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**PERFCOMPASS: ONLINE PERFORMANCE ANOMALY FAULT LOCALIZATION AND INFERENCE IN INFRASTRUCTURE-AS-A-SERVICE CLOUDS**

**ABSTRACT**

Infrastructure-as-a-service clouds are becoming widely adopted. However, resource sharing and multi-tenancy have made performance anomalies a top concern for users. Timely debugging those anomalies is paramount for minimizing the performance penalty for users. Unfortunately, this debugging often takes a long time due to the inherent complexity and sharing nature of cloud infrastructures. When an application experiences a performance anomaly, it is important to distinguish between faults with a global impact and faults with a local impact as the diagnosis and recovery steps forfaults with a global impact or local impact are quite different. In this paper, we present PerfCompass, an online performance anomaly fault debugging tool that can quantify whether a production-run performance anomaly has a global impact or local impact. PerfCompass can use this information to suggest the root cause as either an external fault (e.g., environment-based) or an internal fault (e.g., software bugs). Furthermore, PerfCompass can identify top affected system calls to provide useful diagnostic hints for detailed performance debugging. PerfCompass does not require source code or runtime application instrumentation, which makes it practical for production systems. We have tested PerfCompass by running five common open source systems (e.g., Apache, MySQL, Tomcat, Hadoop, Cassandra) inside a virtualized cloud testbed. Our experiments use a range of common infrastructure sharing issues and real software bugs. The results show that PerfCompass accurately classifies 23 out of the 24 tested cases without calibration and achieves 100 percent accuracy with calibration. PerfCompass provides useful diagnosis hints within several minutes and imposes negligible runtime overhead to the production system during normal execution time.