Amazon Aurora

Monitoring and Performance Insights

Monitoring capabilities

App/schema design
Tuning and config.
Monitoring
Scaling
High availability
Database backups
DB software patches
DB software installs
OS patches
OS installation
Physical hardware
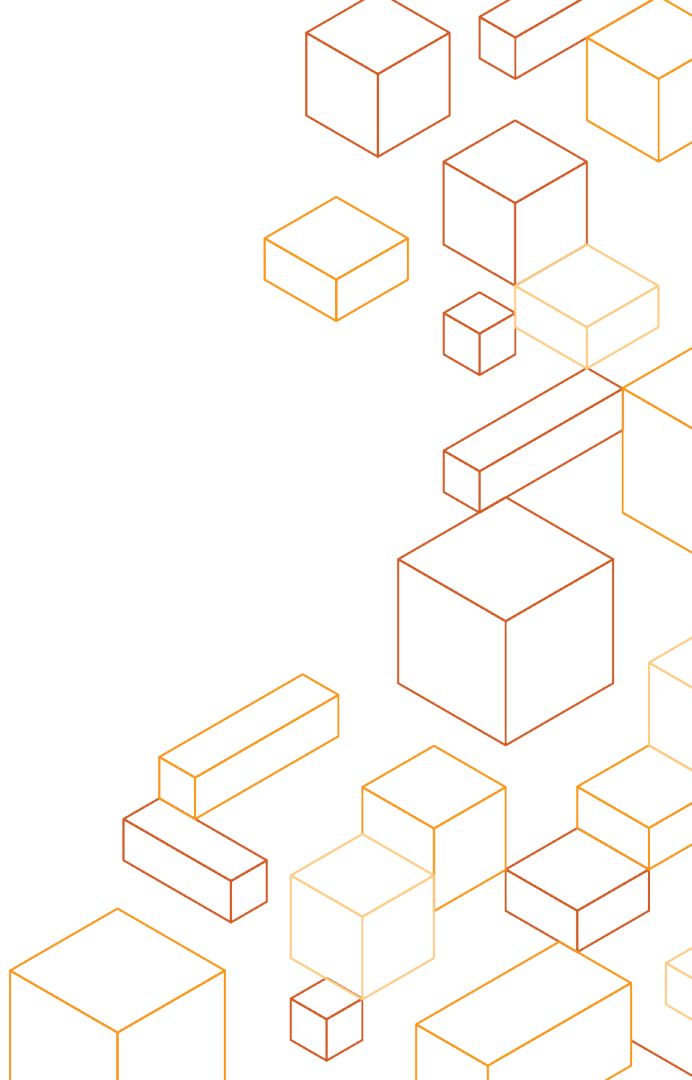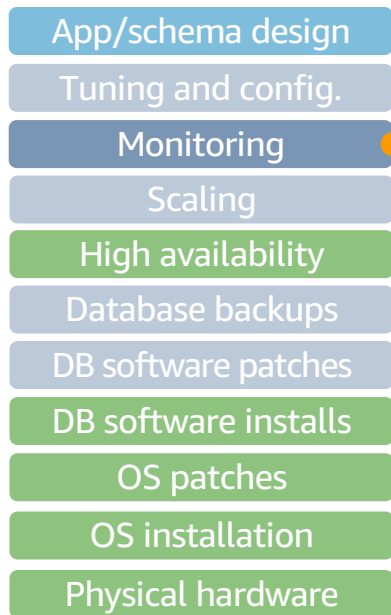
Amazon RDS

AWS provides:
- Built-in monitoring and health checks to operate service
- Tools to monitor database operational and performance metrics: CloudWatch, Enhanced Monitoring, Performance Insights
- Capabilities to alarm, notify based on monitoring metrics
- Log collection and publishing capabilities

You are responsible for:
- Enabling relevant additional monitoring features
- Monitoring and alarming on relevant metrics and setting workload appropriate thresholds
- Enabling and configuring desired logs

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Monitoring capabilities at a glance

Amazon RDS comes with comprehensive monitoring built-in

Amazon CloudWatch Metrics
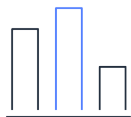
Monitor core (CPU, memory) and transactional (throughput, latency) metrics

