WHITEPAPER

Data Center Modernization: The Journey to the Edge in Asia Pacific

FLOW2EDGE

Cloud computing has transformed the IT landscape by providing on-demand access to computing resources, offering scalability, speed and agility. However, as the number of connected devices and applications continue to grow, traditional cloud computing faces challenges related to latency, bandwidth limitations and data privacy.

To address these challenges, many organizations are adopting a more diversified digital infrastructure strategy, adopting Edge computing, which builds on cloud computing and moves some computing and data processing closer to its source. A report by IDC predicts that by 2023, nearly 50% of all new enterprise data will be generated and processed at the Edge (IDC, 2020), reflecting the growing importance of Edge computing in today's digital landscape.

The rise of Edge Data Centers

With enterprise infrastructure slowly shifting towards a distributed application delivery, Data Centers are transforming beyond traditional large and centralized Data Centers at the “Core”. To address the needs of the new generation of digital businesses, a more agile, hybrid Data Center architecture is required where certain data workloads are processed in real-time at the “Edge”, working across multiple domains of physical locations, cloud resources, and applications.

Edge Data Centers are characterized by being smaller than traditional Data Centers and being located close to the Edge of a Network. They provide similar services to traditional Data Centers, but are contained in a smaller footprint, closer to end users and devices. These Data Centers at the Edge can be expected to better support new technologies and applications. They are designed to be deployed quickly and cost-effectively, and can be easily scaled up or down based on changing business needs.

There are two main types of Edge Data Centers, namely Brick-and-Mortar Data Centers and Modular Data Centers:

- **Brick-and-Mortar Data Centers** are physical fixed buildings housing IT infrastructure. They are usually designed to support high-density computing and networking equipment. These Data Centers have a fixed capacity which is determined during the initial design phase of the build, according to the user’s needs and are either constructed greenfield or repurposed, commonly known as a brownfield facility.
- **Modular Data Centers** are made up of self-contained units called Modules which are purpose built. They often consist of prefabricated components which are designed, then constructed in an off-site fabrication facility (including slabs, columns, façade, plant, switch rooms, generators, and all internal mechanical and electrical reticulation), before being installed on-site. They are typically built

according to standard-sized shipping containers for ease of transportation due to the broad environments and use cases such Data Centers are deployed for. This includes being built to withstand extreme weather conditions, making them a popular choice for organizations operating in regions with harsh climates.

Edge Data Center Considerations

This journey to distributed Core and Edge deployments has been driven by several factors:

1. Demand for Lower Latency & Improved Network Performance

Sharing large volumes of data from one centralized location is slower than distributed alternatives where real-time data processing can take place. This is because, locating compute and storage functions closer to end users reduces the physical distance that data packets need to traverse, as well as the number of network “hops” involved, which lowers the probability of hitting a transmission path where data flow is impaired. Edge Data Centers process data locally, reducing the volume of traffic flowing to and from central servers.

According to Gartner, 85% of infrastructure strategies will integrate on-premises, colocation, cloud, and Edge delivery options by 2025, compared with 20% in 2020 (Gartner, 2020). The rapid proliferation of services requiring greater compute and lower latency in increasingly denser formats in today's digital landscape is therefore a key qualitative factor driving the adoption of Edge Data Centers to deliver compute and analytics to users more reliably.

2. Diversified Capacity Planning Needs

a. Lead Time

Edge Data Centers, in particular modular Data Centers, are attractive solutions as they offer speed to market with rapid deployment in 3 months or less for smaller standard units and 6 to 9 months for larger custom

applications on average. These modules enable faster deployment compared to 24-36 months for traditional Brick-and-Mortar Data Center projects. This is particularly valuable when capacity is required on a tighter lead time, as it enables businesses to simultaneously deploy and optimize resources in a dynamic fashion.

b. Flexible and expandable design offering

Modular solutions do not need to be oversized in anticipation of future growth — the site can be configured for the addition of future modules on demand, offering flexibility in design as well as cost efficiencies. This offers scalability with ease as and when additional capacity is required, as it can be reproduced on a modular basis.

3. Optimization of Resource Efficiency

a. Power, Cooling, Water (MEP)

Traditional Data Centers are often challenged by inefficiencies in power, cooling and water usage that arise from the concentration of computing resources in one location, coupled with rising energy costs. This concentration can lead to substantial energy usage, and Data Centers often consume enormous amounts of electricity, which leads to higher operating costs and environmental concerns.

Edge Data Centers, especially Modular Data Centers, are designed to be more flexible and efficient with a smaller physical footprint and a distributed architecture that helps to reduce energy consumption.

b. Cost

Edge deployment locations are usually outside of central business districts and metro markets since a more distributed or decentralized model is adopted. This provides some cost benefits especially in terms of land pricing since competition for available land in suitable central locations is extremely high leading to sharp increases on commercial land prices. This

has marked benefits in terms of land acquisition costs that can form a significant portion of capital outlays and define long term return profiles.

Edge Data Centers typically cost 20-30% less to build than traditional Data Centers. According to an article by DatacenterDynamics, the average enterprise Data Center costs between $10m and $12m per megawatt to build, with costs typically front-loaded onto the first few megawatts of deployment. In comparison, the typical Edge Data Center costs between $8m and $9m per megawatt for a similar tier and operational use case (DCD, 2021).

