Accessing and Enhancing UPS Efficiency using SNMP

[1]Chirag Arora, [2]Akash Rawat, [3]Anjali Kumari Soni, [4]Harleen Kour

[1]Assistnat Professor, Department of EE, Arya College of Engineering, Jaipur, Rajasthan, India

[2]Assistnat Professor, Department of ECE, Arya College of Engineering, Jaipur, Rajasthan, India

[3,4]Student, Department of CSE, Arya College of Engineering, Jaipur, Rajasthan, India

chi.arora1991@gmail.com, erajaysaini@gmail.com, anjali.soni2001xyz@gmail.com, harleenkour1901@gmail.com

Abstract: In today's world, it's very important for businesses to save energy and run things efficiently. Major part of it is making sure that systems like Uninterruptible Power Supplies (UPS) work well. UPS devices are like backup batteries that is used to keep devices running when the power goes out. Basically, SNMP is used to keeping eye on devices connected to a network, like UPS devices, so we can control and monitor them from one place.As before, if there was any defect or problem occurring in the UPS devices, we needed to tackle the problem by physically visiting the location where the UPS is deployed. But this project replaced the need of physically visiting the location of devices by making it possible to do the same virtually.

Keywords: Simple Network Management Protocol, Wireless Sensor Network, Network Management Systems, SNMPImplementation, Network Monitoring.

1. Introduction

SNMP based monitoring of UPS is a method of monitoring the status and performance of UPS devices. It's a protocol used to monitor the devices on the network. For devices to be monitored by SNMP the devices should be SNMP enabled. This allows organizations to remotely monitor the status of UPS devices, including their Battery life, Load levels or Temperature and other various parameters. The devices need configuration to communicate with SNMP management system such as Nagios, Zabbix or Solar Winds. Once configured, SNMP management system can monitor the UPS and generate alerts so that the organization can make quick decisions before the failure of devices.

Figure 1: SNMP Overview

SNMP based monitoring is particularly useful in Data Centres and other environments where up time is critical. By monitoring the UPS system organisations can ensure that system remain online when there is power shortage or other issue. It can also identify potential issue with the system before they become vulnerable which allows pro-active maintenance and repair.

In conclusion, SNMP based monitoring of UPS systems is a powerful tool for monitoring the performance of UPS by which the organisation can enhance the efficiency of UPS devices used. And by this they can increase the up time and minimize the down time in critical systems.

2. Related Work

In other research, people have looked at ways to make UPS devices work better. Some have focused on things like managing the batteries inside the UPS or deciding when to cut off power to certain devices to save energy and make the battery last longer. These methods don't involve using SNMP like we're proposing.

Others have looked at using SNMP for different things, not just UPS devices. Some use it to watch over networks and make sure everything is running smoothly, while others use it to control devices remotely, like turning on and off smart home gadgets. Even though these studies aren't directly about making UPS devices more efficient, they show that SNMP can be useful in different situations.

In the bigger picture, there are other issues related to managing power that tie into making UPS devices better. These include things like figuring out how much energy we use, finding ways to use more renewable energy sources like solar or wind power, and making sure the power grid stays stable.

All these topics are connected because they're all about using energy smarter and making sure we have reliable power. Seeing how our research fits into these bigger topics helps us understand the challenges and opportunities ahead in making UPS devices and SNMP work better together.

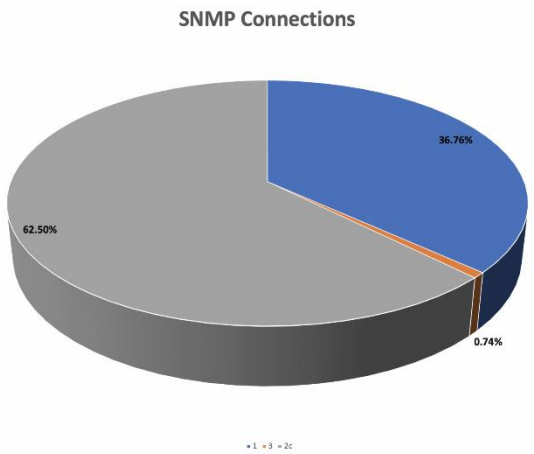


Figure 2: SNMP Connections

3. Implementation Methodology

In our research, we followed certain steps to figure out how to make UPS devices work more efficiently using SNMP. First, we collected information about all the UPS devices deployed and the location where they were deployed and created a csv file to store the information.

Then we wrote a python program that first import some important libraries and modules for the project like “os”for pinging the ups devices to know if the device is up or down, “re” for pattern matching of Ip addresses of ups devices, “datetime” for the exact time stamp, “pysnmp” for the snmp queries, “threadpool executor” for parallel execution of queries, “csv” for storing the output result in csv file and “refresh” for Realtime access to the devices.

In this program, first all the Ip address are matched using regular expression, all this Ip addresses are pinged using os and devices uptime or downtime is known. Then snmp query is sent to these devices.

