

Accenture Strategy & Consulting

Driving semiconductor growth through as-a-service models



Executive overview

For more than 50 years, the semiconductor industry has enjoyed a level of growth unparalleled to many industries. Moore's Law dictated that processing power would double every two years at the same cost. The resulting innovation and growth that this spurred globally has been undeniable and has lasted more than five decades. However, today's semiconductor companies are finding themselves in a completely different landscape. Moore's Law is slowing, chip development costs have skyrocketed, competition is coming from non-traditional places, and customers are demanding exponentially more power and functionality to support exciting new applications such as the Internet of Things (IoT), artificial intelligence (AI), and soon, quantum computing. As a result, semiconductor companies are

thoughtfully exploring new ways to grow and compete more effectively to secure new revenue streams and develop innovative ways to capture additional margin.

This report examines As-a-Service (AaS) as an increasingly relevant competitive growth model for the semiconductor industry. Originally successful in the software realm, AaS business models are poised to help semiconductor companies fuel growth, boost revenue, innovate faster, and deepen relationships with customers. When planned and implemented correctly, AaS can substantially increase shareholder value and improve predictability of revenue. However, if executed poorly, it can negatively impact a company's bottom line.

What is AaS

AaS, also referred to as Everything-as-a-Service (XaaS,) can be defined as the extensive variety of services and applications emerging for users to access on demand as an operational expense instead of outright purchase of the underlying software or equipment as a capital expenditure.¹ With new AaS business models, market leaders can now be more agile and dynamic, with on-demand and plug-and-play services precisely targeted to both individual consumers and businesses.²

By moving to an AaS model, semiconductor manufacturers can gain both a captive audience and recurring revenue. This is in stark contrast to the current monetization model that is typical across the value chain, involving one-time revenue generation from the sale of semiconductor intellectual property (IP), manufacturing equipment or end product(s). AaS also promotes high customer retention and higher switching costs by lowering the barriers to purchase. These additional services can then feed back into traditional sales models because companies stay top of mind for future revenue opportunities.

To help conceptualize AaS in action, below are a few successful examples:



Dell Technologies introduced Dell Technologies On Demand, a set of consumption-based and AaS service offerings. These offerings deliver IT solutions with the agility of the cloud while providing customers the control, performance and predictability of on-premises infrastructure. This facilitates Dell customers to more effectively budget, switch from CAPEX to OPEX, and pay for technology & services only as needed. Services are optimized and adjusted to balance customer's financial and technology objectives.³



Schneider Electric adopted an Energy AaS Model to transform the way its customers approach energy buying and management. Once constrained by a rigid, centralized system, Schneider Electric now offers a broad portfolio of solutions across energy supply, sustainability, DERs and resource efficiency, enabled by a suite of advisory services and software. This assisted the company to exercise innovation to meet its clients' needs, and provides flexibility in technology, funding source and operational risk.⁴

Growing shift towards AaS models

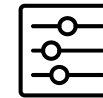
AaS models are not new, having first emerged in the 1960s, when [IBM](#) and other mainframe providers offered compute and database to organizations on a time-sharing or utility computing basis. Another example of AaS in the early 60s was [Rolls Royce](#), which offered its engines based on flight hours. Similarly, in the 90s and 2000s, the internet economy allowed software providers such as [ServiceNow](#), [Salesforce](#) and [Splunk](#) to introduce Software-as-a-service (SaaS). In the 2010s, hardware companies followed the trend with leaders such as [HPE](#), [Lenovo](#), [Cisco](#) and [JCI](#) adopting these models. Most recently, industrial manufacturers such as [GE Digital](#), [Schneider Electric](#) and [Siemens](#) have embraced the IoT and flexible consumption models for B2B products and services.

