

Enhancing Site Reliability Engineering (SRE) Observability: A Comprehensive Approach

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Abstract

Review Article

The subject of applying software engineering techniques to IT operations to create scalable and highly reliable software systems is known as site reliability engineering, or SRE for short. To preserve system's health, it heavily emphasizes automation, ongoing improvement, and efficient incident response. Observability, is the tracking and examination of system outputs in the form of metrics, logs, and traces with the goal of providing insight into the system's internal state, is one of the fundamental principles of SRE. This keeps systems reliable and effective by enabling the early detection and resolution of problems. SRE and observability work together to help businesses achieve high IT operations performance and reliability. The contemporary IT environment is becoming more and more complex as industries growing infrastructure use on-premises and cloud hosting, adding microservice design along with traditional monolithic application architectures. In the pursuit of observability, this diversity presents unique difficulties for SRE. This article sheds light on the significance of SRE observability, tools and tactics used by enterprises, and how site reliability engineering could be improved across numerous industries with the use of an open-source framework like Open Telemetry to strengthen observability.

Keywords: Site Reliability Engineering (SRE), Observability, Microservices, Open Telemetry, Automation.

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Body of the Article

In today's technologically advanced environment, systems are expected to be ever-reliable and highly-performant. Site Reliability Engineering plays a critical role in upholding these standards. One crucial aspect of SRE is observability, which refers to comprehending and preserving the internal state of complex systems. Observability involves monitoring operations, but it extends beyond monitoring. It uses monitoring, log analysis, and machine learning to detect and avoid problems before they occur. Observability offers a comprehensive perspective, transforming data into actionable insights. Effective observability has grown increasingly important and more difficult as environments have become more and more complex in design. This article reviews existing methods and clarify the significance of SRE Observability, which provides insight into resolving IT organizations' present technological difficulties caused by distributed systems landscapes.

Monitoring tools and their functions:

Traditional monitoring solutions sometimes fail to provide comprehensive insight into observability because their design is limited by predetermined metrics that do not account for the complex and dynamic interactions of current distributed systems. Organizations generally monitor their resources using a variety of methods and strategies. Some prominent options include:

- 1. ScienceLogic:** ScienceLogic provides complete IT monitoring and management. It helps with on-premises and cloud environment tracking for in-depth looks at their health and performance.
- 2. New Relic:** New Relic provides application performance monitoring (APM) for applications and infrastructure. It guarantees real-time data and analytics that enable SRE to identify and fix issues more quickly.
- 3. Splunk Analytics:** Splunk Analytics is very strong in log analysis and management. It helps an organization aggregate, analyze, and visualize the log data coming from diverse

sources into valuable insights regarding system performance and security.

4. **Grafana Visualization:** Grafana is an open-source monitoring and observability platform. It has customizable dashboards and alerts that would enable SREs to view and understand complex data sets with ease.
5. **AWS CloudWatch:** Amazon's AWS CloudWatch monitors AWS resources and applications. It collects and tracks metrics, logs, and events, providing a unified view of the system health and performance.
6. **Quantum Metrics:** Quantum Metrics is a user experience analytics application. It helps organizations understand user interactions and behavior, offering insights that can improve system performance and reliability.

The Importance of Observability in SRE:

Observability provides organizations with insight into their systems' health and performance in a real-time. It involves collecting and analyzing metrics, logs, and traces to detect and diagnose issues as quickly as possible. According to Beyer *et al.*, [2016], system or service can't be reliable if it can't be efficiently monitored. With its unified approach, engineers may proactively discover, investigate, and address issues by providing a more complete picture of the system's behavior, resulting in faster problem resolution and stronger system performance. The strong observability has the potential to greatly lower Mean Time to Detect (MTTD) anomalies/failures and Mean Time to Repair/Resolve (MTTR) systems, so the service perform reliably and without interruptions.

1. **Data Integrity and System Health:** Observability makes it possible to examine system health, which provides SREs with real-time data integrity insights. Organizations can identify possible problems that could worsen and prevent them from happening by knowing how their systems behave.
2. **Better Decision-Making:** SREs use real-time data to make well-reasoned judgments, which improves performance, builds reliability, and appropriately distributes resources.

Introducing OpenTelemetry (OTel):

OpenTelemetry (OTel) is an open-source observability framework offers one single way to do monitoring and provide efficient observability. This is designed to fetch telemetry data from a variety of sources. One of OpenTelemetry's main objectives is to make it simple to instrument systems or applications, regardless of its infrastructure, runtime environment, or language. The visualization and storage parts are purposefully left to organizations for their choice.

Distributed Tracing (DT) in OpenTelemetry functions similarly to a GPS tracker for requests as they

move between various system components, which are frequently made up of much smaller units known as micro-services. Each request is further divided into smaller components known as spans, which can stand for any one procedure or piece of work. This is critical in finding how different components of the system work together and comprehend the entire path of a request by keeping an eye on these spans. Because one can pinpoint the precise location of the delay or error, this will aid in performance identification and troubleshooting. As a result, it would resemble a map showing every stop a package makes on its way from the warehouse to the door. This would make it simpler to identify the cause of an issue and address it quickly, preventing a larger system/service failure or problem.

