Sticker Shock: The Invisible Costs of CAD

A comprehensive guide to determining the total cost of ownership (TCO) of your product development platform

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Contents

INTRODUCTION

What are the “Invisible” Costs of CAD and Product Data Management (PDM)?

Whether you are a multinational company looking to expand your engineering and manufacturing operations, a small or medium-sized business adding a few seats of CAD for a new project, or a startup determining which CAD system is the best fit for your team, you all face the same issue when it’s time to plan your budget.

The initial sticker price of CAD or Product Data Management (PDM) software is not the true price of ownership. There are numerous ongoing expenses that are not included – and sometimes not immediately considered – when making your upfront investment.

The purpose of this guide is to help give you an accurate total cost of ownership (TCO) comparison when considering different CAD and PDM vendors. When you buy a new car, the initial purchase price does not include taxes, license or registration fees, maintenance or insurance – all of which can add up to a significant expense. The same dynamic applies to product development software.

Because the majority of product development teams today are using file-based desktop engineering software, we will start our discussion with these on-premise solutions and later discuss alternative cloud-native platforms.

IMPORTANT DISCLAIMER:

Note that when you see the yellow price tag symbol, the listed costs (in US dollars) are conservative estimates based on real prices for mid-range products and services now available in the marketplace. These price tags are meant as a baseline point of comparison for when you begin your own research.

Let's jump right in.

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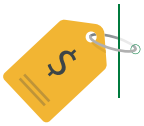
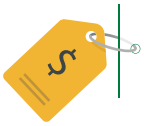
Software Costs

Buying legacy file-based CAD isn't as straightforward as paying the sticker price and moving on. The bills keep coming. There are annual maintenance fees for software upgrades, whether you choose to install them or not. If you want flexibility to share a CAD license between engineers living in different parts of the world, you will pay handsomely for the "privilege." And the costs for data migration to a PDM system (to prevent version control problems) can easily spiral into tens of thousands of dollars.



Software Licenses:
$4,000 to $8,000 per user

There are higher-end packages that include advanced simulation and other specialized tools, but when you buy your typical single seat of CAD, the initial sticker price is usually between $4,000 to $8,000 per user. But that does not include a mandatory maintenance fee billed every year.



Annual Maintenance Fee:
$1,300 to $2,000 per user

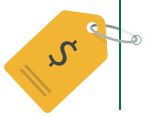
Maintenance fees cover installed software upgrades during the year as well as technical service and support. These fees are charged whether your IT department installs the upgrades or not, or regardless if you need to use tech support (more on this in the "Questions to Ask Yourself" chapter).

Floating License Tax:
$2,000 per installation per region

After making a significant CAD software investment, companies naturally want to extract the most value possible out of it. In principle, floating licenses allow companies to be more flexible for how they allocate their resources. A company might buy 10 floating licenses and install the software on 50 computers, but only 10 engineers can use it at any one time. The caveat is that most CAD vendors will only offer floating licenses per geographic region. If you have engineering teams in the United States, Germany and Indonesia, they cannot share the same group of floating licenses. There is a financial penalty based on where your employees work.

If your company does want a floating license to cover every time zone, there is a follow-the-sun license available but it comes at a premium. A global floating license can cost between $8,000 and $16,000 per user per year.

Although floating licenses are marketed as a convenience, they unfortunately sometimes deliver the opposite effect. If the floating license server goes down, your engineers have no way to check in or check out their CAD license and will be locked out of their work. Other hassles include requiring VPN access to your floating server, maintaining the hardware for the floating license server, and waiting for license file updates that often go wrong. You can't choose when you have bad luck. If there is a floating license problem on the weekend, you'll have to wait for tech support to open on Monday.

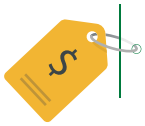


PDM:
$1,900 per user plus $380-$570 in annual maintenance fees per user

Data management and version control issues impact even a single-person company, but typically add-on PDM software is required once an engineering team has 3 to 5 CAD users or more.