The potential for AaS has been demonstrated by the number of success stories in a myriad of industries from software, hardware, industrial, and manufacturing. Highlighting the many benefits for both the service consumer and the service provider, these are the top six reasons why companies are increasingly interested in moving to AaS:



Operational efficiency

Service consumers are able to achieve a shift from high CapEx to more predictable OpEx + predictable, recurring and renewable revenue streams. With an AaS model, they no longer need to invest upfront in high-capital equipment/machinery that needs to be updated frequently. This helps to minimize the lost value with CapEx assets before a return on investment is realized. It also frees up cash for other investments and projects and can reduce overhead, staffing costs, spending on capital equipment, and fixed costs. In addition, better and lower maintenance requirements can increase workforce efficiency and capacity because the service provider also handles maintenance.



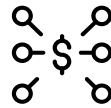
Flexibility and agility

Using AaS, companies can scale capacity, operations and can adjust cost based on demand. AaS also allows the increased adaptability needed to survive industry pressures such as the recent COVID-19 pandemic, trade wars or other business/industry issues. Revenue can also be aligned to consumption with pay-as-you-go or pay-per-use models. Companies can purchase solutions tailored to their needs, rather than invest in developing in-house capabilities, expertise and facilities. With this new “do more with less” mentality, AaS makes it easier and faster for companies to introduce new tools, solutions and technologies. Companies don’t have to wait for drawn-out procurement, design, test, and installation cycles to begin making use of productive technologies. Innovation is also accelerated because it is now easier to deploy cutting-edge solutions such as AI, IoT or big data analytics. Companies can then benefit from faster time to market for products and services, and more opportunity for experimentation—which helps companies stay on the leading edge and cusp of innovation.



Breaking down barriers to innovation

The semiconductor industry has been traditionally dominated by a handful of large players with deep pockets for continued investments in R&D and operations. With AaS, more companies can participate in this market through broader access to analytics and manufacturing tools (without having invest in expensive capital equipment). There is also a high demand for customization today because of AI, automotive and connectivity applications, making it the ideal space for niche players to grow. AaS helps these emerging players successfully compete and grow in these areas, whereas in the past they may not have had the money to make the intensive CapEx purchases needed. AaS also saves companies the inconvenience and cost associated with new upgrades and rollouts, which is significant because monitoring changes in methodology, program and technology is time-consuming and costly.



Greater share of wallet

AaS companies benefit from potentially capturing a greater share of the wallet by providing maintenance, spare parts, peripherals, data analytics services, and upgrades, in addition to access to supporting assets. AaS effectively takes out third-party providers from the equation, resulting in shorter sales cycle and higher margins.



Greater access to data to enhance cross sell/upsell of services

An AaS model offers valuable data that can be used to meaningfully serve clients in the future. For example, they know how customers are using a product, who is using it, how often it breaks down and for how long. This information can be leveraged for additional or recurring revenue for the long-term.



Recurring revenue stream

AaS enables manufacturers to provide components every month or every year. This recurring revenue stream removes the lack of predictability and can help to derisk a company's top line.

Semiconductor companies can learn from and adopt well-known practices and models of other AaS providers and achieve these outcomes.

Ready to take the leap with AaS? Ask these questions first

Moving to an AaS model is top of mind for most of C-suite executives regardless of industry. However, these models are just starting to emerge in the semiconductor industry.

Before embarking on an AaS journey, there are many considerations for the semiconductor industry to frame feasibility and provide scope on what is possible. For example, today there is great uncertainty around how to reconcile AaS and IP, how to introduce AaS to existing service models, and how to re-orient business models and internal operating models to facilitate AaS. This has caused AaS to experience a slow adoption in the semiconductor industry.

Here are the key considerations and questions semiconductor executives should ask if they are considering a move to AaS.

Sensitivity, control and ownership around IP:

The rapid pace of change in the technology sector requires semiconductor companies to invest significant capital (~20% of sales on average) into R&D, and is among the highest in any sector. Intellectual property is the lifeblood of the industry, and semiconductor companies are very sensitive to compromising their IP. As a result, they are typically quite conservative about business models that call for more sharing of data across the value chain.

With an AaS model, executives need to ask themselves

“How will we balance transferred risk ownership for services along the value chain while retaining core IP?”