4. ESG Priorities

Large traditional Data Centers are widely perceived to be inefficient and to be putting pressure on power infrastructure. Achieving ESG targets is proving to be increasingly challenging for Data Center firms, in line with customers' ESG mandates.

The extent of power consumption is one of the biggest barriers to going green for Core Data Center deployment. In order to cover 1MW of power, at least 5,000-10,000 solar panels are required on average. By adopting a diverse digital infrastructure strategy, "shifting" or decentralizing workloads to Edge Data Centers, this opens the door for more renewable energy options to be considered due to its smaller capacity.

Use Cases

Numerous use cases for modular, Edge Data Centers have emerged including:

1. **Connectivity Optimization**
    - Mobile carriers are making huge investments in 5G networks, while their existing 4G networks face increased demand for new services and existing applications. Edge Data Centers ensure optimized performance and experience for 5G and 4G

telecommunications services and applications for instance in supporting computing at satellite earth stations.

- An ever-increasing volume of data usage is forcing telecommunication providers to adopt new technologies to optimize their bandwidth usage. With the growing demand for high-speed connectivity, telecommunication providers are increasingly turning to Edge computing to improve their network performance. By deploying Edge computing infrastructure at key locations, such as mobile towers, telecommunication providers can reduce the distance that data needs to travel, which in turn reduces latency and improves network performance. By fully adopting on-the-spot Edge computing, telecommunication providers can enhance their network performance, deliver better customer experiences, and stay ahead of the competition in the rapidly evolving telecommunications landscape.

2. **Industry 4.0 & The Internet of Things (IoT)**
    - Edge Data Centers allow IoT data to be gathered and processed at the Edge, rather than sending the data back to a Core Data Center or cloud. Together, IoT and Edge computing are a powerful way to rapidly analyze data in real-time.
3. **Healthcare and Robotic Surgery**
    - The COVID-19 pandemic led to a huge increase in demand for telemedicine and 'point of care' treatment in remote locations. Increasingly, healthcare requires local data collection and processing at the Edge.
4. **Smart Factories**
    - Edge computing allows manufacturers to implement automation across factories and supply chains through advanced robotics and machine-to-machine communication closer to the source, rather than sending data to and from a centralized server.

5. **Autonomous/Self Driving vehicles**
    - Self-driving cars will require massive compute power at the Edge and can generate up to 5TB of data an hour (Data Center Frontier, 2020). Edge Data Centers are critical for autonomous vehicles to be used more widely as it not only spreads out the data throughput over a wider network of Edge instances but also dramatically reduces latency that is necessary for safety in this scenario.

Enabling Edge Data Centers in Asia Pacific (APAC)

Many businesses are looking to expand into APAC due to its potential for growth and billions of potential customers. However, these markets present unique challenges such as local regulations, geographical barriers, and limited cloud infrastructure that can make it difficult to provide high-quality digital experiences for every end-user. Edge computing allows customers to access the data and services they need without foregoing speed and reliability.

This is particularly important in APAC countries with many remote locations such as Japan, Indonesia, Australia and the Philippines which fall within the top 10 list of countries with the highest number of islands. This warrants a more robust and flexible Edge Data Center solution in such remote locations and conditions.

According to a survey conducted by Schneider Electric, 79% of respondents in Indonesia were already deploying Edge solutions with 38% of these respondents indicating better customer experience as a key driving factor. This number in Thailand was over 48% - indicating the high demand and rapid shift organizations are undertaking to augment their existing Data Center strategies (Schneider Electric, 2021).

In addition, governments in APAC are increasingly enforcing data localization regulations, resulting in organizations deploying Edge Data Center solutions in order to meet this requirement. For instance, in

countries like Indonesia and Vietnam, the government is offering subsidies to organizations that store their data locally, which means that they must use cloud providers that have Data Centers within the country. This move is aimed at promoting local businesses, creating jobs, and supporting the local economy. Furthermore, data localization regulations can help governments in the region exercise greater control over data security, privacy and sovereignty. By keeping data within their borders, governments can ensure that they have access to critical information and that it is protected from foreign threats.

Conclusion

As organizations increasingly rely on digital technology to engage with customers, optimize their operations, and drive growth, the need to improve the quality of user experiences while optimizing for efficiency and cost has become a critical priority.

Edge computing is a key pillar in an organization’s digital infrastructure strategy for business growth. When applied as part of a wider, holistic digital infrastructure strategy, encompassing both Core and Edge Data Centers, this allows for organizations to stay competitive in today's fast-paced digital economy.

FLOW2EDGE – Infrastructure Solutions Enabling a Distributed Digital Economy

FLOW2EDGE is an Edge-as-a-Service (EaaS) offering, part of FLOW's multi-solution digital infrastructure platform. FLOW offers prefabricated solutions from design to implementation on a turn-key basis to meet customers' low latency needs for smaller, faster and scalable modular Edge Data Center deployment.

FLOW's EaaS solution is capable of scaling from 5kW up to more than 10MW, accommodating anywhere up to 2,000 racks. This deployment profile is both time and cost efficient while offering ease of scale.

Email us at **hello@flowdigital.com** to find out how FLOW can help your business grow.

FLOW ENABLING DIGITAL ECONOMIES

FLOW Digital Infrastructure
8 Marina View #34-05,
Asia Square Tower 1, Singapore 018960