**NSSA-220 Project 1: Application Performance Monitoring**

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**Introduction**

Write a 3-4 sentence introduction that describes what this project was about. Use the project slides as your guide. I want to see you describe the project in your own words.

Application Performance monitoring is an important part of a system administrator's job. It allows administrators to determine what applications are causing issues or using too many resources on a user's computer. APM tools can also be extremely useful in cyber security with the ability to help find malicious software on user computers. Because of this, it’s important to know how to make your own APM tools as well as how to read them. The project included monitoring of performance metrics of a few programs. These metrics help detect system issues and inform the system administrator if they should be fixed.

**Process Level Metrics**

A graph of a graph showing different colored lines

Description automatically generated

Describe what the CPU utilization plot shows in 2-3 sentences.

This plot shows that applications 3 and 5 utilized the CPU the most in the 15 minutes given. Application 4 barely used it, and applications 1, 2, and 6 didn't use the CPU at all. Application 1 utilized the CPU the most with a high of 69% utilization and then dropped down to mid-40s to 50s for the remainder of the test. Application 5 utilized the CPU the 2nd most peaking at 47% but then quickly dropped after 34 seconds and stayed around the mid-10s to 20s.

A graph with a number of objects

Description automatically generated

Describe what the memory utilization plot shows in 2-3 sentences.

This plot shows that Application 5 utilizes the highest amount of memory with 9%, and Applications 1,2,3, and 4 do not utilize any memory. Application 6 comes close to using the most memory but stops at 7% after 15 minutes. Had this experiment gone on longer Application 6 would have most likely beaten out Application 5 as it demonstrates a memory leak, with it continually using more and more memory over time.

**System Level Metrics**

A graph with blue and orange lines

Description automatically generated

Describe what the network bandwidth utilization plot shows in 2-3 sentences.

This plot shows that the TX data rates appear to be consistently lower than the RX data rates, suggesting that data is predominantly received rather than transmitted. Over time, both data rates show an increasing trend, indicating a rise in network activity. Additionally, there is a notable pattern in hard disk access rates and hard disk utilization; both appear to increase gradually, with occasional spikes, suggesting a correlation between network data rates and disk access, possibly due to data storage or caching operations.

A graph with blue line

Description automatically generated

Describe what the hard disk access rates plot shows in 1-2 sentences.

The hard disk access rates plot likely displays how the rates of accessing the hard disk change over time. It appears that there is a consistent upward trend in hard disk access rates, indicating a growing demand for data storage or retrieval operations over the observed time period.

A graph with a line going up

Description automatically generated

Describe what the hard disk utilization plot shows in 1-2 sentences.

The hard disk utilization plot illustrates a declining trend in hard disk capacity over time. This suggests that the hard disk is progressively filling up or experiencing reduced available capacity as the "Disk Capacity" value decreases. Near the end it spikes up due to the program ending freeing up Disk Capacity space.

**Summary and Lessons Learned**

Write 3-4 sentences that describes whether or not the VM you used had enough computing resources (CPU, memory, network capacity, and disk) to handle the mix of application processes that were running and what lessons you learned while working as a team on this project.

The VM we used to be suitable for basic monitoring tasks, and it did show how it is sufficient for handling a mix of application processes with higher resource demands. The APM metrics help to monitor the performance metrics and the network bandwidth. Utilizing these resources, a system administrator can decide if there is need for more resources for the programs to run on. Based on the data and the graph , we can see that we have enough resources in the VM to run the programs successfully. While working as a team on this project we learned and understood the difficulty and the importance of matching VM resources to the specific requirements of the application mix and understanding how resource limitations can impact the accuracy of performance monitoring. It also highlights the need for scalability and resource allocation planning when dealing with diverse workloads.