Limited demand:

Compared to other industries, the semiconductor industry doesn't face the same pressures to adopt AaS and there is also limited demand from customers to go in this direction. The biggest semiconductor companies have outsized market share and influence in the industry. Thus, they are more than comfortable with the current status quo.

Executives need to ask themselves

“How can we recognize the value of AaS as a potential industry disruptor or revenue generating mechanism, even as our peers or competitors are reluctant to embrace AaS?”



customers are willing to adopt AaS, and if so, whether they should change their customer approach. Companies also need to look at their new Total Addressable Market (TAM) and their new go-to-market strategy. There are many things to consider on the operations side. For example, will there be a disruption to operations? Do they have the talent and resources required to execute in-house and can they make the change to AaS without overwhelming their existing talent and resources? What is their customer retention plan? In addition, not all AaS models are equally attainable in the near term or long-term, which means some models may require a bigger cash position up front.

Executives need to ask themselves

“How can my company distinguish among AaS models that are value-adds rather than operations disruptors?”

Operational feasibility:

Executives need to consider the economic and operational feasibility of moving to an AaS model. From an economic perspective, they need to determine if there are financing or ROI changes in the business model or whether there is a pricing strategy change. They also need to know if their

Transferred risk ownership:

In an AaS model, risk shifts from the company to the service provider. The tradeoff is that service providers deliver at scale through a common platform and get deep insights into customer consumption patterns, which can enable them to sell and cross sell better. Companies in turn can leverage this expertise developed and investments made by the service provider, and focus on their core business.

Executives need to ask themselves

“Does my company have the proper visibility to measure, manage and track our risks? Do we have the right SLA’s in place with the service provider to minimize risk?”

Changes to operating model:

AaS is more than a bolt-on of services and requires deep collaboration within a company. Semiconductor companies need to be prepared to design and implement new operational models that encourage integrated, interconnected, hyper-responsive teams with shorter planning cycles and connected data, systems and workflows. In this environment, force-fitting legacy processes to support new AaS models won’t work and developing a customer success team is crucial to success.

Executives need to ask themselves

“Is our business prepared for the operating model shift that coincides with the AaS business model shift? What needs to change?”

Moving forward with AaS— tactical steps

There are several tactical, yet very important steps that semiconductor companies should take before moving ahead with an AaS transformation.

Shared vision for the future

In order for an AaS model to be successful, a company should have C-Suite alignment. The C-Suite needs to unite and identify shared goals and outcomes for the new AaS business model. This sponsorship is a key factor in encouraging cross-functional and cross-organizational cultural collaboration required for the AaS model to be successful.

Risk assessment

There are a wide variety of AaS models to choose from as outlined above. Some have had varying levels of traction while others are still emerging. Companies considering these models should do a financial risk assessment to understand capital investment needed, ROI, and level of overall risk of the undertaking. During the initial risk assessment phase, semiconductor companies must determine the advantages and disadvantages to adopting applicable AaS models.

They need to know if they have the existing technology, resources and data that could support or hinder their transition towards an AaS model. And finally, they must identify and close the gaps that stand in the way of adoption. An example of this could be recognizing the need to hire new talent or third-party vendors to manage the new AaS business model.

Clear & actionable 12-24 month roadmap

After conducting a thorough and thoughtful risk assessment and obtaining C-Suite alignment, it is critical to develop a clear 12-24-month roadmap and tactical action plan to avoid financial risks and generate revenue faster. This includes timing and sequencing of initiatives, such as contracting with AaS service providers, operations model design, operations model implementation, workshops, “go-live” recurring cycle of service maintenance and product customization, and communications to organization and suppliers.

There are also adoption approaches in order to operationalize an AaS business model.

A decision needs to be made to best determine whether capabilities are ‘built’ (through new hires or ecosystem partnerships) or ‘bought’ (through mergers and acquisitions). Once the right approach is determined, how to scale the capabilities must be considered. Below are the different scenarios for scaling and in each case, it is important to scale while also protecting the company’s core business and minimizing any disruption to existing customers:

Pilot/Service addition: In this scenario, a small team builds, launches and operates the new AaS model, leveraging necessary cross-functional support within the organization.