Amazon CloudWatch Logs

Publishing database logs (errors, audit, and slow queries) to a centralized log store

Enhanced Monitoring

Additional database-specific metrics at up to 1 second granularity

Performance Insights

Query- and wait-level performance data

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Monitoring RDS databases

Instance

Amazon CloudWatch

- CPU/ Memory / IOPS / Network – Host level metrics
- Single platform across AWS
- Alarm and notify
- Per minute metric storage in Amazon CloudWatch
- Upload database logs to CloudWatch

Operating System

Amazon RDS Enhanced Monitoring

- Process / Thread list with host metrics
- View in AWS Console or push to monitoring systems
- Stored in Amazon CloudWatch Logs
- 1–60 second granularity
  - Start with 15s & Dial down to 1s when troubleshooting

Database Engine

Amazon RDS Performance Insights

- Measure database load, average active sessions
- Per second granularity
- All Amazon RDS engines
- No licensing requirements
- View in AWS Console or push to monitoring systems

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Enhanced Monitoring

Released on 2016, Enhanced Monitoring gathers finer grained OS metrics from an agent installed on the RDS host.

• By default metrics are stored for 30 days.

• Incurs additional CloudWatch costs based on granularity (from 1 to 60 seconds).
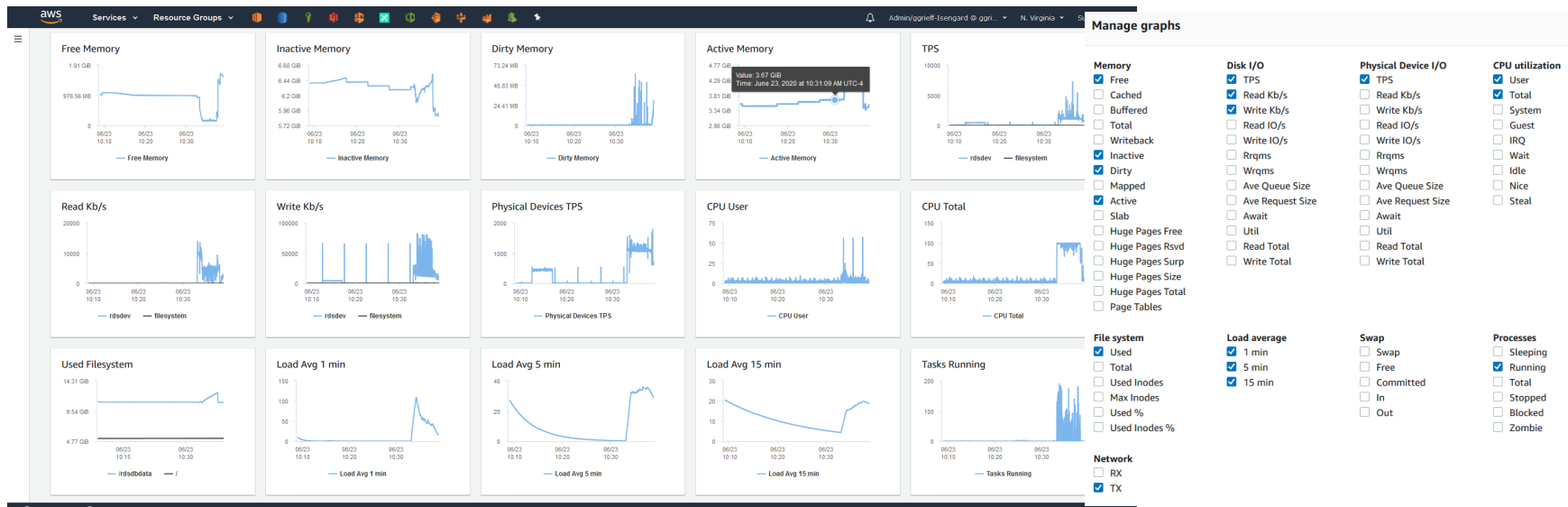
Monitoring RDS Environment

CloudWatch Alarms

RDS Event Notification

RDS Recommendations

Alarm details

Provide the details and threshold for your alarm. Use the graph to help set the appropriate threshold.

