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# Matching Data Center Delivery to Demand

## The changing demands in facilities

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# Executive summary

## New demand is changing the data center industry

Rapid digital transformation and the widespread adoption of remote working environments are creating a massive increase in demand for data, and therefore the demand for data centers. The data center sector spend is expected to reach over $200 billion worldwide by 2022, and according to an October 2021 blog post from Noelle Walsh, Corporate VP of Cloud Operations and Innovation at Microsoft, the organization is on track to build between 50 and 100 data centers annually.

However, the  hyperscale data centers often built by  the tech giants aren't the only type of data centers being delivered. In fact, there has been a shift away from hyperscale models in order to better deal with the challenges in their delivery, moving away from building out the entire facility as quickly as possible and towards building smaller scalable deployments to align income with investment.

As industry leaders in data center delivery, we've seen  increased interest in scalable solutions where the data center provider has the ability to match scale to their demand in a linear fashion as well and edge data centers which have a smaller footprint and can be built around metro areas. We have also seen an uptick in colocation solutions where space is rented out by various consumers. This paper will explore the demand matching strategies and different delivery methodologies for different types of data centers, how data center providers can meet each requirement, and the numerous industry challenges in creating new data centers.

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# Understanding the demand for different types of data centers

Data and information are increasingly becoming an important commodity and the data center (DC) sector is experiencing huge spikes in demand. On the construction side, clients are looking for accelerated timelines and this trend is expected to continue for the next five to ten years. When looking to build a DC that meets current and future demands, data center providers and developers need to understand that demand may eventually slow down or become stagnant. At the same time, technology is evolving so rapidly that DCs will need to be decommissioned or retrofitted in the next decade, particularly existing hyperscale DCs. The 2018 iMasons Think Tank session highlighted some fundamental challenges associated with retrofitting facilities, including the existence of low ceilings, constraints on fuel storage, limited options for expelling heat and issues with introducing new fiber to support next-generation requirements. Ultimately, there are arguments in favor of building new capacity, which view retrofitting to extend the life of a facility as an ineffective use of capital.

This means that providers need to consider what this infers for new builds. If hyperscale models will need to be decommissioned in the next decade, is the upfront investment worth it?

Providers need to focus on immediate needs and look at market capacity and demand to determine if the location of the DC will still be suitable in the next decade. They also need to look at matching demand to maximize project viability to ensure that the total cost of operation and CAPEX will provide long-term ROI.

Currently, most new DC demand is coming in the form of hyperscale and colocation facilities. Colocation data centers  are extremely popular with small and medium size businesses, who can effectively rent the space and equipment to meet both their demands and their operational budgets. They are also popular choices for the top five data center providers, who often rent space in order to supplement their own capacity. With the surge of innovation happening right now driven by AI, blockchain and crypto, 5G data, and other foundational technologies, there are countless businesses for whom colocation data centers are extremely appealing.

Edge DCs are also becoming increasingly popular as they are smaller facilities, which allows them to be located closer to city centers and therefore closer to the populations they serve. As IoT, gaming and smart technologies take off in private homes, edge DCs allow for reliability, speed, and connectivity close to where the users are located. The demand for edge is expected to nearly triple by 2024.

Differing data centers solutions offer providers an interesting challenge  to meet the rapid increase in demand, and these shared centers have been surging in popularity as a result, with an expected $130B market by 2026.

The demand for edge data centers is expected to nearly triple by 2024

Colocation facilities have been surging in popularity, with an expected $130 billion market size by 2026

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# Right sizing delivery, procurement and timeline to demand

Matching demand to your delivery methodology for current and future needs requires the consideration of many different elements. For most data center providers, capital expenditure can be exceptionally high at the outset of the data center. Balancing that with accurately forecasted fill rates will determine whether a hyperscale, or scalable delivery methodology is the right fit for your project, or if a colocation fit-out could be a viable solution. Adopting the right approach certainly differs between DC providers, depending on multiple variables, including markets/regions, design standardization, program capacity, CAPEX availability and sales pipelines.

Models that incorporate procurement strategies such as OFCI (owner-furnished, contractor-installed critical equipment) have meant that providers can utilize a more strategic portfolio-level approach, often developing important partnerships directly with the vendors. This has been vital during recent and ongoing supply chain challenges by having lead time and pricing agreed in advance, thus helping to facilitate just-in-time delivery of a repeatable DC product.

