Cost Estimation of Traditional Infrastructure vs. Cloud Services
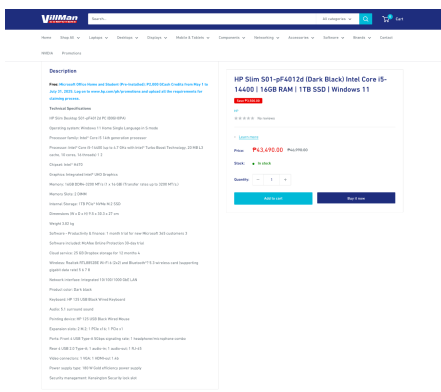College of Computer Studies – De La Salle University

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This document compares the cost of purchasing and maintaining a physical desktop with using equivalent cloud services (AWS, Azure, and Google Cloud). It aims to support the College of Computer Studies' plan to provide computational and storage resources by outlining specifications, cost scenarios, and recommendations to find the most cost-effective option.

1. Machine Specifications
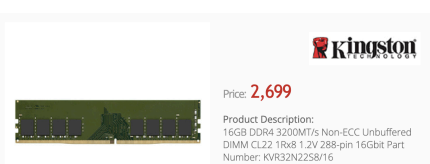
1.1 Desktop Computer Specifications

Model	HP Slim Desktop S01-pF4012d PC (B0GH0PA)	
CPU	Intel® Core i5-14400 (up to 4.7 GHz with Intel® Turbo Boost Technology, 20 MB L3 cache, 10 cores, 16 threads)	
Memory	16GB DDR4-3200 MT/s (1 x 16 GB) (Transfer rates up to 3200 MT/s.)	
Storage	1TB PCIe® NVMe M.2 SSD	
Price	₱43,490.00	
Link	http://bit.ly/44iy6qo (Links to Villman page)	

Remarks:
- This unit comes with I/O devices (HP 125 USB Black Wired Keyboard and HP 125 USB Black Wired Mouse) which would contribute to the cost. Unfortunately, we were unable to find a relevant unit that does not come with peripherals and/or a monitor.
- Also due to the limited selection, this unit also comes with 1TB SSD, more than the storage considerations outlined by the College. However, we believe that it is acceptable—and actually beneficial—to suggest a PC with a 1TB SSD because:
    - SSDs offer significantly faster read/write speeds and lower failure rates compared to HDDs
    - A larger SSD may prevent the need for costly upgrades down the line.

For the purposes of this case study, the RAM will be upgraded to **32GB** with an additional **Kingston 16GB DDR4 3200 DIMM KVR32N22S8 Memory** for ₱2,699 to better match the available cloud machine options. Link:https://villman.com/Product-Detail/kingston_16gb-ddr4-3200-dimm-kvr32n22s8-memory-	 Price: 2,699 Product Description: 16GB DDR4 3200MT/s Non-ECC Unbuffered DIMM CL22 1Rx8 1.2V 288-pin 16Gbit Part Number: KVR32N22S8/16

TOTAL COST: ₱46,189.00

1.2 Cloud Machine Specifications

Provider	Instance	vCPUs	Memory	Storage	Region	Category
AWS	m6a.2xlarge	8	32 GiB	1TB General Purpose SSD	Asia Pacific (Singapore)	General Purpose
Azure	D8a V4	8	32 GB	1024 GiB Standard SSD	Southeast Asia	General Purpose
Google Cloud	n4-standard-8	8	32 GiB	1024 GiB Hyperdisk Balanced	Singapore (asia-southeast1)	General Purpose

1.3 Discussion and Comparison

The final physical machine and cloud machines have similar compute capacity (10 cores on the physical machine vs. 8 vCPUs) and 32 GB RAM. The main differences are that storage is billed separately in cloud and cloud instances offer scalability and regional hosting for better availability.. Cost-wise, the desktop is a bigger CapEx, while cloud services are ongoing OpExs.

2. Cost Estimation and Calculations

2.1 Cost Estimates for Physical Machine

| Physical Machine (HP Slim Desktop S01-pF4012d with RAM upgrade)					
Year	CapEx	OpEx (electricity) running 24/7	OpEx (electricity) 8AM to 5PM (9 hrs)	Cumulative Cost running 24/7	Cumulative Cost 8AM to 5PM (9 hrs)
1	₱46,189.00	₱18,934.56	₱7100.46	₱65,123.56	₱53,289.46
2	₱0	₱18,934.56	₱7100.46	₱84,058.12	₱60,389.92
3	₱0	₱18,934.56	₱7100.46	₱102,992.68	₱67,490.38

