SYNOPSYS®

The Journey to Design in the Cloud

INTRODUCTION

For many years, software developers have been building and delivering products in the cloud. The journey continues as semiconductor companies transition to designing chips in the cloud to innovate faster, leaner, and Q S V I I ¾ G M I R X P]

The reasons to move design to the cloud are compelling but along the way, we will need to shatter some myths and illuminate a new way forward that harnesses the power of the cloud.

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WHY CLOUD? WHY NOW?

For a long time, IC design teams have resisted a move to the cloud for hardware development based on several myths, but three key drivers are now coming together as a perfect storm to make moving to the cloud a must:

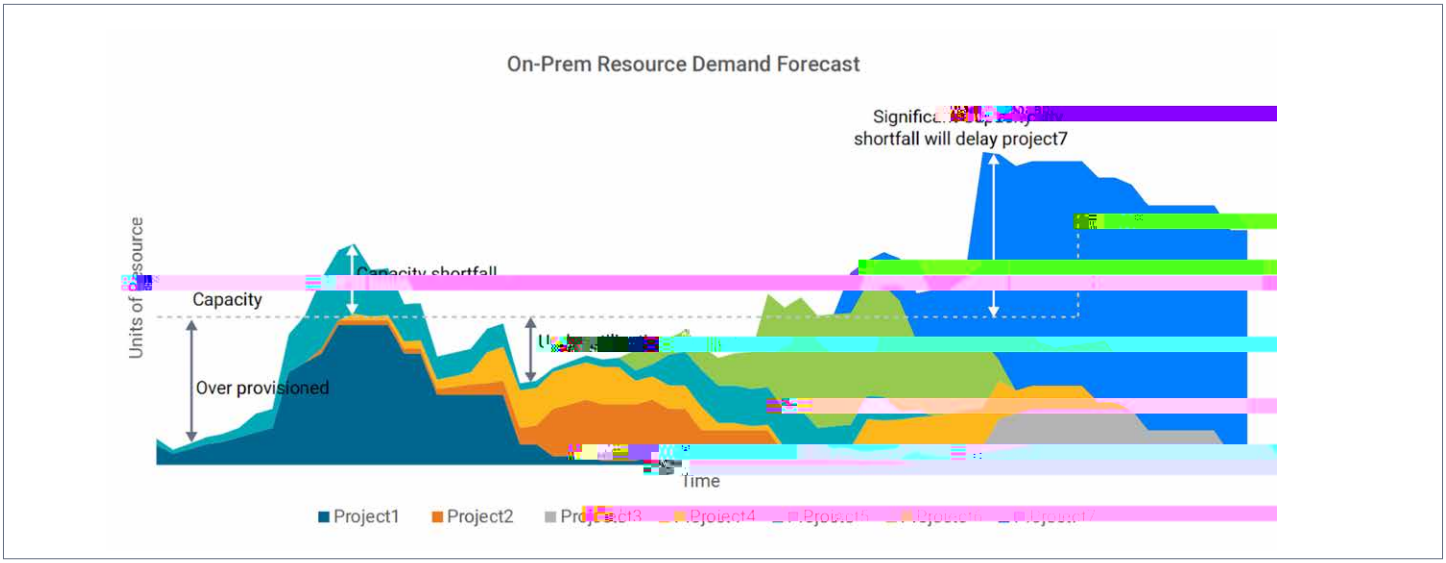
The combination of software as a driver for innovation and the use of hardware to bring new ideas to life is driving a new level of systemic complexity. Designs now combine multiple technologies into one highly sophisticated package, requiring a holistic analysis of the entire system. This is the design paradigm that will fuel semiconductor advances for the foreseeable future. This shift requires exponentially more compute and Electronic Design Automation (EDA) resources.

Artificial Intelligence

AI is [illegible] This drives further [illegible] EDA resources.

Cloud service providers (CSPs) have scaled high-performance computing


System Protected



Furthermore, the compute requirements of actual design projects are GLEVEGXIVM^IH F] WMKRM¼GERX TIEOW ERH ZEPPI]W EW WLS[R MR X XLI RI\X TEKI ;LEX MW XLI STXMQEP SR TVIQ GSR¼KYVEXMSR XS WYT very real situation?

Of course, you can invest and expand your on-prem resources to meet burst capacity requirements, but capacity expansion is typically non-agile, and in one direction only. So the on-prem estate only grows, it never shrinks when demand wanes. In fact, capacity availability is what the cloud excels at, thanks to the huge expansion in capacities globally by the large CSPs.

