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## Operations

System metrics

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## Contents

- 1 Kubernetes and Node metrics
- 2 Kubernetes metrics
- 3 Node metrics

Find useful metrics provided by Kubernetes and other system resources to monitor the status and performance of the cluster and nodes.

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# Kubernetes and Node metrics

In addition to the service-defined metrics described in the service-level guides (see links here), standard Kubernetes and other system metrics are obviously important for monitoring the status and performance of your cluster(s), nodes, and services.

- Kubernetes metrics
- Node metrics

# Kubernetes metrics

For full information about all the cluster metrics Kubernetes provides, see the Kubernetes documentation. Genesys recommends that you pay attention to the following cluster-related metrics in particular.

Metric	Prometheus formula	Indicator of
Pod Restarts	increase(kube_pod_container_status_restarts_total{namespace="\$namespace", pod=~"\$service.*"})[1m]	
The cgroup's total memory	sum(container_memory_usage_bytes{namespace="\$namespace",pod=~"\$service-.*", container!=""}) by (pod)	Memory
The cgroup's CPU usage	sum (rate (container_cpu_usage_seconds_total{namespace="\$namespace",pod=~"\$service-.*", container!="POD"}[1m])) by (pod) * 100	CPU utilization
Bytes transmitted over the network by the container	rate(container_network_transmit_bytes_total{namespace="\$namespace",pod=~"\$service-.*", container!=""})[1m]	
Bytes received over the network by the container	rate(container_network_receive_bytes_total{namespace="\$namespace",pod=~"\$service-.*", container!=""})[1m]	

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# Node metrics

Genesys recommends that you pay attention to the following node-related metrics in particular.

Metric	Prometheus formula	Indicator of
Process HEAP All	{SERVICE_NAME}_process_heap_bytes{pod=~"\$pod",service="\$service"}	Heap status
Process CPU All	sum(rate({SERVICE_NAME}_process_cpu_seconds_total{pod=~"\$pod",service="\$service"} * 100) by (pod))	CPU utilization
Process Memory All: resident memory	{SERVICE_NAME}_process_resident_memory_bytes{pod=~"\$pod",service="\$service"}	Memory
Process Memory All: virtual memory	{SERVICE_NAME}_process_virtual_memory_bytes{pod=~"\$pod",service="\$service"}	Memory