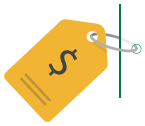
Sometimes a CAD vendor will provide a complimentary lightweight version of their PDM software along with the purchase of certain CAD licenses. However, if your product development team works with multiple sites around the world or you need to customize your approval process and workflows, it costs nearly $2000 per CAD user to access the PDM vault and have editing privileges.

Non-CAD users who want to contribute data to the PDM vault need to pay a separate contributor fee (one company recently charged $700 for this) and employees who only need to view the design files also need to pay a fee. In addition, most PDM vendors charge an annual maintenance fee (for upgrades and tech support) that can cost up to 30 percent of the initial PDM software price. That's an additional $380 to $570 a year for maintenance per user.



Server Database Software to Run PDM: $8,000+

When you buy PDM, you also need to buy server database software in order for it to run. Most PDM systems run on either Microsoft SQL Server or Oracle software. These are separate purchases that need to be factored into your total cost of ownership calculations.



Consulting (PDM Implementation and Data Migration): $20,000+

At the time a company decides they need a PDM system to solve their version control problems, it makes the most sense to hire a specialist familiar with best practices for PDM implementation and data migration. The cost for a consultant to install PDM per site is about $2,000 a day for a typical 3-5 day process (not including travel and other expenses).

But those fees don't include migrating all your old data into the new vaulted system, moving all the CAD files from individual hard drives and servers into one centralized place. On average, the cost of migrating data can start at $10,000 per company. Naturally, your full migration cost will vary widely depending on the number of engineers and the volume of data. Bear in mind that $10,000 would be a bare minimum migration cost. It is not unheard of for companies to pay tens of thousands of dollars for this service.

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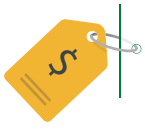
Hardware Costs

The demands of calculating CAD geometry and handling complex graphics isn't like installing typical number-crunching business software. The associated hardware, server and networking costs are enormous.

High-Performance Computer to Run CAD: $3,100+

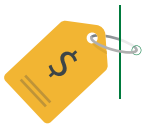
Engineering software that's installed on a local computer usually requires a CAD workstation. If you're doing small-to-medium product designs, you might get away with using a lower-end Windows PC. But if you're creating medium-to-large designs – anything with 100 parts or more – you absolutely need a high-performance workstation with enough processing power to handle the demands of calculating CAD geometry.

High-end CAD workstations have faster memory and an advanced graphics card. Driving up the price right now is the global chip shortage due to supply chain delays. It's a problem that has been impacting the availability of a wide range of high-tech products. Computer chip availability aside, you'll typically do a hardware refresh every 3 to 5 years. Some companies replace their computer hardware sooner, some later, but computer obsolescence is a factor that should be considered in your budget planning.



High-Performance Laptops or Tablets to Run CAD: $3,100+

Most engineers have a CAD workstation, but they usually also have a high-end laptop or tablet so they can work at home or while traveling. For the high-performance laptops and tablets, prices are very similar to the desktops with the same specs.



Servers and Networking Equipment: $20,000+

Now, on the IT side of the house, you need to consider servers. If you're a startup and you need to start buying all these servers, that's a big investment. But even if you're an established company that already has servers, they will need to be replaced at some point. The servers you need to run PDM software have to have fast memory and fast hard disks. Those kind of servers can easily cost $10,000 each.

You'll need one database server plus an archive server for each site that your company has. Servers for just one location will cost you $20,000. If you have a five-site company, you'll need one database server and five archive servers. That's $60,000 worth of hardware right there, just so you can share files across your organization. But how do you share those files around? You need to have good networking equipment in place. You need high-speed switches, routers and Multiprotocol Label Switching (MPLS) lines connecting your database servers to all these different sites.

Once you have the hardware in place, you'll also need to pay for line access from one of the major telecoms. If your company has multiple locations, just the line access alone can cost thousands of dollars each month.