# Other demand considerations

Data center providers also need to consider the market constraints of where they are building their assets. Many of the most popular locations, such as Northern Virginia , are in demand due to their ability to meet asset demands for power, water, and land while providing connectivity to the U.S. and Europe, the Middle East, and Africa. Colocation or wholesale is another option many providers consider when faced with new markets or challenges that prevent them from being able to deliver their own projects. Providers can take space within a data center facility built solely for the purpose of renting out data center space to other companies. When selecting a site for a data center, and the type of data center and delivery model, consider asking these questions to ensure the site will be able to manage demand.

# Data center delivery methods

Like a traditional manufacturing company, data center providers also need to weigh the benefits and disadvantages of Hyperscale versus Scalable. This consideration has become even more important following recent supply chain challenges due to the global pandemic. Hyperscale focuses on constructing all phases of the entire DC in advance of having the assurances of a potential lease from clients. Although this guarantees capacity, it does require a large capex investment. Scalable could be viewed as a more conversative approach, whereby the DC provider constructs enough IT capacity upfront in order to obtain a foothold in the market prior to committing the full capex of an entire project. There are pros and cons to each approach.

## Hyperscale: pros and cons

Hyperscale is the most favorable approach from many DC providers. Although the number of DC providers entering new markets globally has increased, the pace of growing digital demands has also remained high, which can reduce levels of risk associated with having a data center built in advance of revenue.

Some of the key benefits include greater labor retention and an increased pipeline of work, economy-of-scale benefits during procurement and project execution, as well as reduced time-related costs, as multiple fit-out phases can be constructed concurrently.

A key risk associated with Hyperscale in terms of the DC market is having a project completed too far in advance of sales and therefore incurring operational costs and reducing whole project lifecycle profitability. Also, since DCs are technology-driven, and the technology is rapidly and constantly evolving, design and technology can change every three years — with some changing every six months — Hyperscale technology and IT infrastructure can age quickly, even before the project capacity is realized.

# Scalable: pros and cons

The pros of scalable facilities have certainly been highlighted by DC providers as they enter new regions and forecasted availability of funding comes under pressure. It is worth noting that such has been the push towards scalable solutions, that traditional hyperscalers, have started delivering scalable solutions in certain markets.

In new regions, it's particularly important to optimize speed to market to obtain a competitive advantage amongst competitors. Having flexible space to meet the demands of any potential clients in a new region can help to meet new demands before competitors enter the market. Also, funding requirements, design timing and schedules can be viewed as more efficient — at least for a portion of the project — when delivering buildings in a phased scalable approach. For example, depending on the size and capacity, the first phase of construction could be on the market anywhere between 6-12 months ahead of the entire building's IT capacity. That allows for a faster timeline to meet client demands.

On the other hand, there are the disadvantages of a scalable approach in terms of overall project delivery. Reduced economies of scale, in conjunction with labor demand shortages, can mean that there are insufficient resources to complete DC projects due to other regional demands. Given the material price inflation (and general inflation) and volatility seen in recent times (as covered in our most recent quarterly update on material pricing) , this approach can lead to higher costs and a lower level of cost predictability over the longer overall duration. Overall soft costs can also be significantly higher in many cases due to longer project schedules for completing the entire DC.

It is particularly important that data center providers clearly align on their delivery strategies up front to help ensure that initial time, quality, and cost expectations match the actual project outcomes.

# Data center - site checklist

When considering and selecting a site for a facility, there are a number of key areas that should be front of mind, in terms of fundamental resources. However, it is worth noting that in particularly hot markets, such as North Virginia, just getting permittable land may constitute enough of a business case for site selection, but in general the below represent some of the key considerations:

## Power

- Availability of existing power infrastructure availability (public or private)
- Consider impact of DC power requirements to local and regional power girds
- Is there sufficient capacity to meet delivery model?
- Connection to alternate or renewable power sources (solar, wind or hydro)
- Ease of access to existing power backup (diesel generators or cut in of new battery technology to support uptime requirements)
- Can local substations support the new build?
  - Will upgrades be required or should a new substation be built to support both the growing market demand and the new data center?
  - How close is the existing substation or power source? Routing of new power lines to the DC can be expensive.
- Are there tax benefits and other state legislation givebacks (or drawbacks) to consider?