The Affordability Myth

The third myth is around cost. On-prem IT teams always believe they can deliver capacity more cheaply than the cloud, and owning hardware is essentially more cost effective than renting it over time, or at least the costs are better understood and more controllable. They worry that the GPSYH…W MR¼RMXI GETEGMX] [MPP IRGSYVEKI IRKMRIIVMRK XIEQW X compute and storage in an uncontrollable fashion with runaway costs.

However, IT teams will need to provision enough on-prem capacity to cope with peak demands, meaning expensive on-prem hardware may sit idle for a percentage of time, with poor overall utilization. This is an on-prem cost that is often overlooked.

The Ease of Use Myth

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So, some may conclude that, “If it’s not broken, **don’t fx it.”**

-R JEGX MRZIWXMRK IJJSVX XS QMKVEXI I\MWXMRK [SVO½S[W XS XLI SXLIV FIRI¼XW %W NSFW FIGSQI FIXXIV IRGETWYPEXIRERH PI½W FIT on the target platform, one can progress to an environment where [SVO½S[W EVI TSVXEFPI ERH GER FI VYR FSXL SR TVIQ SV MR GPSYH seamless fashion.

BARRIERS TO ADOPTION

Let's look at some of the practical issues preventing hardware engineering teams (in both large and small organizations) from **successful cloud adoption.**

)\MWXMRK -' HIWMKR MQTPIQIRXEXMSR ERH ZIVM¼GEXMSR [SVO½S[W have evolved with an unknown number of assumptions and dependencies SR XLI GSQTYXI ERH WXSVEKI IRZMVSRQIRX QEOMRK MX HM¾GYPX XS the cloud. On top of that, there may be tool licensing assumptions XLEX EPWS TVIZIRX YWMRK XLI I\EGX WEQI [SVO½S[MR ER YRGSRWXV cloud environment.

Can I Use My EDA Tools in the Cloud?

The likelihood is that existing contracts may not have the provision to use EDA tool licenses in the cloud. So, whoever manages EDA contracts is going to have to talk to the vendor to establish the art of the possible. All the main EDA vendors offer multiple models to use licenses in the cloud. However, there may be some contract changes necessary, and you may in fact want to be able to operate some of your licenses on-prem as before, while operating others in a cloud environment.

After all, there's no point having access to infinite compute in the cloud if you are then limited by **EDA licenses.**

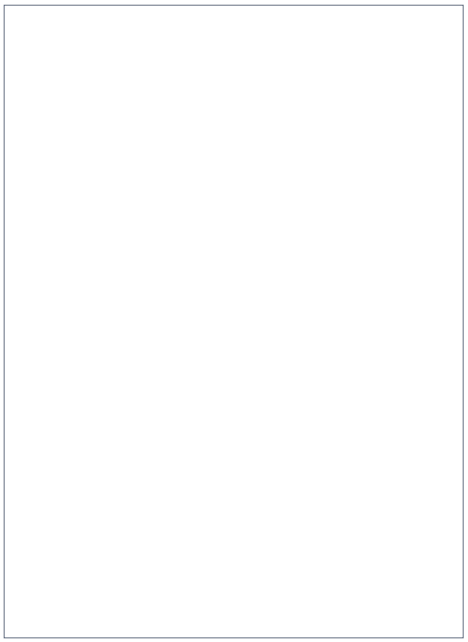
Data and Storage

The cloud is not just about compute, it's also about storage. For some IRKMRIIVMRK [SVO½S[W XLI WXSVEKI GSWX GER FI E WMKRM¼GERX J a rule, creating large datasets in the cloud is not an issue in terms of availability, but cloud storage can be expensive. Not everything that is stored in the cloud needs to be in high-performance tier storage.

You can move less frequently accessed data into one of the slower tier 2 or tier 3 storage mediums provided by your CSP. There is also a cost associated with data transfer. It's usually free to upload, but downloads are metered and can contribute to extra fees.

Don't retain large volumes of intermediate data that can be reproduced easily. Perform all your data analytics in the cloud, something that the cloud is increasingly capable of doing, thanks to the emergence of modern big data analytics.

The need for demand forecasting does not go away as you switch to the cloud. What does go away are the technical and physical barriers to capacity expansion, as short-term demands can be more easily met, and you need only pay for the services you consume.



