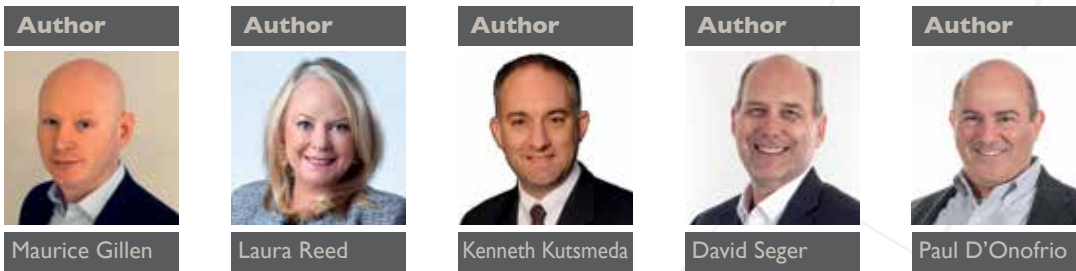


Company Overview | JACOBS | jacobs.com

Jacobs leads the global professional services sector, providing solutions for a more connected, sustainable world. Headquartered in Dallas, Texas, with approximately US\$14 billion in revenue and a talent force of more than 55,000, Jacobs provides a full spectrum of services including scientific, technical, professional, construction, and program management for business, industrial, commercial, government, and infrastructure sectors. Jacobs established its first international office outside the USA in Ireland in 1974. Today, the company employs more than 1,100 people across its Dublin, Cork, and Belfast offices, serving the Life Sciences, Advanced

Manufacturing, Data Centre, infrastructure, utilities, transportation, and environmental sectors, amongst others.

Over the past 30 years, we have developed one of the largest global data centre practices in the world, providing integrated planning, design, and construction services for critical facilities. Ranked #1 in data centres by ENR and Building Design + Construction magazines, we have delivered over 17 million square feet of data centre space and have 15 mission-critical centres of excellence housing our global subject matter experts, including one in Dublin.



Overview & Background to the Lean Initiative

This case study focuses on Lean in Design and the application of Lean thinking and practices to help bring Hyperscale to Colocation, and outlines our journey to “Cloud Condos”. The world’s biggest hyperscalers are also big users of colocation (“colo”) services.

This case study presents how Jacobs incorporated Lean thinking and methodologies to innovate and develop a standardised but nimble design approach – “Cloud Condos” approach – to colocation for hyperscalers, which are plugged together 5MW modules at a time and can provide a better fit for their needs. This helped bridge Hyperscale and Colocation data centre design approaches and provided solutions for both.



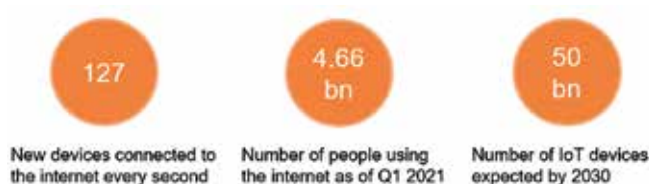
Figure 1. CloudCondos

Lean Initiative Undertaken – Lean Thinking, Tools, Techniques

Colocation & Hyperscale Definitions

In the data centre sector, Colocation (Colo) is the practice of renting space for servers and other computing hardware at a third-party provider’s data centre facility. Typically, colocation services include the

building in which everything is housed, as well as networking, physical security, redundant power, and redundant cooling components, which then support the servers and storage provided by the customer.



Hyperscalers are turning to Colocation to help them meet this growing demand. They are looking for colocation partners that are flexible and can deliver their main goals of **Speed to Market** and **Scaling CapEx** in alignment with deployable MWs

The term “Hyperscalers” refers to large companies like Google, Facebook, and Amazon that design and build large-scale computing facilities which dominate the public cloud and cloud services industries. In computing terminology, hyperscale is the ability of the architecture to scale appropriately as increased demand is added to the system.

The Nimble Initiative

With the rapid growth of the data centre sector over the past decade, accelerated even further by the Covid pandemic, data centre providers are seeking solutions to accelerate their entry into new markets as well as capacity growth in existing ones. To meet demand as quickly as possible, many of the hyperscale data centre providers are turning to colocation developers who have

Figure 2. Colocation

existing sites and the ability to quickly bring new data centres online. Working with both colocation and hyperscale builders, Jacobs could see where gaps and opportunities were in the two design-delivery models, and we understood the drivers behind both.

Hyperscale data centre operators are always building, and when they're not building – or can't due to various constraints – they're also big users of colocation services. Sometimes, that's driven by risk management decisions as a company enters a new market or geography, or to manage the ever-present risk that demand could flatten or fall. Often, it's because permitting, securing permission for, and building new facilities can be challenging.