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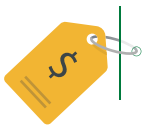
Efficiency Costs

Salary and employee benefits are two of the largest expenses in a company's operating budget. In the early days of CAD in the 1970s, mechanical engineers were paid only a fraction of what they are paid today – and one seat of CAD software could cost hundreds of thousands of dollars! You had a situation where several relatively inexpensive engineers were crowded around a super-expensive computer.

Today, the scenario is the exact opposite. Each expensive engineer is surrounded by multiple "cheap" computers, laptops, tablets and phones. Every minute of engineering downtime is money tossed out the window. Efficiency costs are far more intangible than software or hardware costs, but they definitely come with real dollar signs attached.

Let's explore two of the biggest reasons for engineering work interruptions.



CAD Crashes, Data Corruption and Lost Work: $???

If you're using file-based CAD, crashes will happen. Some engineers may deal with it more than once a day or a few times a week, while others may be more fortunate and experience these headaches less often. If you're humming along on a project for a few hours and forget to save, a software crash can cost you not only those few hours of work, but also the hours needed to recreate it. Even if you automatically save every 30 minutes, that's still 30 minutes of rework (if you remember your exact steps) and an interruption when you may have had tremendous creative momentum.

It is tough to put a price tag on frustration and aggravation, but every hour you move backward is time you no longer have to develop new design ideas and explore alternative paths.

Time Managing Software Upgrades, Hardware and Servers: $???

Upgrading traditional desktop-installed CAD software is an extremely time-consuming process. You first need to download the update and then install it on everyone's computer – one at a time, a process that seems antiquated at a time when we have instant gratification for everything else we need on the internet. Whoever is doing the installation (at smaller companies, engineers are their own CAD administrators) has to also manage license codes and make sure they all work.

Once the new software update is installed, you need to check that all your CAD models regenerate in the same way they did before the upgrade and fix any broken models. If you are at a larger company and have a significant number of CAD users, you have to make sure whatever you do is in sync. All work is shut down until the process is complete.

If you have a PDM system or multiple sites, this IT overhead is multiplied. Your data needs to be synchronized between servers.

If your engineers are their own CAD administrators, how much time are they spending managing their software and hardware versus actually using it?

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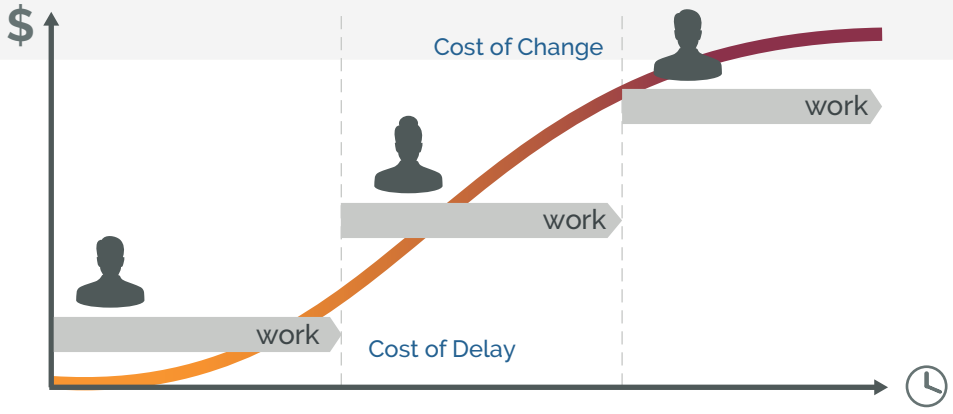
Opportunity Costs

For decades, file-based CAD and PDM have rigidly controlled how engineering teams work and collaborate. File-based engineering tools force users to work on a design one person at a time, inherently slowing down the product development process.

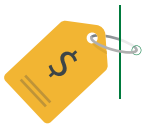
Imagine if you were in a book club, but instead of everyone buying the book or borrowing a copy, there was only one copy of the book for the group to share. You could not start reading the book until your friend finished it, and so on. Imagine how long you would wait for the book discussion. A similar dynamic is going on in the product design world.



