD Radeon™ Pro graphics have been available for years now, taking work-in-progress to client premises can still set an AEC firm apart from its competitors. In addition, MEP engineers can take their drawings to construction sites and check that the installation of their systems is being done to spec. They can also update drawings to as-built versions, taking into account physical changes required due to unforeseen circumstances.

The latest graphics driver from AMD also brings the possibility to easily access the full GPU-accelerated experience of your AMD Radeon™ Pro WX 7100 or WX 9100 graphics card-powered workstation from virtually anywhere with the new remote workstation IP built into AMD Radeon™ Pro Software when using Citrix® XenDesktop® 7.15+.



## 6 / Building Information Modeling (BIM)

By providing a digital model of a structure's physical and functional characteristics, BIM offers a way for all stakeholders—AEC professionals, their clients and, after construction, the management teams of their buildings—to share facility information during its full life cycle. BIM can start at the earliest pre-design concept stages and extend for decades of occupied use, all the way through to demolition. In manufacturing, such a product model is called a “digital twin” and serves as a virtual proxy for the physical object.

BIM has a bright future in the AEC industry because it can help reduce project time, errors, costs and waste, while improving efficiency, predictability, visibility, integration and, ultimately, building performance. Although BIM-based projects rely heavily on database technology to hold all the information associated with a facility, workstations still have important roles to play as endpoints to access BIM data and to manipulate associated files or analyze data to seek ways to improve a facility's performance.

A full 3D BIM environment places more strain on the workstation than traditional 2D CAD workflows. Typically a higher viewport experience is expected from the user, with advanced features like shadows used in walk-through modes to explore the design in greater detail. This places more pressure on the GPU, and as such only professional GPUs are recommended for this workload.





## Profound changes will continue, creating new opportunities and challenges

The AEC industry is undergoing profound changes as the result of these six trends. Of course, technology is driving many of these developments; in others, perennial goals, such as continuous quality improvements and reductions in costs and time, are drivers. Green-building initiatives, in particular, reflect growing environmental concerns that are here to stay.

But, no matter what's behind these trends, they offer new opportunities for AEC firms worldwide—and challenges, too. To capitalize on those opportunities, address the challenges and not get left behind, the AEC industry must continue to become more creative, efficient and client-responsive.

The way forward is through the use of advanced design and engineering tools that can boost productivity and streamline workflows with the support of certified high-performance workstations and graphics. Dell Precision workstations with powerful AMD graphics cards are ready to help.

AMD professional graphics are certified for whichever software you love for BIM challenges, be it tools like Autodesk® Revit® or Nemetschek ALLPLAN, to name just two.

Together AMD and Dell offer you the confidence to take on any AEC task.

<sup>1</sup>“76% of architects practices are fewer than 10 people,” Just Practising, February 2010. [www.justpractising.com/its-about-money-stupid/76-of-architects-practices-are-less-than-10-people/](http://www.justpractising.com/its-about-money-stupid/76-of-architects-practices-are-less-than-10-people/)

<sup>2</sup>“World Green Building Trends 2016,” World Green Building Council. February 2016. [www.worldgbc.org/news-media/world-green-building-trends-2016](http://www.worldgbc.org/news-media/world-green-building-trends-2016)

<sup>3</sup>“Intel Turbo Boost Technology - How It Affects Processor Speed” <https://www.dell.com/support/article/us/en/04/sln298588/intel-turbo-boost-technology-how-it-affects-processor-speed?lang=en>

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Based on Dell internal testing, July 2017, using the SPECcapc Creo 3.0 Wireframe Graphics benchmark test comparing a Dell Precision 7920 Rack with Dell Precision Optimizer vs. the same system with factory standard settings. Actual performance will vary based on usage, configuration, and manufacturing variability

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