By incorporating OTel framework, organization will have:

1. **Unified Data Collection:** OTel enables organizations to collect telemetry data from various systems, including on-premises, cloud hosted, with monolithic, and microservices designed architectures. This unified approach simplifies data analysis and improves observability.
2. **Better Integration:** OTel integrates nicely with existing monitoring and logging tools like New Relic, Splunk, and Grafana. That means an organization can utilize its investments in these areas further, while enhancing observability.
3. **Flexibility and Customization:** OTel ensures that the level of flexibility and customization it offers helps an organization carve out an observability strategy that would address specific needs. This enables SREs to handle system monitoring and management independent of the environment.

Case Study: Implementing SRE Observability using OTel:

Scenario: Consider an organization using a various technology, its core services are distributed across on-premises, vendor hosted, or cloud hosted, and they use applications based on traditional model based monolithic and smaller, independent microservice architectures.

Challenge: The organization uses a variety of monitoring solutions to keep an eye on on-premises infrastructures, cloud native monitoring for cloud resources, and classic logging for apps that lack out-of-the-box monitoring tools or capabilities. When issues need to be resolved quickly, this design typically makes it difficult for the operations team to trace failures since it obscures end-to-end visibility.

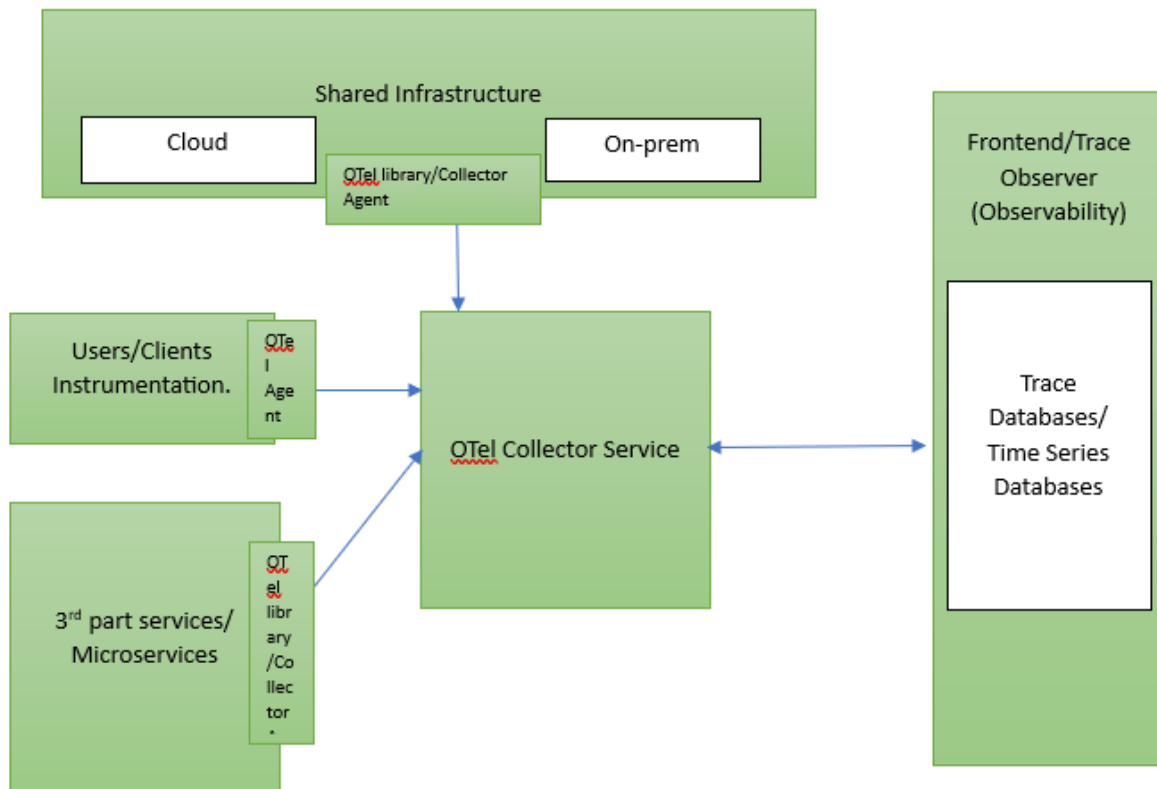
Solution: The company decided to use an open-source framework called OpenTelemetry (OTel), which helps gather data from all parts of their system in one place. Besides, Prometheus and Grafana were employed for

further visualization of the data by placing it onto easy-to-understand dashboards.

Outcome: With these adjustments, the organization was able to integrate observability in its critical service. They could discover and fix problems sooner, making their

system more reliable and efficient. As a result, they were also able to use the information they acquired to make better decisions.

OpenTelemetry Design Diagram:



CONCLUSION

The cornerstone of successful site reliability engineering is observability. But with today's infrastructure, which involves complicated systems architecture, it is challenging to do. There is a need to thoroughly plan, design, and evaluate an observability architecture. This may minimize organizational expenses while simultaneously providing end-to-end service visibility and keeping up with the growing infrastructure. It is time to switch from traditional monitoring to an observability framework. To do this, it is necessary to discuss and review an open-source observability framework which can offer a holistic view, enhances

decision-making and system stability. Organizations can plan and maximize their resource utilization by spreading these concepts and methods. This can improve knowledge of SRE observability and its importance in the contemporary IT environment.

REFERENCE

- Beyer, B., Jones, C., Petoff, J., & Murphy, N. R. (Eds.). (2016). Site Reliability Engineering: How Google Runs Production Systems. O'Reilly Media. Retrieved from <https://www.oreilly.com/library/view/site-reliability-engineering/9781491929117/>