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Development of Ubuntu Performance Monitoring Tool

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ABSTRACT

The paper is about the development of the performance monitoring tool for ubuntu operating system. Monitoring the performance of operating systems and processes is very much essential to debug processes and systems, constructively manage system resources, making system decisions, and evaluating and examining systems. In a system, processes are the main resource holder, and most monitoring is done at the process level. This information is used by Linux operating systems while they are running to perform effective memory management, scheduling, multitasking, and many other important decisions. In addition to that, performance monitoring is useful while developing and redefining the systems, and it provides support to user during everyday operation. Recordings of operating system and process performance can be used to evaluate changes to the system and allow meticulous comparisons to other systems. The performance tool can also be used to predict the performance of similar systems and what type of performance gains may be expected in the future.

Keywords: Ubuntu, Operating system, performance, monitoring, REST

I. INTRODUCTION

As the technology is enlarging, the demand for reliable and quality software also increasing. In recent market trends developing reliable software is also important for many other requirements such as future growth, robustness, and standardization and user adoption. Information technology industry has become very competitive due to growing demands and transformation in every field. As time passes, user expectations are rising, and leading towards integration and synchronization of applications and services. Software companies are trying increasingly harder to satisfy user expectation by offering maximum new features and functionalities in their products [13].

As Ubuntu is a wholly Linux operating system, freely available with both community and professional support. The Ubuntu community is built on the ideas preserved in the Ubuntu platform: that is software should be available freely without any charges, that software tools should be usable by users in their local language and without any disabilities, and that people should have the freedom to customize and change their software in whatever way they want. Ubuntu is suitable for both desktop and server use and Ubuntu includes thousands of pieces of software. By understanding the infrastructure and features of Ubuntu operating system we have performed a quantitative analysis on various distributions of Ubuntu to analyse its complexity and growth throughout the time [13].

A monitoring solution for operating systems is composed from various elements. Once the data are stored in monitoring system as an event, depending on threshold the system configuration can trigger an alert notification to the relevant support team. Also monitoring system requires a stratagem, which defines how often the data need to be collected by running the tool [7].

A reliable and efficient Ubuntu performance monitoring tool is developed which will collect different system performance data and logs and that data is sent to the server to populate as a graph. That will help in creation of interactive user interface to initiate performance measurement task on devices, return performance data period and performs Analysis.

II. METHODS AND MATERIAL

A. FEATURES OF THE TOOL

An Efficient Linux or Ubuntu performance monitoring tool is developed with the features: Create interactive UI to initiate performance measurement task on devices. Device APIs to return performance data period. Server -Collection of different performance data and logs. Server -Serialize the data for representation. Data are populated in graph. Perform Analysis.

B. TOOLS AND TECHNOLOGIES

1) Linux commands and performance tools: There are different Linux commands and performance tools are available for monitoring the system performance like Top, Htop. VmStat commands for process and memory monitoring. Nmon, Collectl, Glances, Sysstat tools for monitoring the system performance. These are used to gather different performance metrices required for our tool.
2) Python programming language: Python Programming Language is an elucidated and high-level programming language. Python is quite easy to learn and provides stronger typing. Python code has a very natural and own style to it, by that it is easy to read and understand. Python programming language supports multiple platforms that is ranging from Windows to Linux to Macintosh, Solaris etc. Therefore, we had used python language for full stack development. For the creation for client-side and server-side APIs at the backend.
3) Django: Django is a Python Web framework that stimulates rapid development and clean usage, realistic design. It's free and open source. It is used for frontend and backend development process. With Django, we can take web applications from concept to launch in a matter of hours. Django takes care of much of the annoyance of Web development and makes development easy.
4) Machine learning: Machine learning is a kind of AI that provides computers with the ability to learn without being explicitly programmed. It helps in the development of Computer Programs that can change when exposed to new data. Machine learning is used for collection and storage of large amount of data.
5) REST API: REST is an architectural style which defines set web service APIs stands for Representational State Transfer. It means when a RESTful API is called, the server will transfer to the client a representation of the state of the requested resource. It was used to build client-side and server-side APIs.