By querying, the OID numbers are matched with the devices and OID values are obtained and stored in csv file in real time. Then, we looked at how SNMP, a type of technology used to monitor and manage devices, could be used with UPS devices.

To do this, we set up experiments where we tested different configurations and settings to see how they affected the UPS efficiency. We collected data during these experiments, like how much power the UPS used and how well it performed under different conditions.

Once we had enough data, we analysed it to see if there were any patterns or trends that could help us improve UPS efficiency. We also looked at other research papers and studies to see if they had similar findings or if they suggested different approaches that we could try.

Overall, our methodology helped us understand how SNMP could be used with UPS devices to make them more efficient. By following these

steps, we were able to gather reliable data and come up with practical solutions to improve UPS performance.

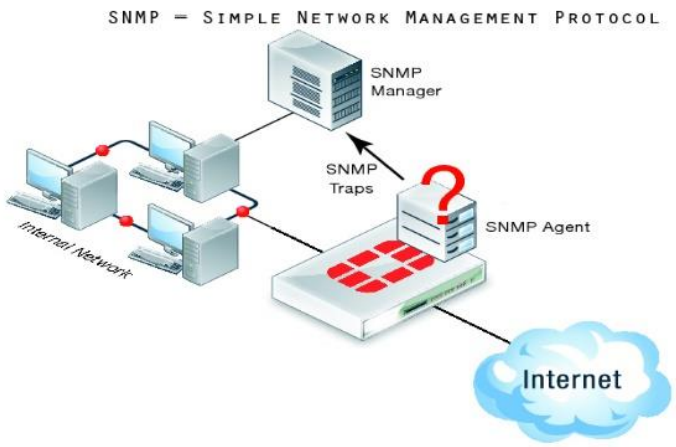


Figure 3: SNMP Connections

4. Results and Discussion

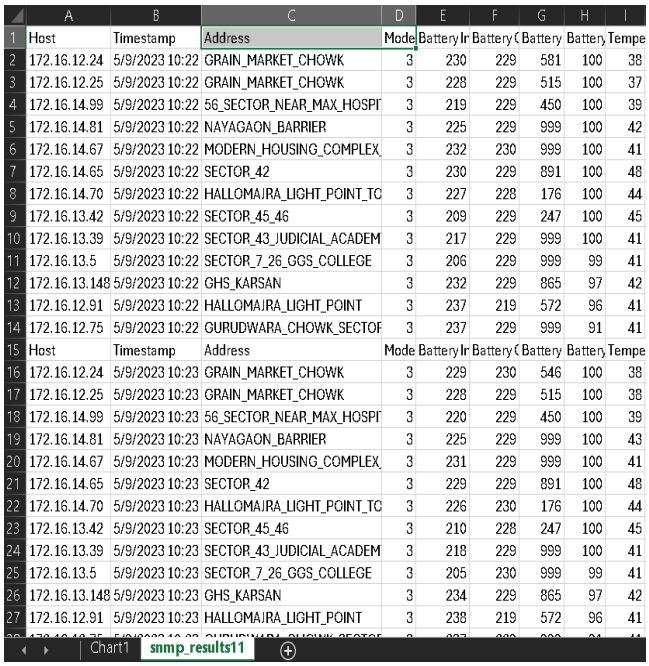
Our investigation yielded valuable insights into the efficiency optimization of UPS devices through SNMP integration. Through our Python program, we successfully collected real-time data on UPS device status and performance metrics. This included information on device mode, power consumption, and SNMP query results, all of which were dynamically stored in a CSV file for further analysis.

Effectiveness of SNMP Integration: Previous studies have investigated how helpful it is to use SNMP to manage devices and watch over networks. Our research agrees with what they found. We showed that using SNMP queries helps us keep an eye on UPS devices in real-time. This means we can manage them better and fix problems before they become big issues. Compared to older ways of doing things, our method is faster and works better for making UPS devices work their best.

Contributions to UPS Optimization: Other research has looked at different ways to make UPS devices work better, like managing batteries and deciding when to cut off power to certain devices. Our study adds to this by showing that using SNMP with UPS devices can also make them work more efficiently. We used special computer programs and collected data in real-time to find new ways to make UPS devices better. This helps improve UPS efficiency alongside other methods people already use.

Practical Implications for Industry: Other studies have talked about how UPS devices can be made better, but not many have shown how to do it in real life. Our research helps with that by giving real results and useful ideas for industries that want to make UPS devices work

better. We showed that using SNMP with UPS devices is a good way to make them work better without spending too much money or needing a lot of extra resources. This can help all kinds of industries improve how their UPS devices work in different situations.