Productivity: Serial vs. Parallel Workflow

If you are designing your product in file-based CAD, only one person can work on a file at a time. You have zero visibility into your colleague's work and vice-versa. The chart above illustrates a very typical serial workflow. Engineer 1 works on an assembly file and then passes it on to Engineer 2, who in turn passes it on to Engineer 3.

Needless to say, this is a very inefficient approach to work. For maximum efficiency, it makes sense to have multiple engineers working together in parallel on the same part or assembly whenever required, rather than tolerate extra downtime. File-based CAD slows teams down.



Cost of Change:
$???

The longer it takes to find a problem in your design process, the higher your cost of change will be because you've already put in all the hours of engineering. That number is a straight-forward one to calculate. But you may have even started creating rapid prototypes or cut a small production run before you discover a problem.

The earlier you can share CAD models with not only your core design team, but also internal stakeholders (marketing, sales, executives, etc.) and external manufacturing partners, the sooner you will identify potential problems. Working serially, one person at a time, by definition disregards potentially valuable feedback.

How much time or materials has your company wasted because you found an issue much later in the design process than you anticipated?

Cost of Delay:
$???

Simply put, the cost of delay can be defined as the amount of revenue you will lose if your product isn't delivered on its expected deadline. Every day your product isn't on the shelf is another day the customer isn't buying it.

Project delays happen for many reasons. If there are global shipping delays because of shortages of raw materials or labor problems, you can't do much to change your situation. But when your design team is working one person at a time, and your outdated software is blocking simultaneous collaboration, perhaps it is time to re-evaluate your technology.

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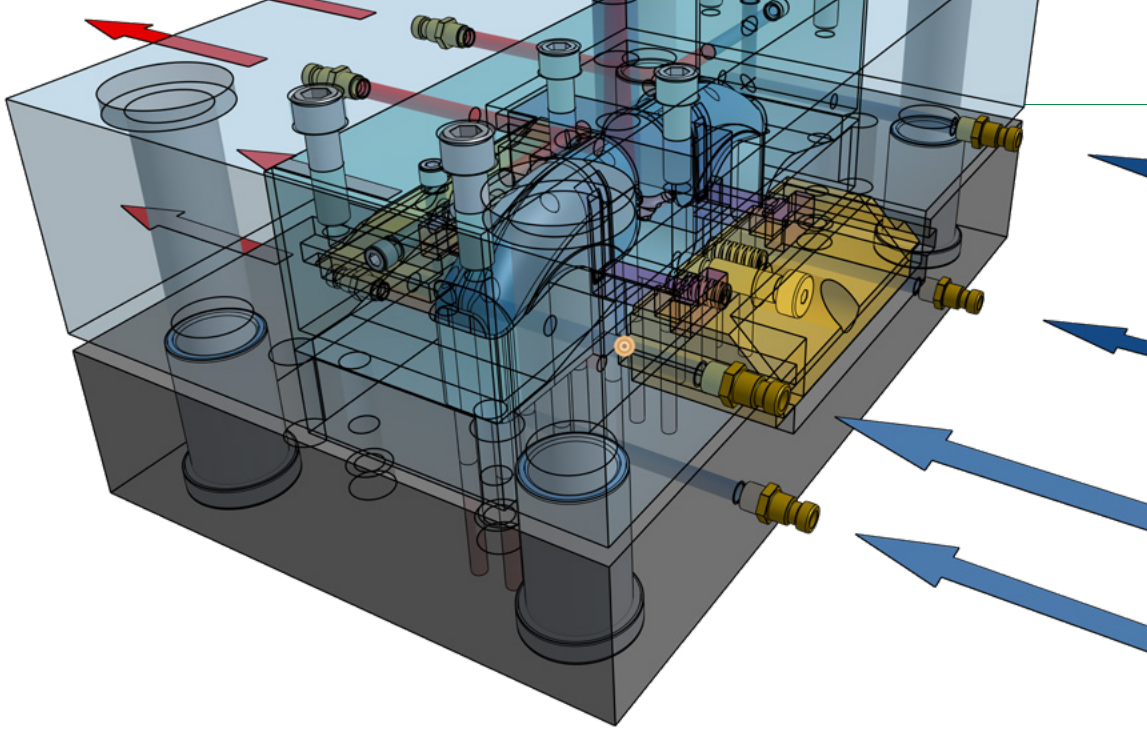