Working with our clients, we could see that hyperscalers need a more bespoke solution to help give them flexibility to navigate these challenges more nimbly. We could see an opportunity in how the colo business operates that may benefit the larger clients. Using tools such as A3 Thinking, Root Cause Analysis and 5-Whys, Jacobs' solution began to take form and the concept of 'cloud condos' (condominiums) emerged as a strategy to provide fast, efficient options to data centre providers and customers.



Figure 3. Enabling Clients with Bespoke Solutions

The condominium concept brings together the best of both hyperscale and colocation data centre design, refining it into a plug and play approach that provides both flexibility and scalability whilst accelerating speed to market and providing greater alignment with sustainability goals.

This framework offers colocation developers the flexibility to scale-up with minimal investment and faster time to market and revenue generation. For hyperscale customers, it provides greater efficiency with the ability to scale individual costs in alignment with deployable megawatts.

Jacobs cloud condos are designed to provide computing space in discreet 5MW server hall modules as part of a larger data centre building with varying degrees of shared services between different occupants. The intent is to afford companies who require larger computing capacity beyond the traditional colocation caged areas the opportunity to secure separated private server hall spaces in 5MW increments. The Cloud Condo facility masterplan allows up to 30MW per building in an expedited manner and with the

flexibility to allow for a degree of bespoke configuration options to suit each individual user. Unlike standard colocation, clients won't be forced to use only standard offerings with limited opportunities for modification.

In other words, while colo is like renting a room in a shared house, re-thinking the problem using a structured approach enabled Jacobs to think differently – a Cloud Condo is like renting or owning an entire spacious apartment, complete with your own front door. This concept appeals to both providers and hyperscalers.

The Jacobs solution is intended not just for colo users with (much) bigger needs, but to enable data centre operators to build out campuses in 30MW blocks in a form that makes them faster to design and build than conventional data centres. The finished building can come in the form of a self-performed client fit-out or a full-service turnkey deployment for IT, electrical, mechanical, security, network operations, administration, and more.

The modular design approach enables larger colo providers and their customers to cost-effectively consolidate their colocation contracts in a form that better suits their security, management, and sustainability goals, as well as other needs, and helps everyone balance risk better in a rapidly-changing world.

Need for Speed

Like many industries, the Cloud industry is driven by speed to market and the ability to provide capacity. Jacobs estimates that the Cloud Condos will enable design-to-online availability up to 40 percent faster than conventional data centres' project delivery timelines.

Leveraging Adjacent Industries

Many buildings, such as hotels, apartment buildings, and schools are built with pre-fab off-the-shelf designs. These building types have repetitive design elements which helps to cut costs and expedite the design process.

Jacobs modular design is intended to be highly configurable, depending on the geography, market, and particular customer needs. Cloud Condos is designed as a repeating structural grid that allows for flexibility and evolution over time. Depending on the site, the solution can be single-storey or stacked, and it can be concrete or steel. The modular design is future-proofed by enabling future changes to the mechanical-electrical equipment sets without affecting the overall architecture.

Today, we're all dealing with supply chain issues, and the Cloud Condos design enables flexibility in terms of vendors. The equipment that goes into each server hall is determined by the end-user and the model can be adapted to any geography or climate.

As we all strive for a carbon-zero future, the Cloud Condo configuration will enable clients to easily plug-in hydrogen backup generator or hydrogen fuel cells should the technology shift in that direction. The team are continuously looking for continuous improvement opportunities in this space also and are currently evaluating other renewable energy sources like micro-nuclear.

Lean Initiative Improvements & Impact

This innovative development provides significant benefits for stakeholders, including:

- Accelerated design process.
- Improved speed to market.
- Flexible scalability for each client's growth needs.
- Future-proof – ability to incorporate sustainability based on client priorities.
- Standardisation and elimination of waste.
- Modular and scalable building block design and construction.
- Global deployment capabilities.
- Lean, standardised designs with customisable kit of parts.
- Embedded sustainability options.
- Flexible Mechanical and Electrical systems – adaptable to different configurations and climates.

Additional Lean benefits include:

- Greater flexibility compared to pre-fab data centre with the same timeline reduction.
- Vendor agnostic for a truly independent plug-and-play experience.
- Sustainable options are embedded in our pre-designed solution.

- Major changes can be made to the mechanical-electrical equipment sets without affecting the architecture.
- Jacobs de-risks the process with our deep expertise in regulatory and compliance which are frequent causes of delays.
- A global footprint and expertise across multiple industries.



Figure 4. Data Centre Excellence