Rashtreeya Sikshana Samithi Trust

RV COLLEGE OF ENGINEERING

(DEPT. OF COMPUTER SCIENCE AND ENGINEERING)

OPERATING SYSTEMS

TOPIC:- Virtual Memory Profiler

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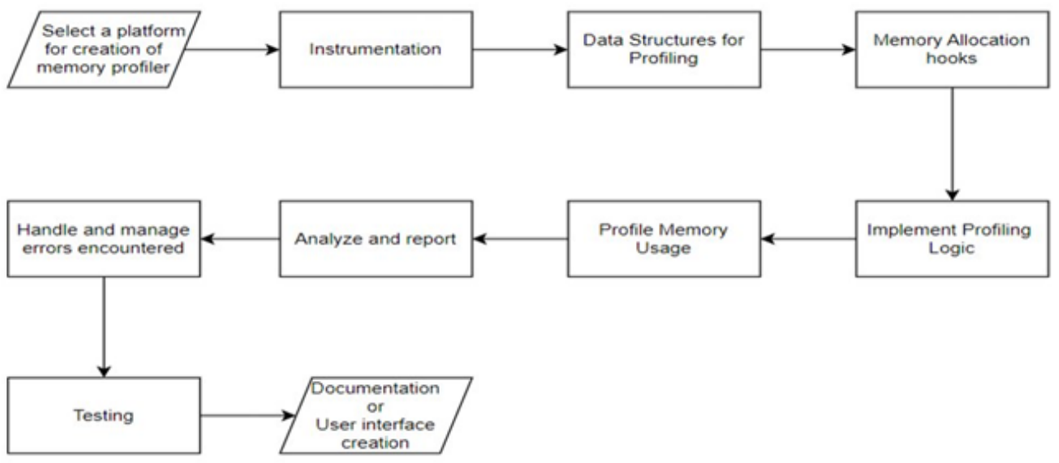
INTRODUCTION:

Virtual Memory Profiler(VMP) is a software tool designed to analyze and optimize memory usage in virtualized environments. Key features of VMP include real-time monitoring, historical data analysis, and customizable alerting machines. Creating a memory profiler in C holds significant relevance for software development, offering essential benefits in debugging, optimization, and resource efficiency. Such a tool aids in identifying and rectifying memory-related issues. The profiler should be capable of identifying memory leaks, inefficient memory allocation, and excessive page swapping, providing valuable insights for developers and system administrators to enhance performance of their applications.

METHODOLOGY:



TOOLS/API's used:

System calls:

- fopen: opens a file descriptor for the proc/{pid}/status file.
- fclose: closes the file descriptor.
- getrusage: retrieves resource usage information for the current process.
- getrlimit: gets the current or maximum value for a specific resource limit.

Functions:

- sscanf function scans specific lines for desired information
- Vmsize: %ld kB: Extracts the virtual memory size of the process.
- VmRSS: %ld kB: Extracts the resident set size(physical memory usage) of the process.
- majflt: %ld kB: Extracts the number of major page faults incurred by the process.
- minflt: %ld kB: Extracts the number of minor page faults incurred by the process.
- Struct rusage is a structure used to represent resource usage statistics.
- sprintf: This function formats and stores a series of characters and values in the command array, constructing the command to read the process's memory maps.
- popen: This function opens a pipe to execute a shell command (cat /proc/{pid}/maps) and returns a stream that can be used to read the output of the command.
- fgets: This function reads a line from the stream (fp) and stores it into the line buffer. It's used to read the output of the command line by line, representing memory mapping information.
- pclose: This function closes the pipe (fp) associated with the command, ensuring that the command execution is complete and releasing any resources associated with it.
- atoi: This function converts a string argument (argv[1]) to an integer (pid_t pid). It's used to extract the process ID from the command-line argument

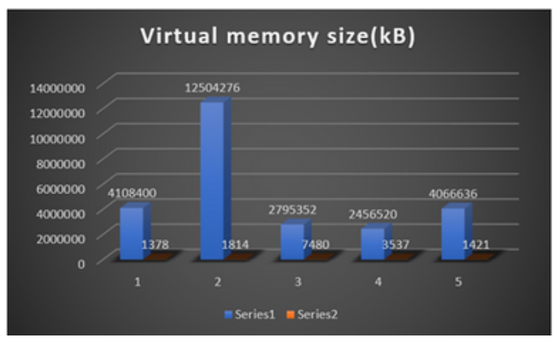
ADVANTAGES OF VIRTUAL MEMORY PROFILER:

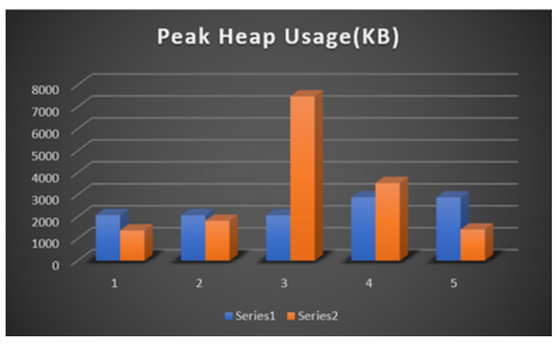
- Identification of Memory Leaks
- Optimization of memory usage
- Detection of resource contention
- Real-time Monitoring and alerting
- Historical Analysis and trend identification

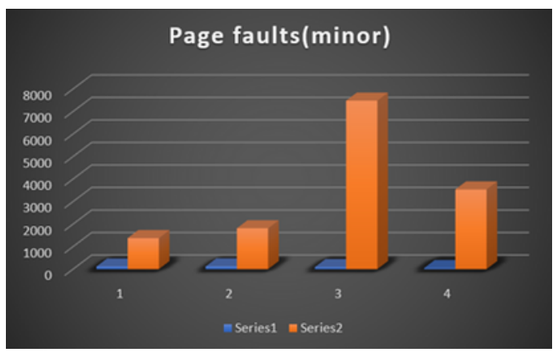
SYSTEM ARCHITECTURE:

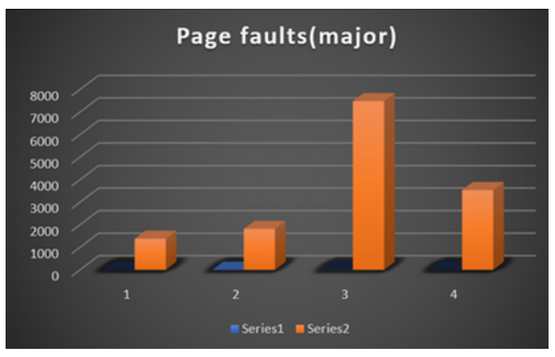
- Profiler Interface
- Profiler Engine
- Virtual Machine Monitor(VMM)
- Profiling Agent
- Data Storage
- Analysis and Visualization Module
- Reporting and Alerting
- Configuration and management

USER INTERFACE DASHBOARDS:









CONCLUSION:

In conclusion, a Virtual Memory Profiler (VMP) is a valuable tool for analyzing and optimizing memory usage within virtualized environments. By providing insights into memory allocation, page swapping, resource contention, and memory access patterns, VMP empowers users to identify inefficiencies, detect memory-related issues such as leaks or contention, and improve overall system performance. Through real-time monitoring, historical analysis, and customizable alerting mechanisms, VMP enables proactive management of memory resources, helping to prevent downtime, enhance application responsiveness, and optimize resource utilization. With its ability to integrate with virtualization platforms and provide customizable reporting and visualization features, VMP offers a comprehensive solution for effectively managing memory in virtualized environments, ultimately contributing to the stability, scalability, and efficiency of modern computing infrastructures.

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