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Cloud-native Application Performance Metrics for Resource Monitoring

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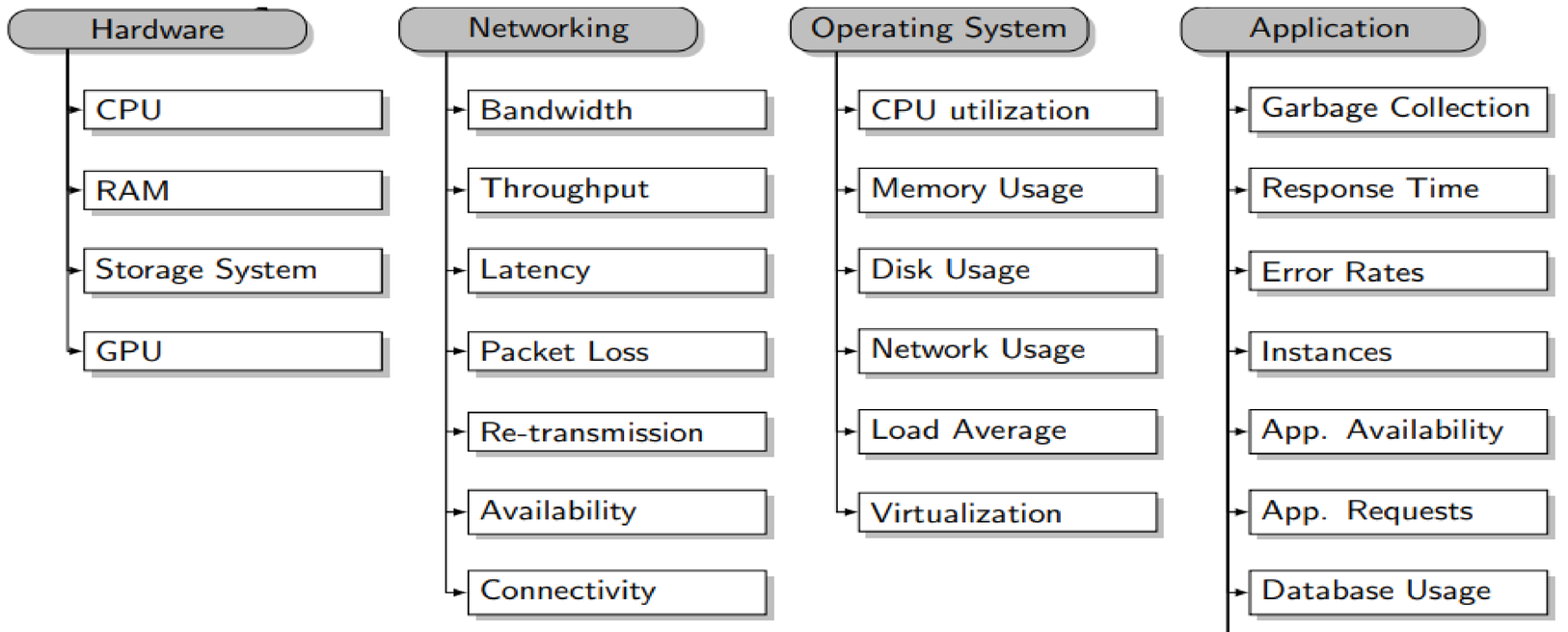
Abstract

Like all software, cloud systems do not always perform predictably. It can be difficult to diagnose what is wrong with the application in question between crashes and sudden drops in speed. Developers can use Application Performance Metrics (APMs) to identify critical issues; however, there are no general frameworks that provide consistent performance metrics across many systems. We propose a unified framework to obtain, manage and employ application performance metrics for cloud-native environments. Cloud-native application deployments can take advantage of our proposed framework for resource management (i.e., scaling). Our framework can help identify issues faster, reduce development times and pinpoint specific areas of concern for application security teams.

Tools

Prometheus is an open-source tool that collects and stores metrics/data from target applications. **Grafana** is another open-source tool and can be used to generate graphs to visualize data from various sources, including Prometheus.

Framework



A list of four high-level groupings were introduced (Hardware, Networking, Operating System, and Application). A set of mid-level, less general, sections were attributed under each of the four categories. Prometheus' metrics were then divided into each of the mid-level sections. For example, if a Prometheus metric is *http_counter*, that would fall under the Application Requests section under the Application group.

Use Cases

Observability: the framework deepens the internal understanding of the system by attaching metrics to specific cloud-native resources.
Monitoring: the framework can help pinpoint specific areas where the system is slowing down or being bottlenecked.
Scaling: the framework can help identify where resources can be scaled back or increased.

Research Questions

1. What constitutes a unified APM framework for cloud-native environments?
2. How can the framework improve observability, monitoring and scaling for cloud-native applications?
3. How can the framework improve efficiency and security of public cloud providers?

Purdue Cloud-native, Cyberinfrastructure and Networks

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References

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