Business inside the business: This is where a new ring-fenced unit handles implementing the AaS offering within the company.

Transforming the whole business: This situation is more common in S&P companies than others. It involves a dramatic operating model transformation to a full digital business. However, this approach is often too risky and complicated for large semiconductor companies as it can put at risk their core business and existing customer relationships.



ACCENTURE AAS SUCCESS STORY #1

\$8
billion
communications
hardware
provider

A leading global provider of mission-critical communications hardware with ~\$8 billion in annual revenues had been experimenting with XaaS offerings but was not achieving the desired scale and seeing costs increase. Their technology platforms in communications, software, video, and services make cities safer and help communities and businesses thrive, which has led to a new era in public safety and security. Public safety and commercial customers globally depend on their solutions to keep them connected, from every day to extreme moments. The client serves more than 100,000 customers in more than 100 countries and has a rich heritage of innovation spanning more than 90 years.

To help them better traverse and succeed at adopting an XaaS model, Accenture assisted in the planning and execution process. The first step was completing an as-is assessment and to-be design for capabilities, technology and operating model.

Accenture then conducted 50+ interviews with 100 people to understand the pain points and future vision. They also facilitated five design thinking workshops to share leading practices and develop fit-for-purpose solutions. The key outcomes around these activities were:

- ✓ **Co-created** a two-year tactical roadmap of 70 initiatives to achieve target state
- ✓ **Re-prioritized** IT initiatives to tie with business priorities
- ✓ **Defined** to-be decision authority and pilots to launch customer success and new NPI forums
- ✓ **Created** microsite to socialize project across organization

ACCENTURE AAS SUCCESS STORY #2

A large multinational information technology company

A large multinational information technology company was experiencing significant competitive pressure and customer demands for a subscription-based option for many of their compute, storage, security, and networking offerings. Due to a series of targeted acquisitions, an opportunity for EaaS appeared, they wanted to bundle all types of solutions into a single offer (hardware, software, services) and finance them. Accenture partnered with the company to conduct a SaaS assessment and roadmap for their existing software business. This included looking at their operating capabilities and evaluating the current state of several of their business units and offerings against industry best practices. The teams focused on sales, customer success, finance, marketing and organizational areas. Accenture also helped them evaluate its business systems to provide actionable recommendations to change front and back office systems to conduct frictionless subscription and consumption transactions.

Working with Accenture, the company was able to successfully transition to an AaaS model that had a significant impact to their channel. This presented an opportunity to grow their services through its channel strategy. Since they were a hardware provider, special focus was given to protecting the existing business while growing a new (SaaS and Network-as-a-Service (NaaS)) business. New customer types (e.g. lines of business, different markets) were opened because of SaaS, resulting in new revenue streams.

Getting started

The benefits that AaS business models can deliver to the semiconductor industry are substantial, as shown by the transformation they have spurred in other industries.

If you are thinking about an AaS model or just starting to evaluate your readiness, start by asking these key questions:

01

Is the market my company serves ready for AaS?

04

Are my products, operations, people, and sales ready for an AaS shift?

06

What pricing strategy do I adopt for long-term growth?

02

Is there a credible value case for my company launching an AaS offering?

05

How do I acquire the capabilities to make this transformation?

07

How do I grow in AaS without affecting the core? What is my go-to-market strategy.

03

Can my IT systems support AaS?

Fuel growth and start your AaS journey today

Whether it's through an initial exploratory conversation or a detailed risk assessment, **Accenture has the expertise and resources to guide you in the 'where to play, what to disrupt, and how to win' decisions associated with AaS.**

We've worked with many semiconductor clients on transformation projects that have delivered significant benefits to the company's growth and bottom line. Our advisors have vast experience in planning and executing AaS models and can help determine if your company is ready for AaS and also recommend best practices.