Are You Getting Your Money's Worth Out of Your CAD System?

As you compare costs between CAD platforms and PDM systems, here are some questions to ask yourself about the value of your current product development software:

1 Are you employing IT professionals or CAD administrators just to keep your CAD software running?

In theory, your product development software should just run when you turn on your computer and you should be able to start working without pestering your IT department. We know that's not the reality or otherwise there would be no need for an IT department. But the real productivity hit happening at many companies is that **often a team's best engineer is also serving as the CAD administrator**. Why? Because usually the person who is the best designer is often the best CAD IT person as well.

Larger companies usually have separate IT people for overall organization-wide issues. Either these generalists choose to learn the CAD specifics or they don't. More often than not, they don't, leaving your best engineer with the added responsibility. Do you really want your best product designer working on IT tasks versus what they were hired to do?

2 Are you paying a consultant or Value Added Reseller (VAR) for services and training?

What's the learning curve on your CAD platform and PDM system? Are these costs included with your purchase or are you paying consultants more than a full-time employee to bring your team up to speed? Training costs should be considered when comparing product development platforms.

3 Are you redoing manufacturing runs after producing the wrong versions of parts? What is your scrap rate?

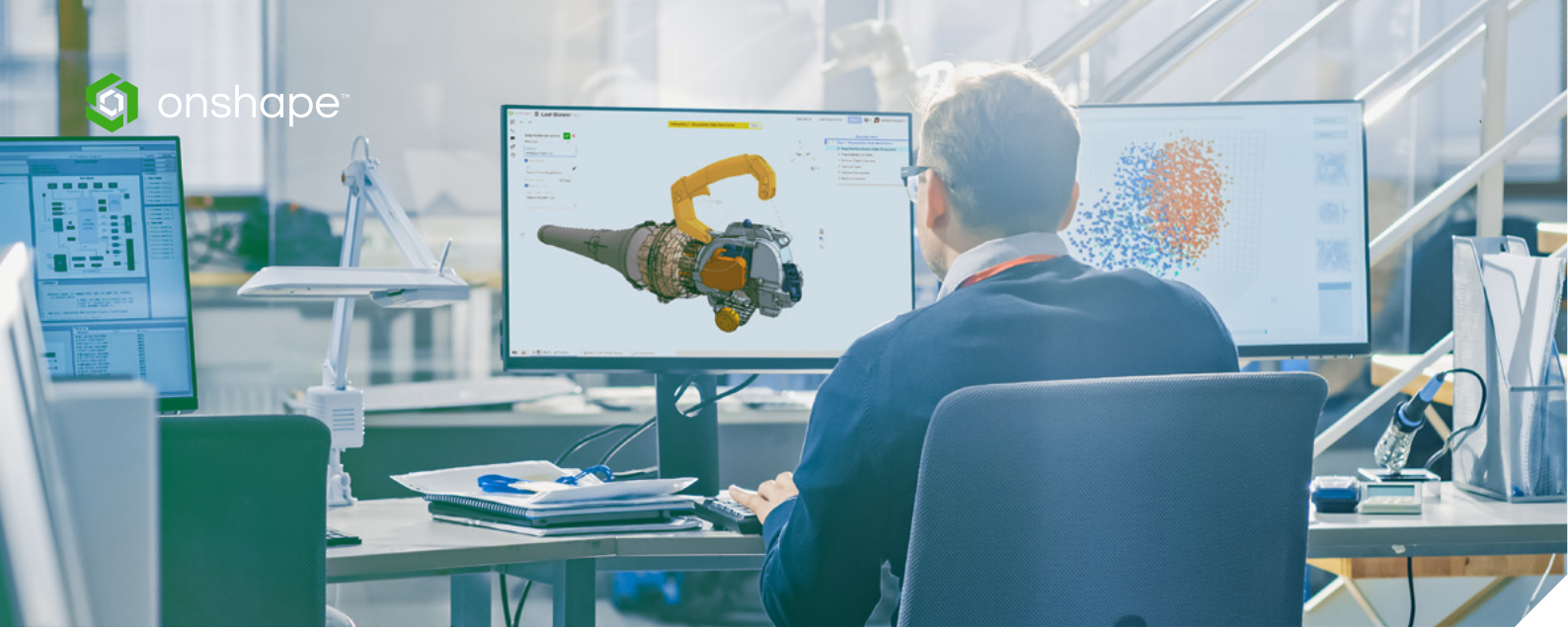
Mistakes happen, and totally eliminating human error is a pipe dream. However, how many production errors ARE in your control? How much scrap (and wasted time) is the result of communication breakdowns or confusion over which manufacturing drawing is the latest version?