Using these technologies and other useful methods and techniques built a performance tool for ubuntu for Monitoring the performance of operating system and processes which is required to debug processes and systems, and to manage system resources and for system evaluation.

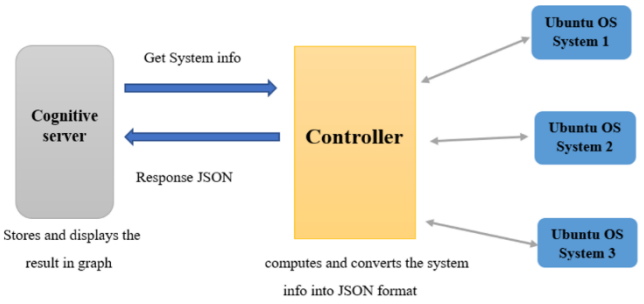

Figure1: System Model

- Server: In server system all the required processes for the performance monitoring will be carried out. The cognitive server contains the system details of the all the ubuntu client's which performance units needs to be monitored. Server will store each units of data fetched from the ubuntu clients or systems and that data will be modified according to measuring parameters and the result will be displayed on the graph.

- Controller: The controller in our tool act as a main controlling point, which will collect the system information from the cognitive server and connects to the specific ubuntu system which process and collects the performance data by executing client-side APIs as Agents in the Ubuntu clients. The data gathered will be converted into JSON format, that data will be sent to the cognitive server as a response.

- Ubuntu OS: Ubuntu operating system is fully and called as Linux operating system. There are different versions available in the market, but our focus is on ubuntu version 18.04 and the performance will be measured in that versions of the system.

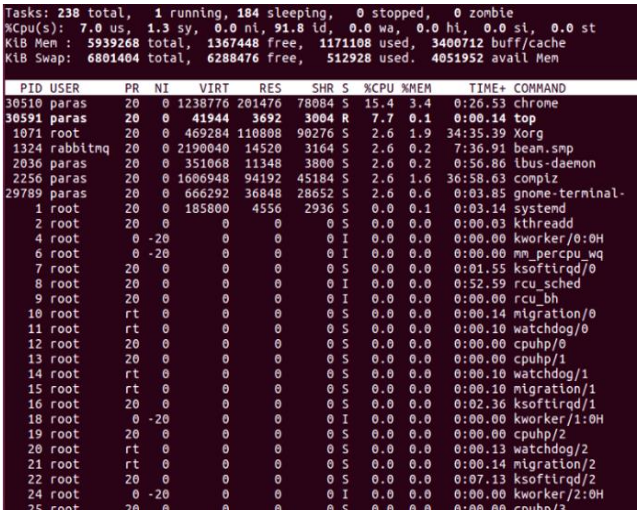

Figure2: Example of Ubuntu OS performance metrices

Key metrics used for monitoring system performance:

- CPU – It is very critical to monitor CPU, as it can reach a high utilization rate and temperature. It can have multiple cores for different versions and systems, in that an application can be directed to only one of these cores, targeting to a dangerous hardware behavior. The formula to calculate CPU utilization is $(1–p^n)$, n is number of process running in memory and p is the average percentage of time processes are waiting for I/O.
- Memory – Memory monitoring is also important unit to be measured the memory overflow will stop the application or misdirects application. The formula to calculate memory usage: Total Memory - (Free + Buffer + Cache) = current total memory usage.
- Disk Capacity and IO – Disk capacity metrics is especially important when it comes to image servers, files, and VMs, as it can directly affect system shutdown, corrupt the operating system, or cause extreme IO slowness. Along with disk monitoring, it can plan for a change or addition of a disk, and to verify the behavior hardware failure. Formula is S= P/(1-U), S is service time, P is Process time, U-resource utilization.