The AaS quick reference guide for the semiconductor industry


Accenture Strategy & Consulting

There are many AaS models that are applicable to the semiconductor industry. However, what might work for one semiconductor company might not work for another. Therefore, it is important to carefully assess the different models to determine which one applies to your industry and more importantly, your company. Here is an overview of the various models.

Manufacturing-as-a-Service (MaaS)

Key things to consider when looking at MaaS models:

- 01 Manufacturers must understand their value proposition to design houses relative to their competition (technology, operational efficiency, and scale, etc.) and accordingly invest in capabilities.
- 02 Manufacturers need to have the ability to forecast end-customer demand by technology/node to anticipate market changes and have mechanisms to prioritize customers.
- 03 Manufacturers should have a clear strategy and vision for their place in the value chain. They need to determine if they want their core manufacturing business (foundry model), or if they want to start to compete with their customers/suppliers by having more vertically integrated offerings (waterfall model).
- 04 Design houses need a clear strategy for single or multi-sourcing from manufacturers.




MaaS allows manufacturers to specialize in semiconductor manufacturing, R&D and operations, while other “fabless” companies specialize in other parts of the value chain. Manufacturers gain efficiencies by pooling demand from many customers, thereby maintaining high-capacity utilization and lowering costs for everyone in the ecosystem.

With the foundry-fabless model firmly established in the industry, MaaS is a mature offering from foundries and OSATs such as [TSMC](#) and [ASE](#) respectively.⁵ These companies are also leveraging the cloud to enable customers to communicate their design/manufacturing needs and capacities automatically, enabling complex production tasks to be executed collaboratively.

Equipment-as-a-Service (EaaS)

Key things to consider when looking at EaaS models:

- 01 Companies need to be aligned on what value the equipment brings to the user, and how that value can be shared with the equipment maker.
- 02 Pricing models need to be evaluated to determine whether an outcome-based model or usage-based model is best. An outcome-based model is preferable when the outcome (whether financial or manufacturing) is well known and agreed upon. Alternatively, a usage-based model is preferable when unit operations of the equipment are well quantized and measured.
- 03 Companies need to take into consideration planned obsolescence and tool upgrades. While developing the ability to price in material feature changes in addition to tool upgrades.
- 04 In this model, equipment maker organizations need to be better prepared to be a service organization in the following ways:
 - Financial investment and ROI
 - Product design to enable greater monitoring and self-service of equipment
 - Contracting and pricing strategy that encompasses customer value
 - Sales and customer service
 - Setting up infrastructure to extract data from equipment in factory environment at the user location to a centralized location



In this model, the semiconductor industry leases equipment and includes services such as equipment install, maintenance, managing consumables, chemicals, and providing more analytics/simulation and modeling to optimize process.

EaaS offers many advantages to equipment makers, such as predictable revenue streams and an ability to capture more revenue from the equipment.

Equipment revenue can consist of ongoing maintenance, spare parts, peripherals, and data and analytics services. It also provides benefits to equipment users by eliminating large upfront capex, which lowers risky opex expenses. Enabling customers to get access to state-of-the-art equipment, while still focusing on their core business.

Yield-as-a-Service (YaaS)

Key things to consider when looking at YaaS models:

- 01 There is no one vendor that has expertise in end-to-end analytics in the product and manufacturing lifecycle. Companies have strengths in one or more distinct areas such as yield management, prediction, process control, metrology optimization, DFM solutions, and test analytics and optimization.
- 02 Data availability and sharing across the supply chain greatly increases the quality of insights derived from analytics. This remains a challenge due to IP protection concerns.
- 03 Borrowing from the software industry, many yield services are beginning to run on cloud infrastructure provided by hyperscalers. Location of sensitive data (outside the company data centers) and the velocity and volume of data that needs to be backhauled presents an ideal edge analytics use case.