4 Are you paying your CAD vendor annual maintenance fees without installing their software updates or using their tech support?

This is the question sure to give your CFO and other executives major heartburn. The bigger a company is, the more likely it will not install the latest version of CAD and PDM software every single year. It's a huge pain to do the testing and deployment of these systems yourself and it requires considerable engineering downtime. Sometimes the improvements in the new software release aren't consequential to a company's products, so why bother with the hassle?

So some product development teams upgrade their CAD and PDM every other year or even every third year – while still paying their mandatory annual maintenance fees. It seems counterintuitive to keep paying for something you are not going to use, but that is what is happening widely in the industry.

Are you flushing away money every year for CAD vendors' maintenance fees?



The Cost Benefits of Cloud-Native CAD

> When comparing the costs of competing CAD and PDM vendors, there is no point in adding up all the yellow price tags in this book and coming up with a final number. These stickers are meant to be only a baseline.

Every company has its own unique needs and processes. The important thing is to be aware of all the "invisible" costs you may not see in that initial sticker price.

Like most other industries, the product development world has been migrating its business-critical tools from on-premise software – which must be installed on individual hard drives to platforms which operate online in the cloud.

You're probably already very familiar with platforms like Salesforce.com, Zendesk, Google Workspace, and Microsoft Office 365. Rather than downloading and installing software on your company servers and workstations, the application and your data are accessed via a web browser on any device running any operating system.

There are no setup costs, maintenance costs or implementation delays. There is no requirement for IT support – software updates are applied automatically and downtime is negligible. You can reassign your IT team to other high-priority tasks and free up your best engineers to spend more time on their designs.

Why Cloud Solutions are Better for Budgeting (CAPEX vs. OPEX)

On-premise desktop software with significant upfront costs impacts cash flow and potentially keeps companies from making other meaningful long-term investments. Cloud solutions offer much more out of the box support for start-ups, businesses and enterprises who don't have the budget to maintain hardware and administer installed software.

Your CFO will most likely prefer a cloud-native CAD system because:

- ✓ Less cash is required upfront.
- ✓ Without depreciation, the company does not need to prepare supporting financial schedules, keep track of the installed software asset, etc.
- ✓ The company is not stuck with the solution (and the "stranded capital" used to pay for it) if it becomes no longer useful or outdated.
- ✓ The company can pay for exactly what it needs and scale as requirements change.
- ✓ The budgeting process is straightforward as short-term spending requirements are easier to understand.
- ✓ Precious capital can be redeployed to other long-term investments.
- ✓ Less IT and hardware resources are required to implement the system (i.e., a further reduction in CAPEX).

