

UNIFIED MONITORING ARCHITECTURE FOR DISTRIBUTED CLOUD SYSTEMS USING OPENTELEMETRY AND OPEN-SOURCE TECHNOLOGIES

Kristiyan Kolev, Veselin Kyurkchiev

Abstract. *The intensive development of distributed cloud systems necessitates the creation of unified and standardized observability architectures capable of integrating diverse technological environments regardless of chosen cloud provider. Traditional solutions rely on proprietary tools of specific platforms, leading to fragmentation, duplication, and hindered interoperability between systems. This research presents a comprehensive monitoring architecture based on vendor-agnostic open-source technologies, designed to centralize the collection, processing, and presentation of metrics, system logs, and request tracing.*

The study analyzes the implementation of OpenTelemetry as a unified standard for instrumentation and data exchange, combined with open source backends. Using Infrastructure-as-Code and container orchestration reduces vendor lock-in and enables rapid horizontal scalability under dynamic workloads. Utilizing Infrastructure as Code principles and container orchestration ensures immediate horizontal scalability under dynamic workloads.

The proposed model is validated through production deployment across distributed systems, demonstrating rapid adaptation to peak loads, automatic resource scaling, and seamless migration between different cloud providers. Results confirm that the integrated approach to metrics, logs, and request traces provides complete system visibility while maintaining operational flexibility. This research introduces a vendor-agnostic approach, demonstrating how correlation between metrics, logs, and request lifecycles creates a complete picture of system behavior.

Key words: Observability Architecture, OpenTelemetry, Distributed Cloud Systems, Infrastructure-as-Code, Metrics, Logs, Traces, Sontainer Orchestration, Telemetry Data Exchange.

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Kristiyan Kolev¹, Veselin Kyurkchiev¹

¹ Paisii Hilendarski University of Plovdiv,
Faculty of Mathematics and Informatics,
236 Bulgaria Blvd., 4003 Plovdiv, Bulgaria

Corresponding author: kristiyan.kolev@fmi-plovdiv.org