Reliable Software Systems

Week 3: Monitoring

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Example outage: Instapaper

Had a 32-hour outage

One day, their database writes stopped working: `"The table 'bookmarks' is full"`

The database’s underlying file system had a 2TB file size limit

The database had changed companies, been upgraded, etc

To restore service, they needed to explore solutions, dump and restore the database (took several hours)

https://medium.com/making-instapaper/instapaper-outage-cause-recovery-3c32a7e9cc5f

"If you can't measure it, you can't improve it."

-- Lord Kelvin? Peter Drucker? The internet?

"If you can't measure it, you can't detect or debug problems in it."

-- me

What to monitor

Traffic

- HTTP requests
- API requests
- Latency

Customer experience

Failures

- Request status codes
- Exceptions

Server utilization

- CPU
- Memory
- Limits (e.g. open file handles)

Underlying causes

Application

- CPU, memory
- Garbage collection
- Binary versions

And more...

What to monitor

USE method:

“For every resource, check utilization, saturation, and errors.”

Hardware: CPU, memory, network

OS: file handles

Software: thread pools, locks

http://www.brendangregg.com/usemethod.html

How to monitor

At development time

Design your monitoring and decide what to measure.

Instrumentation - add to your code & infrastructure to capture metrics.

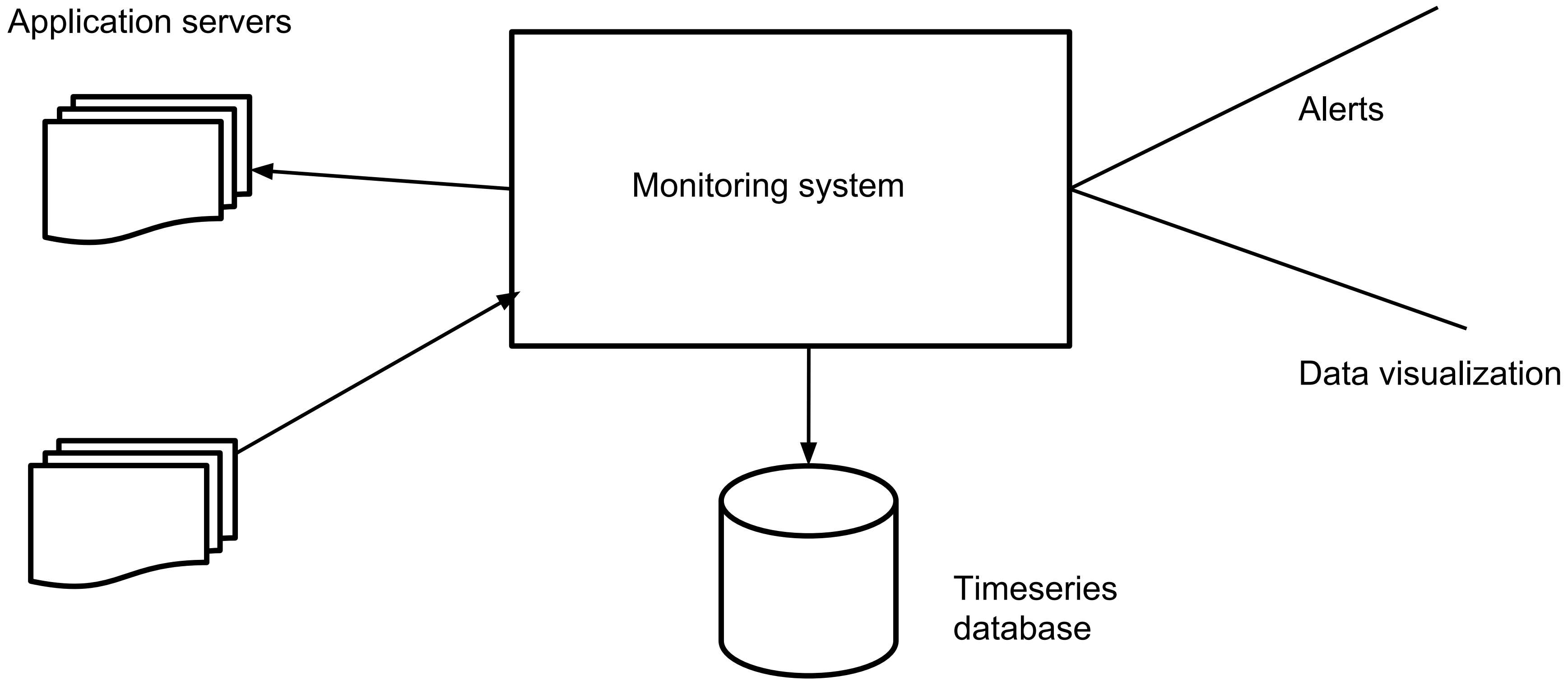
At run time

System collects metrics as the application runs.