However, as mentioned earlier, costs could spiral with runaway

Cost Factors: On-Prem vs. Cloud

8LIVI…W RS SRI WM^I ¼XW EPP GSWX QSHIP EW IEGL SVKERM^EXMSR needs. Keep these considerations in mind in your calculations.

The great thing about the cloud is that all the costs associated with running a job can be accounted for on a single OPEX line. Remember that costs must be considered as the combination of compute, EDA tool licenses, storage, and data transfer.

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ADOPTION MODELS

There are several approaches to adopting a cloud design model. The particular approach will be tempered by the size of your **organization and the current hardware and software investment.**

There are two scenarios here that should not be confused. Bring your

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simulation for example. Effectively this becomes “simulation as a service.”
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could be based on a given capacity of licenses.

For larger organizations with a pre-existing investment in on-prem capabilities, a hybrid approach is a popular strategy. Peak demands can be met by bursting capacity into the cloud for suitable workloads, while less portable workloads continue to be run on-prem with no impact. This more gradual migration 1 (i)11.4 (s m)-1.2 (o)-0.9 (r)12.7 (eo)1.2 (8)1 (d f)23.3 (o)-0.8 (97 54 611 36..9 <00z7 (eo)1.2 (8)141

OPPORTUNITIES TO DO THINGS DIFFERENTLY

Innovation is the lifeblood of any R&D effort in the semiconductor **industry.** The pace of change has been relentless and has been pushed by EDA tool advances and customers presenting vendors with engineering challenges that would have seemed unimaginable **only fve years ago.**

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history, allowing engineers to improve productivity, performance, and time-to-market.

Essentially, breaking free of the constraints placed on innovation by limited compute can offer opportunities to do things in a different way and it becomes an equalizer for small organizations to compete with larger ones. Many IC design engineering teams are accustomed to the
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and the time to market. What opportunities are missed by not being able to deliver the highest possible quality in a market-winning timeframe because there simply aren't enough on-demand compute resources and EDA licenses available to accelerate the delivery?

At the end of the day, the main resource constraint is the people. Engineer time is the most valuable and the most limiting factor. Engineers being blocked, waiting for lengthy batch compute jobs to complete is not an effective use of engineering talent. With capacity and availability constraints lifted, talented engineers can focus on the things that they do best: innovating.

Earlier we asked, "why cloud, why now?" and characterized the present situation as a perfect storm in which growth in systemic complexity drives compute and EDA demands exponentially, and modern AI-enhanced EDA technologies further increase this demand. Both CSPs and EDA vendors offer usage models that make cloud adoption affordable and scalable for IC hardware developers.

What's more, if the competition is already exploiting this vast resource to deliver products faster, why shouldn't you do the same?

THE WAY FORWARD

Chip development in the cloud represents a way forward for an **industry grappling with exploding computational demands along with continued time-to-market pressure.** From established design houses, to system companies, to start-ups, more chipmakers are migrating workloads to the cloud to take full advantage of the faster time-to-results, enhanced quality-of-results and better **cost-of-results that cloud-based design and verification technologies provide.**

With Synopsys Cloud, we're taking EDA to new heights, combining the availability of advanced compute and storage infrastructure with *unlimited access* to EDA software licenses on-demand, so you can focus on what you do best — designing complex chips, faster.

8LI 7EE7 QSHIP TVSZMHIW STXMQM^IH [SVO½S[W JSV IZIV] X]TI SJ -' H matched to the best hardware for the job. Up to now, only companies with ZEWX ½S[HIZIPSTQIRX VIWSYVGIW GSYPH TVSZMHI XLMW GETEFMPMX now makes this same comprehensive support available to all design teams.

The revolutionary FlexEDA model provides access to the entire catalog of Synopsys software. Reduce time-to-results from days to hours through cloud-scale elasticity using Synopsys' unique FlexEDA pay-per-use model. Get unlimited access to EDA licenses on-demand, enabling the scaling of EDA licenses and compute up or down in real time. You are freed from long procurement cycles and the need to know what tools are needed up-front. FlexEDA is available as both SaaS and BYOC.

Delivering cloud-native EDA tools and pre-optimized hardware platforms,

Take Synopsys Cloud for a Test Drive

Synopsys technology transforms how people work and play. Let us power your design journey with cloud-based EDA solutions.

Sign up to try Synopsys Cloud for free