- Load – load provides the information whether the CPU is being used, how much is being executed, also how long it has been running.
- Network- it is extremely important to monitor network performance as input and output of data packet When it comes to DNS, DHCP, firewall, file server, and proxy. With its performance logs, can create a plan to suit the application according to the use of the network.
- Swap – it is virtual memory created by the system and allocated to the disk it is used when *necessary*. Its high utilization will indicate that the amount of memory for the server is not enough.

III.RESULTS AND DISCUSSION

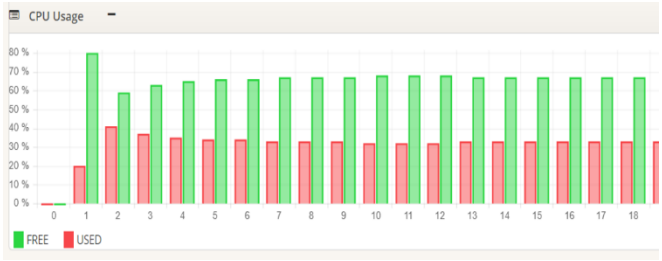

Figure 3: graphical representation of CPU Usage.

Figure 4: Graphical representation of Memory Usage.

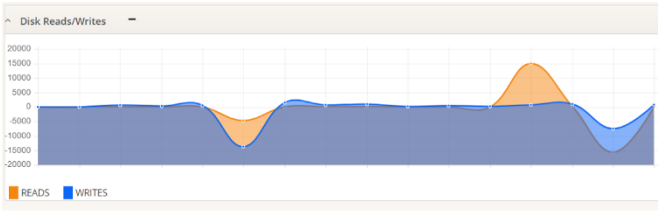

Figure 5: Graphical representation of Disk Usage

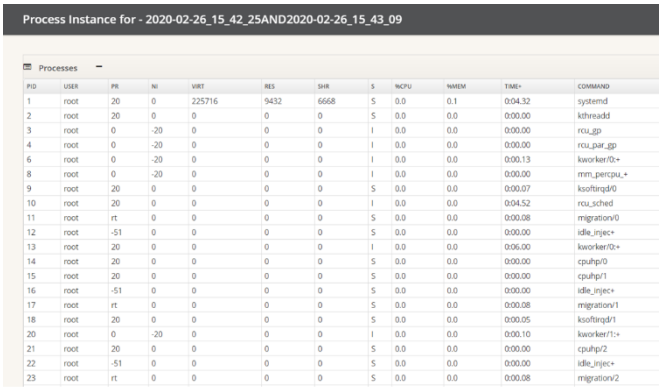

Figure 6: Process instance of Ubuntu system on performance test execution.

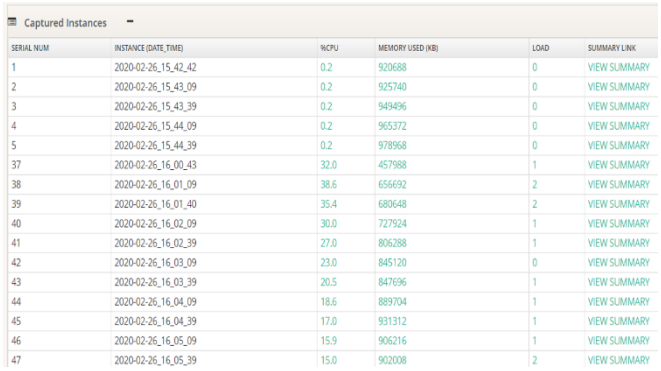

Figure 7: Summary page of tested systems.

IV.CONCLUSION

In this paper, a reliable and efficient Ubuntu Performance monitoring tool is proposed and implemented. The proposed architecture uses the client-side APIs to gather the performance data from the Ubuntu OS and the formatted data will be stored in the server and the results are populated on the graph. The information is used by Ubuntu operating

systems when they are running to perform efficient memory management, multiprogramming, scheduling, and other decisions can be taken, also helps in comparison of historic data for the data analysis. In future this tool can be enhanced with more features as and when the new versions are released.

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