



Assignment-3 Submission

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Answer

Data centre is a group of networked computer servers used by organizations for the storage, management, or distribution of large amount of data – a necessity in the digital age. A forecast shows that the data centre services industry in Australia alone will grow by 12.4% a year to 2022, with the total market reaching to top \$2 billion by 2021 (Anatas, 2018). However, data centres are having an adverse effect on our environment due to its huge energy consumption.

A green data centre is designed specifically to achieve better energy-efficiency with minimal environmental impact. Its focus is to reduce carbon emissions produced normally by power generators, HVAC (heating, ventilation, and air-conditioning) plus the heat generated by individual servers and network appliances. In addition, green data centres minimize costly infrastructure upgrades that deal with ever increasing demand for cooling and power. These in turn translate into cost savings to companies in terms of data centre operating expenditures.

With concerns around the conservation of energy consumption, global warming and increased carbon emissions, the practice of incorporating green technologies in data centres has tremendously grown. Being green is especially applicable to data centres given that they consume copious amounts of power and increases heat emissions in the surrounding area. According to Global e-Sustainability Initiative's *Smarter 2020* report, data centres will be the fastest-growing part of the global IT sector energy footprint, with demands increasing 81% by 2020 (Gardiner, 2015).

So, what are the major advancements in the development of green data centres?

Virtualization software is a technology for installing cloud-based infrastructure that allows a single physical server to host multiple operating systems. Through consolidation, server virtualization lessens the total physical server and data centres enabling companies to share resources to a central data centre facility – which translates into cost savings, energy efficiency and reduced carbon footprints.

From a resource-efficient viewpoint, less equipment and manpower are needed to run jobs, which in turn reduces data centre space and thus e-waste footprint. From an energy-efficient perspective, with fewer equipment plugged, data centres will consume less electricity. Examples include Microsoft's Hyper-V and Oracle's VirtualBox technologies, which aid in streamlining IT resources and utilising untapped processing power of servers and storage devices.

The presence of virtualization alone does not maximize efficiencies. To quickly provide and scale workloads, cloud computing is a crucial aspect towards a greener data centre. With the rise in mobility and the Internet of Things (IoT), the amount of data created is rising exponentially. Clouds, such as multi-cloud (multiple cloud providers) and hybrid cloud (a mix of public and private cloud solutions), are key as they allow businesses to easily scale up their storage and processing requirement based on current and future demand. According to Gartner, "2016 was a milestone year for adoption, with the bulk of IT spend going on cloud resources for the first time" (Deutekom, 2016).

Despite the popularity of cloud services, addressing the security aspect of such an arrangement remains a challenge for many companies. Thus, they are reluctant to subscribe to such an arrangement.

A significant innovation that Microsoft invested a lot pertains to improving the cooling system of data centres. It came up with the concept of an underwater data centre and launched Project Natick in 2014 as a new way to cool these centres naturally. This could also mean that energy and cooling is transitioned to renewable sources which in turn helps our environment (Donaldson, 2017).

Another advancement that has enormous green benefits is the modular data centre which is portable and designed primarily for energy-efficiency and rapid deployment. This 'data-centre-in-a-box' design type can be transported wherever there is a need for one, which can help companies avoid building and maintaining extremely large data centre facilities. Large companies like Deutsche Bank, Morgan Stanley and Goldman Sachs have implemented these to boost their green IT efforts and at the same time, it is an effective business continuity strategy. HP's EcoPod is an example of a modular datacentre that supports more than 4,000

servers with a power usage effectiveness (PUE) rating of 1.05 when using fresh air cooling (Venkatraman, 2013). However, the main forefront of data centre container development was Google, having come up with the concept in 2003. Furthermore, Google's shipping container-based data centres could be powered with waterpower.

Society uses an incredible amount of data, which means data centres will continue to grow in demand as technology advances. While it has a negative impact to the environment, the most promising advancements currently made in transforming the way data centres operate come from tech giants like Google and Microsoft. Additionally, Facebook uses wind energy to empower data centres and leverages on solar arrays for electricity generation while Apple has developed emerging technologies such as the biogas fuel cells, energy storage technologies and micro-hydro generation systems (Waldron, 2018).

In summary, as the world continues to face turmoil in global warming and businesses try to satisfy the ever-increasing demand for computing resources, it is important to commit to green practices in the evolution of the digital world.

Word Count: **837 words**

References

- Anatas. (2018). Cloud computing driving growth in Australia's data centre industry. *Resource Centre*. Retrieved from <http://anatas.com.au/blog/news/cloud-computing-driving-growth-in-australias-data-centre-industry/>
- Gardiner, B. (2015). CIO: Working towards the green data centre. Retrieved from <https://www.cio.com.au/article/574108/working-towards-green-data-centre/>
- Deutekom, S. (2016). Key factors likely to influence data centre choice and function 2016-2020. *Clouds on the Horizon*. Retrieved from https://evoswitch.com/wp-content/uploads/2016/09/160103_Evoswitch_Whitepaper_digitaal.pdf
- Waldron, A. (2018). Apple now globally powered by 100 percent renewable energy. *Newsroom*. Retrieved from <https://www.apple.com/au/newsroom/2018/04/apple-now-globally-powered-by-100-percent-renewable-energy/>
- Donaldson, S. (2017). Top Three Ways Data Centres are Going Green. *Underwater Data Centres*. Retrieved from <https://fossbytes.com/top-three-ways-data-centers-going-green/>
- Venkatraman, A. (2013). Top technologies that can make your datacentre green. Retrieved from <https://www.computerweekly.com/feature/Top-technologies-that-can-make-your-datacentre-green>
- Royal Wolf. (2014). The story of Google's shipping container servers. Retrieved from <http://www.royalwolf.com.au/blog/the-story-of-googles-shipping-container-servers/>