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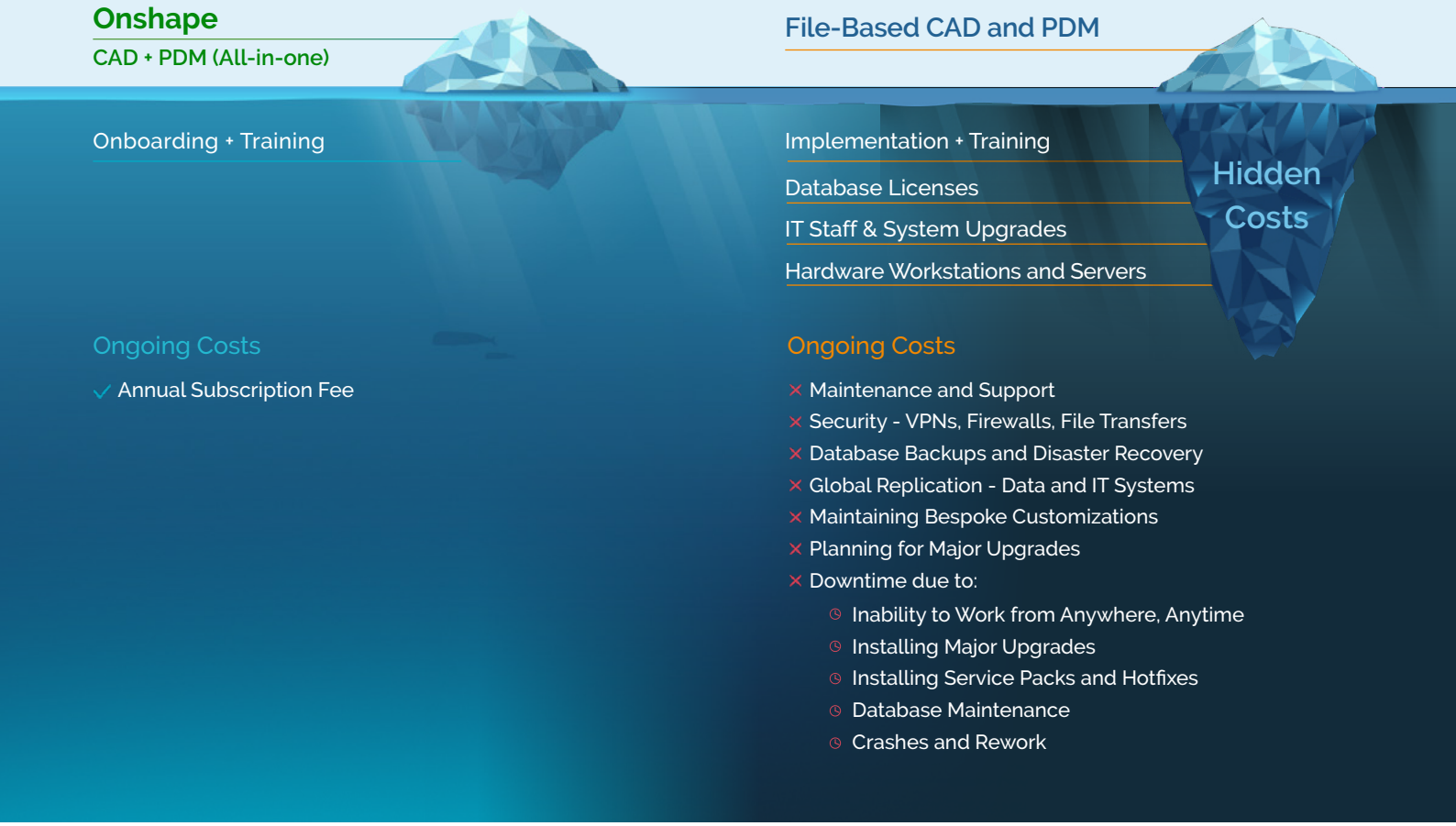
No Hidden Costs: The Straightforward Pricing of Cloud-Native Onshape



Budgeting for product development software shouldn't be a guessing game filled with unpleasant surprises.