An example of a YaaS is Applied Materials, [Applied Fabvantage Consulting](#) offering analyses in tool output, yield, predictability, fab productivity and cycle time.⁶ Other examples include AI-based big data analytics software companies such as Optimal+, YieldHUB.⁷

Many companies do not have the R&D budgets and scale to create state-of-the-art analytics capabilities in-house in order to improve yield.

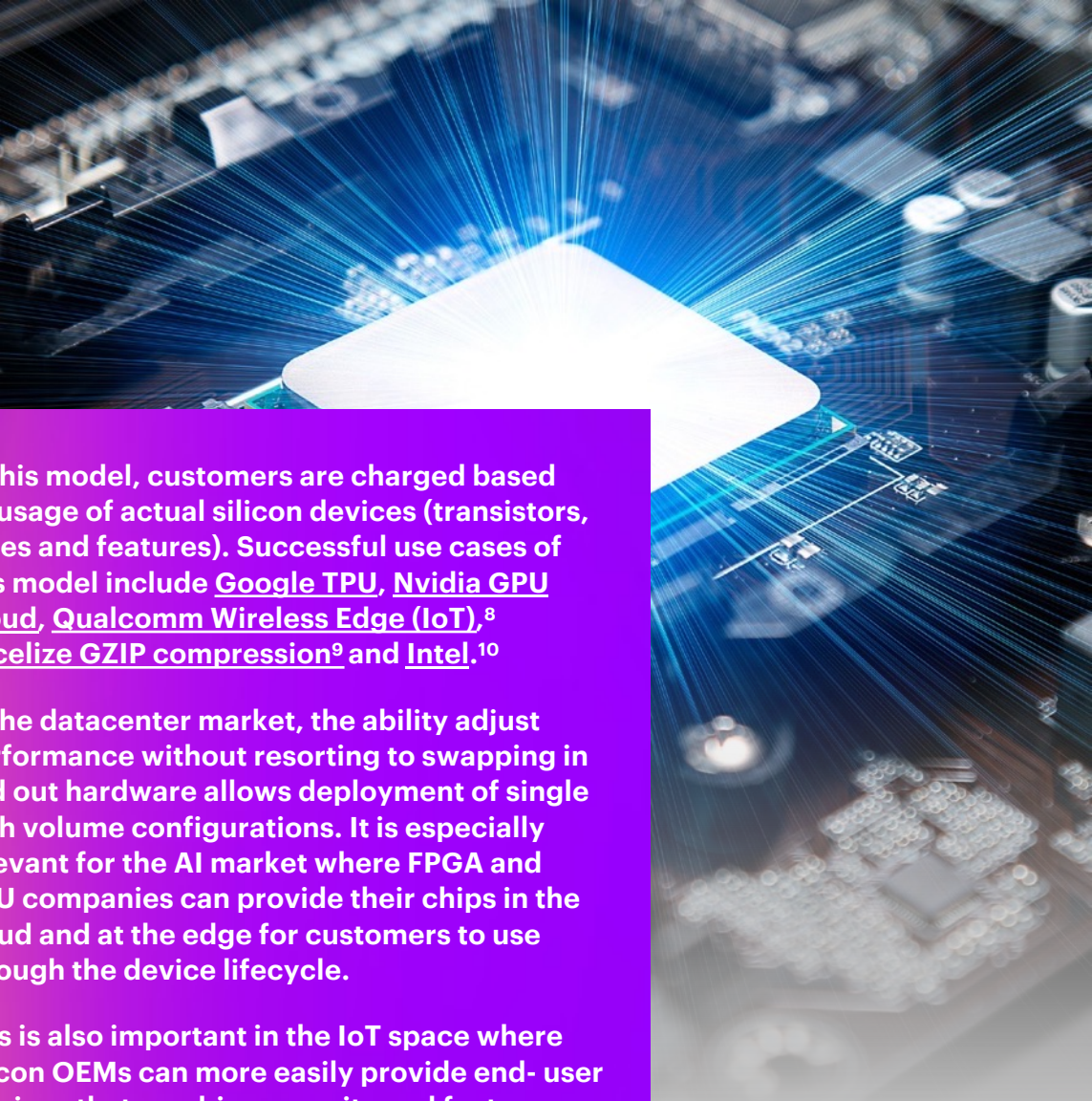
To better compete in the marketplace, they can obtain these services from third-party yield management companies.