## Water

- Since data centers require extensive cooling, is there sufficient access to water (fresh water or sea water)?
- Is the DC designed to utilize the local water quality (including impact of utilizing sea water or freshwater, and high PH levels)?
- Storm water capacity and AHJ wastewater requirements – will the sewer have capacity to take the wastewater, or will an attenuation pond be required?
- Will berms and vegetation need to be implemented to prevent site erosion?
- Impact on site run off needs to be considered, including impact on local environment
- Can the local storm water system manage the new DC conditions?
- Will additional infrastructure be required, such as a new wastewater treatment plant or a pump station?
- Identify what local authorities (state, city, federal) need to be involved. Level of sign off may by AHJ be extensive depending on location and impact on ecologically sensitive areas such as wetlands

# Land and location

- Is there sufficient space to expand the data center campus should demand rise?
- What does local zoning outline?
    - Approval of DC could be limited by energy restrictions
    - There could be a cap on emissions preventing actual growth in capacity
- Do local building regulations allow for new data centers, and if so, how easily are permits obtained?
    - For example, this year, new rules regarding waters of the US (WOUS) have been put in place that affect what is considered a jurisdictional wetland on a potential site.
    - What local critters are in the area that are protected?
    - Soil type will play a significant role as well. For example, Virginia is attractive as it is underlain by soil with little to no clay.
- Has space for ancillary buildings also been considered, e.g., site warehousing, parking, offices for maintenance crew, WWTP, pump house?
- What was the previous land use, i.e., is there soil contamination?
- Is the site accessible easily by dependable travel routes? What are the entrance locations, and what are the local traffic patterns?
- Is there potential for market saturation with other DC providers?
- Noise ordinances need to be reviewed and complied with – this may require sound attenuating stacks on generators, for example.
- Is there existing infrastructure already running above or under the property? Will easements be required?
- Are there any security considerations?
- Is the land subject to natural disasters, such as frequent fires or earthquakes? Is there seismic activity to be considered? This will impact the infrastructure of the data center.
- Is the land subject to seasonal impacts? Needs to be factored into the selection, as can lead to seasonal work and an elongated schedule
- Will local temperatures of the area that impact the proposed cooling system?
- Is the property on a flood plain, near train lines, or on a flight path?

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## Fiber

- Can fiber be easily routed from the location to service areas?
    - What is the delivery method - duct banks, boring, overhead or surface trenched?
- What providers are in the area?
- Is it short haul or long haul, and what is the latency?

## Supply chain

- Local supply chain considerations are important to avoid schedule delays. For example, steel lead times are over ten months in certain regions, and this can change strategy as to whether things are run overhead or underground.

# Key considerations for successful delivery

Efficiency is key in any large-scale construction project, and data center construction is no different. With the many complexities at play in a DC construction project, there is no one-size-fits-all solution for driving efficiency. However, there are common areas where efficiencies can be created in any project or program.

## Availability of skilled trade

A shortage of skilled trade is impacting the construction industry overall, leading to longer project timelines. Statistics show that for every one person that enters the trades, five retire, taking with them years of expertise and insights. Although little can be done to help mitigate this shortage, there are construction approaches that help to relieve the pressure on the industry.

## Supply chain management solutions

Following the disruption to the supply chain caused by the pandemic, the Russia-Ukraine conflict has dealt an additional blow, and the industry is not expecting a return to normal any time soon. This includes disruptions to key equipment used in DCs — the ongoing chip shortage, for example, has caused some suppliers to build 52-week lead times into their project plans. Such ongoing volatility makes it more important than ever to have a reliable - and far-seeing - supply-chain management solution in place for your project.

# Modular delivery

Modular manufacturing and pre-fabrication approaches reduce the amount of skilled labor required on new projects. With substantial portions of the DCs built in factories, expertise is only required on-site for integration. This means that the construction industry can leverage manufacturing experts, along with less skilled labor, to help deliver the projects. These approaches are required to enable projects to actually be delivered at the level required and manage the constraint on labor. Building to order and modular design also help provide stability and longer-term job opportunities within the labor market by moving the site-based work to off-site. Maintaining quality will constitute a key consideration with a modular approach, although often, the savings associated with modular can cover the cost of regular Factory Witness Testing (FWTs) or having someone on-site responsible for validating quality.

# Key takeaways

- Data center spending is on the rise, and is expected to continue at a high level for the foreseeable future.
- Hyperscale data centers are still popular, but a shifting marketplace has many service providers looking for alternatives.
- Scalable data centers are built in a modular fashion that allows them to meet demands without large upfront costs.
- Colocation data centers rent space and equipment to multiple customers, making them popular with start-ups and newer businesses.
- Edge data centers have a smaller physical footprint, making them popular choices for urban areas.
- Both hyperscale and scalable data center construction approaches have pros and cons. It's important to evaluate each project on its individual merits to determine which approach makes the most sense.
- Driving project efficiency means considering supply chain management solutions, finding ways to mitigate the shortage of skilled labor in the data center construction industry and keeping overall spending in check.

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