As a comparison to the most popular file-based CAD and PDM systems on the market, let's take a look at the straightforward pricing and total cost of ownership of Onshape, the leading cloud-native product development platform.

Onshape, which combines an advanced CAD system with built-in PDM, real-time collaboration tools and business analytics, is a complete all-in-one platform.

> The Onshape Professional plan costs $2,500 per user per year, roughly the equivalent of what file-based CAD vendors are charging for annual maintenance fees alone.

Cloud-Native Onshape

$2,500
Per User, Per Year for:

- ✓ Full CAD System
- ✓ PDM
- ✓ Collaboration Tools
- ✓ Business Analytics

File-Based CAD and PDM

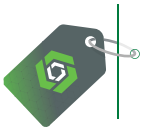
$1,300 to $2,000
Per User, Per Year for:
CAD Maintenance Fees ONLY

+

$380 to $570
Per User, Per Year for:
PDM Maintenance Fees ONLY

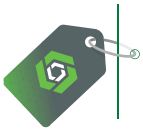
But the relatively balanced scale above is an incomplete picture.

Here's a quick price check on **what you aren't paying for** when your product design and manufacturing teams use cloud-native Onshape:



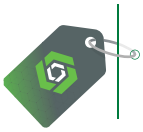
$ 0.00
Extra for PDM

There's no need for an external add-on PDM system (along with associated servers, installs, licenses or backups) because Onshape includes built-in version control. For cloud-native CAD users, the "Where's the Latest Version?" problem is no longer a problem.



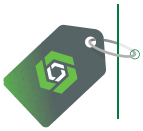
$ 0.00
Extra for Software Maintenance Fees

Onshape users receive free automatic product updates in the cloud every few weeks. Onshape frees your IT team from CAD and PDM maintenance and empowers your engineers to spend more time designing.



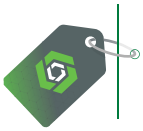
$ 0.00
Extra for High-End CAD Workstations

Onshape runs on PCs, Macs, Chromebook or Linux computers. There is no need to purchase a high-performance workstation just to handle the demands of CAD as all the heavy calculations are offloaded from your computer to Onshape's servers in the cloud.



$ 0.00
Extra for Servers and Networking Equipment

As noted earlier in this guide, the cost of purchasing database and archive servers for your company can easily cost tens of thousands of dollars – not including the salaries and benefits of the IT team to maintain them. By choosing a cloud product development platform, all your IT software and hardware costs are included in your plan. Onshape uses Amazon Web Services (AWS) for its world-class cloud computing infrastructure.



$ 0.00
Extra for Cybersecurity

With traditional file-based CAD, your product designs and intellectual property are subject to unauthorized duplication, data breaches, or even accidental sharing. Onshape's database-driven architecture eliminates these kinds of security risks. There are no files to copy or manage, period. Onshape has achieved a SOC 2, Type 2 certification using the AICPA's Trust Service Criteria for security, availability and confidentiality.

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The Onshape savings outlined above are only the immediate tangible savings. As noted earlier in this TCO guide, there are also significant efficiency costs and opportunity costs associated with your choice between file-based and cloud-native platforms. (See our "Preventing Product Design Bottlenecks" eBook for an even deeper dive on these production costs.)

Users of cloud-native Onshape can take advantage of parallel workflows with their teams, working simultaneously on product designs without the tight restrictions and delays of checking in and checking out files from a PDM vault. Cloud-native product development streamlines communication and collaboration across your organization and creates opportunities for more design iterations and exploring alternative ideas.

Offering real-time business analytics – 24/7 visibility into a design project's progress – Onshape also helps teams identify and address potential bottlenecks earlier, minimizing the risks of future delays.

To learn more about how Onshape is advancing PDM, click here

GET STARTED

Onshape is a PTC Business.