Name: rds-freestoragespace-below-1gib

Description: Alarm when free storage below 1 GiB
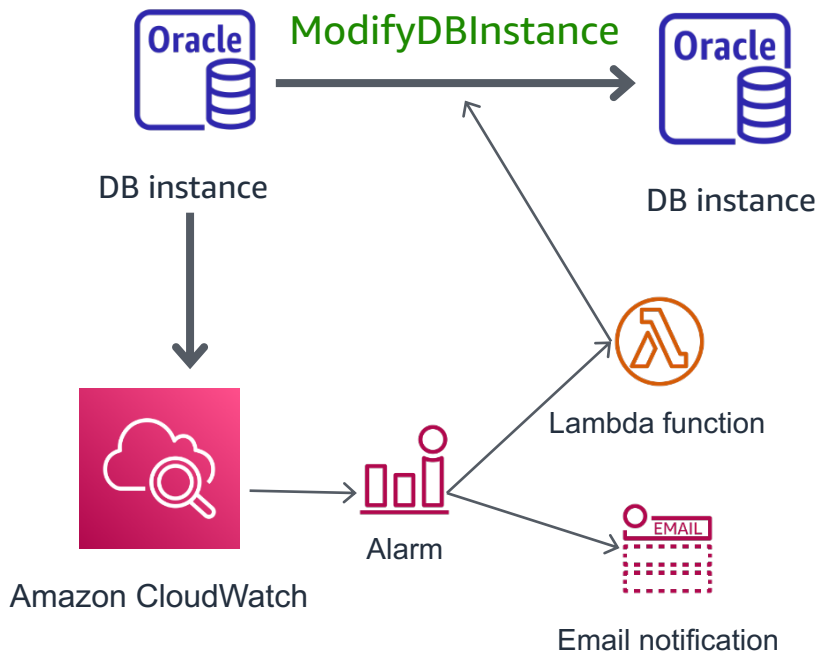
Whenever: FreeStorageSpace

is: <= 107374182

for: 5 ✏ out of 5 datapoints ⓘ

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Monitoring RDS Environment

CloudWatch Alarms

RDS Event Notification

RDS Recommendations

ModifyDBInstance

DB instance

DB instance

Amazon CloudWatch

Alarm

Lambda function

Email notification

Monitoring RDS Environment

CloudWatch Alarms

RDS Event Notification

RDS Recommendations

Provide notifications when RDS events occur

Built-in API to list events (adhoc delivery)

Leverage an Amazon SNS topic as the delivery target (push delivery)

Create subscription for specific RDS resource types (DB instances, DB clusters, snapshots, parameter groups…) and event categories

Add desired RDS resources to subscription

Near real-time notifications

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Monitoring RDS Environment

CloudWatch Alarms

RDS Event Notification

RDS Recommendations

Performance Insights

Amazon RDS Performance Insights monitors your **Database Load**

- Visibility into performance of Amazon Relational Database Service (Amazon RDS) databases