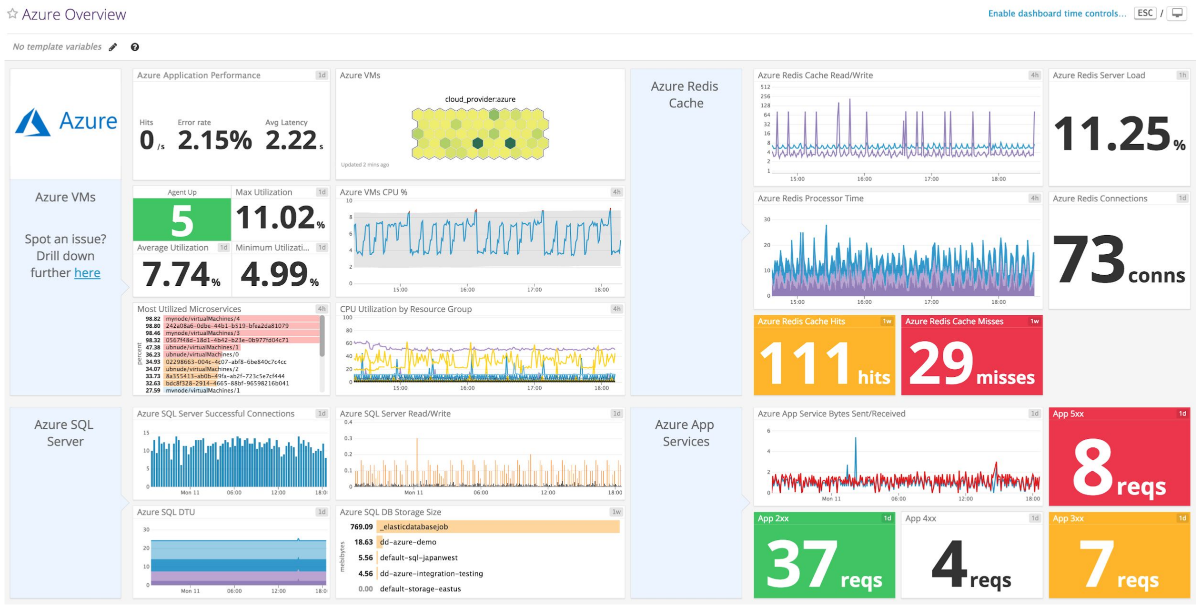
Centralized monitoring server polls your system to save them metrics.

Monitoring system generates dashboards and alerts.

How to monitor



Demo (https://www.honeycomb.io/play/)


Azure Overview

Enable dashboard time controls... ESC /

No template variables

Azure

Azure Application Performance 1d
Hits 0 /s · Error rate 2.15% · Avg Latency 2.22 s

Azure VMs
cloud_provider:azure
Updated 2 mins ago

Azure VMs

Spot an issue? Drill down further here

Agent Up 5 · Max Utilization 11.02% · Average Utilization 7.74% · Minimum Utilizati... 4.99%

Azure VMs CPU % 4h

Most Utilized Microservices 4h

percent	
98.82	mynode/virtualMachines/4
98.80	242a08a6-0dbe-44b1-b519-bfea2da81079
98.46	mynode/virtualMachines/3
98.32	0567f48d-18d1-4b42-b23e-0b977fd04c71
47.38	ubnude/virtualMachines/1
36.23	ubnude/virtualMachines/0
34.93	02298663-004c-4c07-abf8-6be840c7c4cc
34.07	ubnude/virtualMachines/2
33.73	8a355413-ab0b-49fa-ab2f-723c5e7cf444
32.63	bdc8f328-2914-4665-88bf-96598216b041
27.59	mvnode/virtualMachines/1

CPU Utilization by Resource Group 4h

Azure Redis Cache

Azure Redis Cache Read/Write 4h

Azure Redis Server Load 1h: 11.25%

Azure Redis Processor Time 4h

Azure Redis Connections 1d: 73 conns

Azure Redis Cache Hits 1w: 111 hits

Azure Redis Cache Misses 1w: 29 misses

Azure SQL Server

Azure SQL Server Successful Connections 1d

Azure SQL Server Read/Write 1d

Azure SQL DTU 1d

Azure SQL DB Storage Size 1w

mebibytes	
769.09	_elasticdatabasejob
18.63	dd-azure-demo
5.56	default-sql-japanwest
4.56	dd-azure-integration-testing
0.00	default-storage-eastus

Azure App Services

Azure App Service Bytes Sent/Received 1d

App 5xx 1d: 8 reqs

App 2xx 1d: 37 reqs

App 4xx 1d: 4 reqs

App 3xx 1d: 7 reqs

dashboard image from https://www.datadoghq.com/blog/azure-monitoring-enhancements/

Types of metrics

Counters - monotonically increasing numbers (e.g. time, total requests served)

Gauge - numeric value that can go up or down (e.g. temperature, memory usage)

Distributions (e.g. request latency)

Boolean (e.g. whether the cache was hit, whether a user was logged in)

String (e.g. an error type, a team name, a binary version)

They are recorded as timeseries - each value at a specific timestamp

Types of monitoring outputs

Dashboards

  For visualizing, discovering, analyzing data

Alerts

  For letting you know you have an urgent, important problem

Tickets

  For letting you know you have potential, minor problems

Logs

  For giving you detailed, textual information

Blackbox vs whitebox

Whitebox

You instrument the code to send metrics about inner details.

Examples: the metrics mentioned earlier, health checks

Blackbox

You use the system like a user and record the results.

Examples: isitdownrightnow.com, a prober

Metamonitoring

YO DAWG, I HEARD YOU LIKE MONITORING
SO I INSTRUMENTED SOME MONITORING FOR YOUR MONITORING SO YOU CAN MONITOR YOUR MONITORING
imgflip.com

Sometimes necessary but use sparingly, only when you build/run your own monitoring, such as your own prober.

Information overload

Use frameworks and existing toolkits.

- They often package some of these metrics for you.

Think carefully before introducing new metrics & logs.

- Is this information already recorded somewhere else?
- Will this be useful in an outage or will it overwhelm the rest of the data?

END

Alerting exercise

Service is receiving high QPS.

Service is receiving low QPS.

Server has high CPU load.

Service is responding with many failures.

A processing queue has a large number of messages in it.

A processing queue is taking too long to complete processing messages.

Database is almost filled to capacity.