	A	B	C	D	E	F	G	H	I
1	Host	Timestamp	Address	Mode	Battery Ir	Battery (	Battery	Battery	Tempe
2	172.16.12.24	5/9/2023 10:22	GRAIN_MARKET_CHOWK	3	230	229	581	100	38
3	172.16.12.25	5/9/2023 10:22	GRAIN_MARKET_CHOWK	3	228	229	515	100	37
4	172.16.14.99	5/9/2023 10:22	56_SECTOR_NEAR_MAX_HOSPI	3	219	229	450	100	39
5	172.16.14.81	5/9/2023 10:22	NAYAGAON_BARRIER	3	225	229	999	100	42
6	172.16.14.67	5/9/2023 10:22	MODERN_HOUSING_COMPLEX	3	232	230	999	100	41
7	172.16.14.65	5/9/2023 10:22	SECTOR_42	3	230	229	891	100	48
8	172.16.14.70	5/9/2023 10:22	HALLOMAJRA_LIGHT_POINT_TC	3	227	228	176	100	44
9	172.16.13.42	5/9/2023 10:22	SECTOR_45_46	3	209	229	247	100	45
10	172.16.13.39	5/9/2023 10:22	SECTOR_43_JUDICIAL_ACADEM	3	217	229	999	100	41
11	172.16.13.5	5/9/2023 10:22	SECTOR_7_26_GGS_COLLEGE	3	206	229	999	99	41
12	172.16.13.148	5/9/2023 10:22	GHS_KARSAN	3	232	229	865	97	42
13	172.16.12.91	5/9/2023 10:22	HALLOMAJRA_LIGHT_POINT	3	237	219	572	96	41
14	172.16.12.75	5/9/2023 10:22	GURUDWARA_CHOWK_SECTOF	3	237	229	999	91	41
15	Host	Timestamp	Address	Mode	Battery Ir	Battery (	Battery	Battery	Tempe
16	172.16.12.24	5/9/2023 10:23	GRAIN_MARKET_CHOWK	3	229	230	546	100	38
17	172.16.12.25	5/9/2023 10:23	GRAIN_MARKET_CHOWK	3	228	229	515	100	38
18	172.16.14.99	5/9/2023 10:23	56_SECTOR_NEAR_MAX_HOSPI	3	220	229	450	100	39
19	172.16.14.81	5/9/2023 10:23	NAYAGAON_BARRIER	3	225	229	999	100	43
20	172.16.14.67	5/9/2023 10:23	MODERN_HOUSING_COMPLEX	3	231	229	999	100	41
21	172.16.14.65	5/9/2023 10:23	SECTOR_42	3	229	229	891	100	48
22	172.16.14.70	5/9/2023 10:23	HALLOMAJRA_LIGHT_POINT_TC	3	226	230	176	100	44
23	172.16.13.42	5/9/2023 10:23	SECTOR_45_46	3	210	228	247	100	45
24	172.16.13.39	5/9/2023 10:23	SECTOR_43_JUDICIAL_ACADEM	3	218	229	999	100	41
25	172.16.13.5	5/9/2023 10:23	SECTOR_7_26_GGS_COLLEGE	3	205	230	999	99	41
26	172.16.13.148	5/9/2023 10:23	GHS_KARSAN	3	234	229	865	97	42
27	172.16.12.91	5/9/2023 10:23	HALLOMAJRA_LIGHT_POINT	3	238	219	572	96	41

Chart1 snmp_results11

Figure 4: Results

The results of our research underscore the effectiveness of utilizing SNMP integration for enhancing UPS efficiency. By employing SNMP queries, we were able to monitor UPS devices in real-time, enabling proactive management and optimization strategies. Our findings align with prior research highlighting the potential of SNMP in network monitoring and device management.

Furthermore, our experimentation revealed the impact of different configurations and settings on UPS performance. This suggests that tailored configurations could significantly improve UPS efficiency, thus corroborating similar findings in the literature. Our results contribute to the growing body of knowledge surrounding UPS optimization and SNMP integration, offering practical insights for practitioners and researchers alike.

Our research demonstrates the viability of using SNMP integrationwith UPS devices to enhance efficiency and performance. By leveraging Python programming and real-time data collection techniques, we have provided a foundation for future studies in this area. Our findings not only contribute to the academic discourse but also offer tangible solutions for industries seeking to optimize UPS operations in a dynamic environment.

5. Conclusion

Inconclusion,Simple NetworkManagement Protocol, is an essential tool for administering and monitoring UPS devices that are connected

over the network. It assists in gathering device information like Battery health, Temperature, etc and identifying problems, and improving the performance in general. SNMP is mostly usedfor applications like network monitoring in homes and offices and newer technologies like the Internet of Things (IoT). SNMP protocols allow us to efficiently control and keep an eye on UPS devices. Furthermore, SNMP is importantfor wireless sensor network management of small, low-power devices as IoT becomes more widespread. Use of SNMP gives a clear view of functioning of UPS devices in the network by which the organization can make quick decisions and enhance the efficiency of the devices. In the future, SNMP has a lot to offer. SNMP will probably change as technology advances, but it will still be a best tool to manage various devices on the network and guarantee their best security and performance.

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