They offer superior analytics tools and infrastructure to their customers by cross learning from many customers, often delivered on a cloud platform.

Silicon AaS (SiaaS)

Key things to consider when looking at SiaaS models:

- 01 Design houses and IP integrators need an accurate, traceable and verifiable IP inventory with versioning and configuration in their PLM system for royalty calculation.
- 02 IP producers need to configure and activate in a flexible and traceable manner.
- 03 IP producers must have the ability to securely meter the use of their IP and retrieve that information for royalty charging.
- 04 Chip/core power consumption can sometimes be used as an effective proxy for silicon usage and metering



In this model, customers are charged based on usage of actual silicon devices (transistors, cores and features). Successful use cases of this model include [Google TPU](#), [Nvidia GPU Cloud](#), [Qualcomm Wireless Edge \(IoT\)](#),⁸ [Accelize GZIP compression](#)⁹ and [Intel](#).¹⁰

In the datacenter market, the ability adjust performance without resorting to swapping in and out hardware allows deployment of single high volume configurations. It is especially relevant for the AI market where FPGA and GPU companies can provide their chips in the cloud and at the edge for customers to use through the device lifecycle.

This is also important in the IoT space where silicon OEMs can more easily provide end-user services that combine security and feature management in a subscription model.

Design-as-a-Service (DaaS)

Key things to consider when looking at DaaS models:

- 01 EDA cloud-deployment model (public/hybrid/private) that match the workloads, cloud compute and storage pricing, tool pricing and performance requirements
- 02 Impact of geopolitics and IP export control on the long-term availability of IP and services from current vendors
- 03 In-house vs. third-party vs. open source of IP—Total cost of ownership, IP reuse, time to market, and available talent.

The DaaS model helps companies design silicon for their applications with lower upfront costs.

EDA (Electronic Design Automation) vendors like [Cadence](#), [Synopsys](#) and [Mentor](#) have been steadily moving capabilities to the cloud (public or hybrid/private) offering EDA as a SaaS. The key draw for customers is compute elasticity—responding to highly volatile compute demand during the semiconductor design, verification and tape-out process.

IP houses like [ARM](#) provide access to ARM ISA, IP and tool through a variety of licensing models, including subscription. Open source ISA RISC-V has been gaining popularity in embedded systems due to even lower cost. Startups like [SiFive](#) provides cloud-native RISC-V design platforms, further reducing capex requirements.¹¹

EMS providers such as [Jabil](#), [Flextronics](#) and [Hon Hai](#) also provide design services and reference designs to system integrators. Semiconductor product companies like [ON Semi](#) and [NXP](#) also provide cloud-based evaluation, test and developer software to quickly deploy applications using their products.

Quantum-as-a-Service (QaaS)

Continuous investments and developments have propelled quantum computing from a theoretical concept into a tangible computing option for enterprises.

In response, a number of companies are providing cloud-based services to access quantum computing resources remotely, similar to how [AWS](#) and [Azure](#)¹² provide infrastructure as a service today on the public cloud.

Companies that are exploring this area include [IBM](#), [Microsoft](#),¹³ [Dwave](#), [Rigetti](#), and [Amazon](#).

The range of use cases presently range from logistics and route optimization to speeding up drug discovery for diseases. While QaaS is a new emerging concept, many enterprises and system integration companies are interested in starting their learning curve in this disruptive technology space early.

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We have deep relationships, experience, and expertise across the semiconductor ecosystem: IDM, IP designers, fabless, foundries and equipment manufacturers. We also have dedicated practice areas and proven results in growth strategy, mergers and acquisitions, engineering operations, silicon design services, supply chain operations, system implementation and manufacturing analytics.

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