What is Cassandra?

Apache Cassandra is an open-source distributed database for managing large amounts of data across multiple servers and ensuring no single point of failure. Cassandra offers continuous availability, linear scale performance, operational simplicity, and easy data distribution across multiple data centers and cloud availability zones. The built-for-scale architecture means that it maintains reliable read/write performance with massive amounts of data, expands horizontally with no downtime as additional hardware or cloud infrastructure is added, and can handle thousands of concurrent users or operations per second.

Cassandra’s popularity as an NoSQL database is related to the expansion of storage requirements across multiple data centers and the emergence of more advanced big data use cases. Modern enterprises use Cassandra as the database underlying complex and large-scale workloads like recommendation engines, social graphs, real-time content streams, and fraud detection.

Sending Cassandra Metrics to SignalFx

SignalFx provides an integration for Cassandra using collectd and the generic-jmx plugin to report metrics for request throughput, errors, latency, compaction activity, and hint activity. SignalFx provides built-in dashboards to display the most useful metrics by cluster and by specific node for running Cassandra in production. You can also add dimensions to the metadata to easily aggregate, filter, and group metrics by any properties you choose.

Monitoring Cassandra

Cassandra is a completely decentralized database. Every node is essentially identical and plays the same role. This means that any node can respond to any request—there is no single point of failure, but it becomes more difficult to troubleshoot when performance and availability issues arise. Therefore, the four key aspects to monitoring Cassandra are:

- How resources are used by each node in the cluster
- How quickly each node is able to respond to requests
- How requests are handled when nodes are unavailable
- How efficiently the compaction process is working
MONITORING LOAD FOR EACH NODE:

Understanding how much resource is available in the cluster is key to managing a healthy Cassandra service. Recovering from running out of capacity is difficult and costly due to the large amount of data stored on each individual Cassandra node.

Two key indicators of capacity are CPU load and free disk, and knowing the basic consumption of these resources can help determine where and when resources should be adjusted. Normally, the nodes in the cluster will be approximately equally loaded. If steady state load gets too high, it can be difficult to add more resources because provisioning new capacity for Cassandra requires sufficient CPU and disk resources from the cluster. If one node is more loaded than the rest of the cluster, it likely has a heavier compaction workload and requires further attention.

MEASURING LATENCY IN READ/WRITE REQUESTS:

Knowing how much capacity is available in the Cassandra cluster is critical but does not provide a complete view of cluster performance. Cassandra read and write latencies can have a large impact on application performance, and therefore are important metrics to monitor. An increase in read or write latency may indicate an emerging performance issue, potentially caused by:

- A change in client request patterns (such as an application making more requests or more complex requests)
- Nodes approaching capacity limits
- A heavier compaction workload

HANDLING REQUESTS WITH OFFLINE NODES:

If a node goes offline, then other nodes in the Cassandra cluster will help keep track of writes while the node is gone. These nodes store “hints” about these changes and, after the offline node returns, the other nodes can send the hints to help the node catch up on missed write tasks. Typically, the number of active hints will be zero. A sustained number of hints indicates an issue with one or more nodes.

AN EFFICIENT COMPACTION PROCESS:

Compaction is automatic maintenance process in Cassandra that occurs in the background. The compaction process can have a large impact on Cassandra server performance and application performance.

The number of pending compaction tasks should be low, and a sustained increase is a sign of emerging performance issues. This may be remediated by:

- Tuning the compaction throughput
- Adding capacity to the cluster: either more or faster disks or more nodes

The SignalFx Difference

INTELLIGENT ALERTS: Simplistic alerts based on static thresholds sometimes do not provide enough insight for determining whether an issue requires attention. Applying analytics to alert rules helps to understand whether a change is normal, part of a trend, an anomaly, or a threat to performance. Time conditions such as duration or percent of duration provide context to alert rules and help determine whether a problem persists longer than expected. By setting alert detectors against metrics that are derived to reflect specific performance objectives and triggered by a dynamic threshold—for example, against a moving average or within a percentile bounds—alerting becomes a function of service-wide performance requirements.

Measuring the rate of change of compaction activity gives an early indication to how much capacity will be required for the cluster. However, adding a duration condition over a set time period gives additional context to whether the increase in compaction activity can be managed with the current configuration or whether new nodes should be added to the cluster.
MONITORING FROM CLUSTER TO NODE: With SignalFx, you can monitor from cluster to node in a single dashboard. Instant visibility gives you both the flexibility to gain a service-wide view of performance and the power to explore individual nodes within the cluster.

In SignalFx, start with an aggregated view of data from all Cassandra nodes, including aggregate infrastructure metrics like CPU utilization and network traffic. Easily track individual nodes by hints in progress, pending compactions, or latency metrics. Investigate any outlier behavior by filtering by a dimension such as AWS availability zone or service tag. Or drill down to a single node to investigate whether specific metrics are impacting performance at the service level.

INSTANT INSIGHT: SignalFx provides out-of-the-box insight across a broad range of open-source software platforms. Integrations easily plug into and collect all kinds of metrics from Cassandra, while built-in dashboards instantly capture and display relevant metrics to provide instant visibility.

Surfacing SignalFx’s recommended detectors allows you to immediately subscribe to relevant alerts for key Cassandra metrics, created by your team or pre-built by SignalFx. You can create and change detectors at any time, but having a jumpstart with recommended detectors at the click of a button significantly reduces your time to productivity and customization.
About SignalFx

SignalFx is the most advanced monitoring solution for modern infrastructure. Our mission is to help cloud-ready organizations drive high levels of availability in today's elastic, agile, distributed environments. With SignalFx, development and operations teams gain a real-time view of, interact with, and take action on the infrastructure and application metrics that matter. We have enterprise customers including Yelp, Cisco, Zuora, and Hubspot and thousands of users analyzing billions of metrics every day. SignalFx was founded in 2013 by former Facebook and VMware executives, launched in 2015, and is backed by Andreessen Horowitz and Charles River Ventures.