2.2 Cost Estimates for Cloud Machine
2.2.1 Per-Year Cost Estimates for Cloud Machine **Running 24/7**

		Reservation term of 1 Year			Reservation term of 3 Years		
Provider	On-Demand	No Upfront (NURI)	Partial Upfront (PURI)	All Upfront (AURI)	No Upfront (NURI)	Partial Upfront (PURI)	All Upfront (AURI)
AWS	₱280,548.67	₱168,730.68	₱134,035.10	₱66,664.90	₱163,678.26	₱66,664.90	₱447,597.47
Azure	₱349,668.57	₱209,963.90	N/A	209,963.90	₱299,313.85	N/A	₱209,963.90
	On-Demand	Committed Use Discount (CUD) 1 Year			Committed Use Discount (CUD) 3 Years		
Google Cloud	₱299,591.91	₱213,924.46			₱172,250.43		

2.2.2 Cost Estimates for Cloud Machine **Running from 8AM to 5PM**

|		Reservation term of 1 Year			Reservation term of 3 Years		
Provider	On-Demand	No Upfront (NURI)	Partial Upfront (PURI)	All Upfront (AURI)	No Upfront (NURI)	Partial Upfront (PURI)	All Upfront (AURI)
AWS	₱103,768.01	₱168,730.68	₱134,035.10	₱66,664.90	₱163,678.26	₱111,580.62	₱66,664.90
Azure	₱183,053.80	₱349,668.57	N/A	₱209,963.90	₱299,313.85	N/A	₱209,963.90
	On-Demand	Committed Use Discount (CUD) 1 Year			Committed Use Discount (CUD) 3 Years		
Google Cloud	₱153,695.48	₱122,004.22			₱106,596.02		

2.3 Sample Cost Visualizations
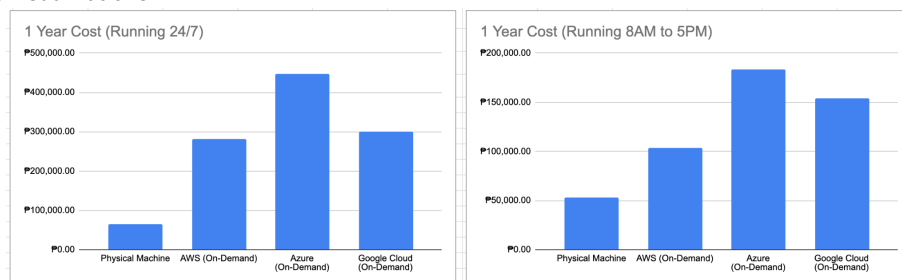
Link to Spreadsheet: 📗 Spreadsheet for STCLOUD MP2

3. Discussion

3.1 Findings

The cost estimation shows that the physical desktop has a much lower total cost across the board compared to the cloud options, whether running 24/7 or only from 8AM to 5PM (9 hours). Even with discounts and longer reservation terms, cloud services remain significantly more expensive due to their recurring charges and added premium for scalability and flexibility.
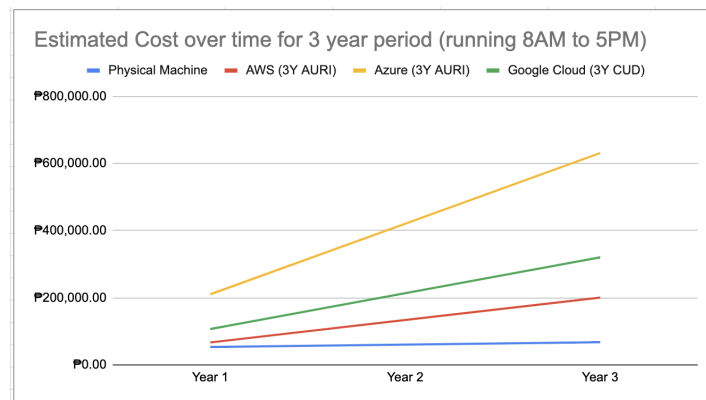
Sample Computation of estimated costs over time when left running from 8AM to 5PM.

3.2 Analysis

While cloud services offer advantages like on-demand scalability and built-in redundancy, these features add substantial operational expenses. In contrast, the physical machine only requires a one-time capital expense plus relatively low electricity costs. This makes the physical machine more cost-effective for a predictable, fixed workload as described in the College's scenario.

3.3 Recommendation

Given the College's goal of providing stable computational and storage resources given their considered specifications, it is recommended to invest in a physical machine instead of cloud instances. This approach minimizes long-term costs, avoids recurring fees, and still meets the required performance and storage needs. Cloud should only be considered if future workloads become highly variable or need quick scaling.

3.4 Assumptions and Limitations

The estimates in this document excludes costs like manpower, cooling, software licenses, and internet since it is assumed that the College's datacenter already covers them. It also assumes stable electricity rates, consistent machine usage patterns, and ignores possible hardware failure or future upgrades. Cloud costs were based on current published rates and may change in the future.

3.5 Conclusion

Overall, owning a physical machine is far more cost-effective over several years for the College's scenario. While cloud services bring flexibility, the high costs outweigh their benefits given the intended use of the machine. The physical machine strikes the best balance between performance and affordability, offering the best value proposition for this case study.