- Adjustable timeframe

- Filter load by Waits, SQL Statements, Hosts, or Users

- Easily find SQLs causing load

- Change chart granularly from 5 minutes to 1+ weeks

- For beginners as well as experts
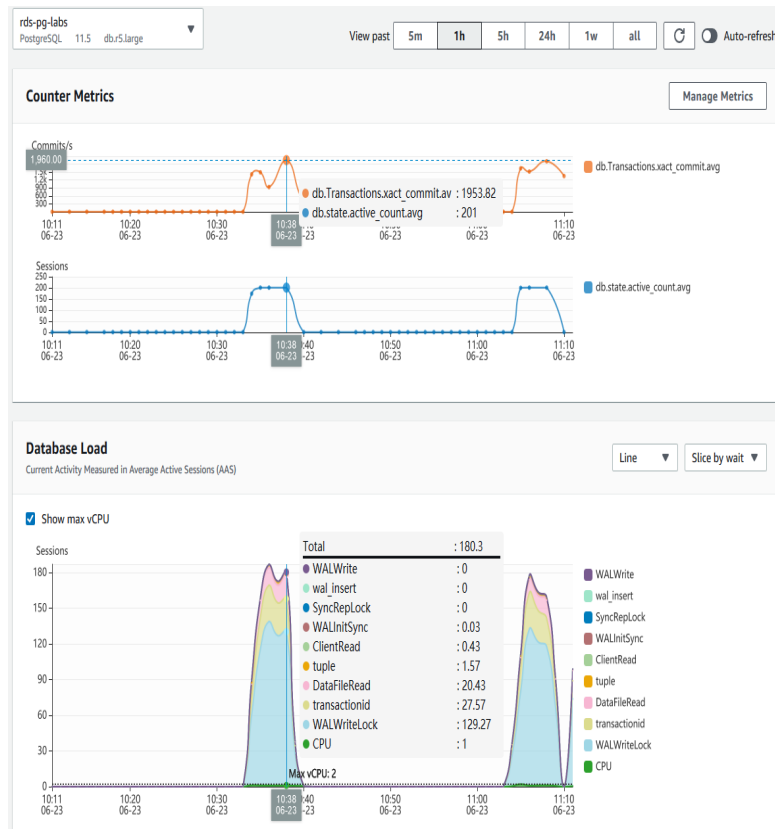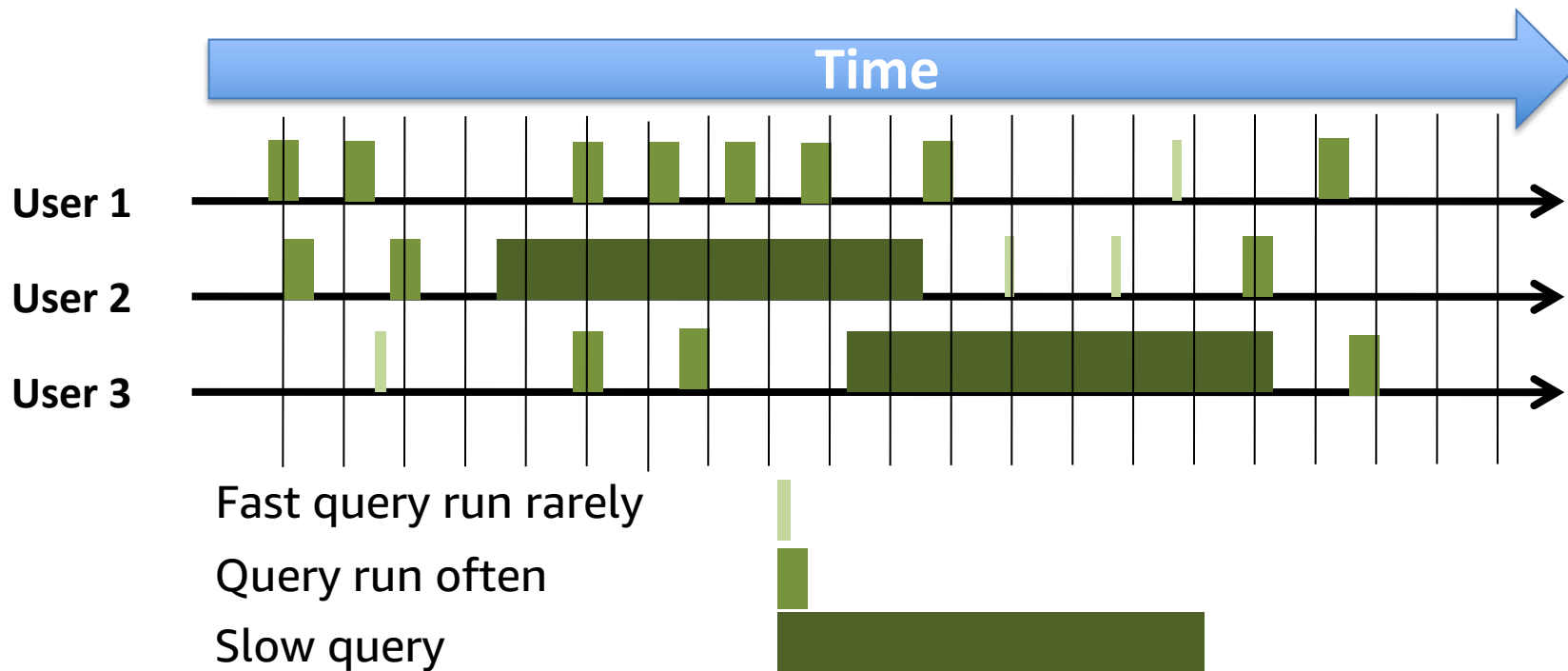
Performance Insights dashboard
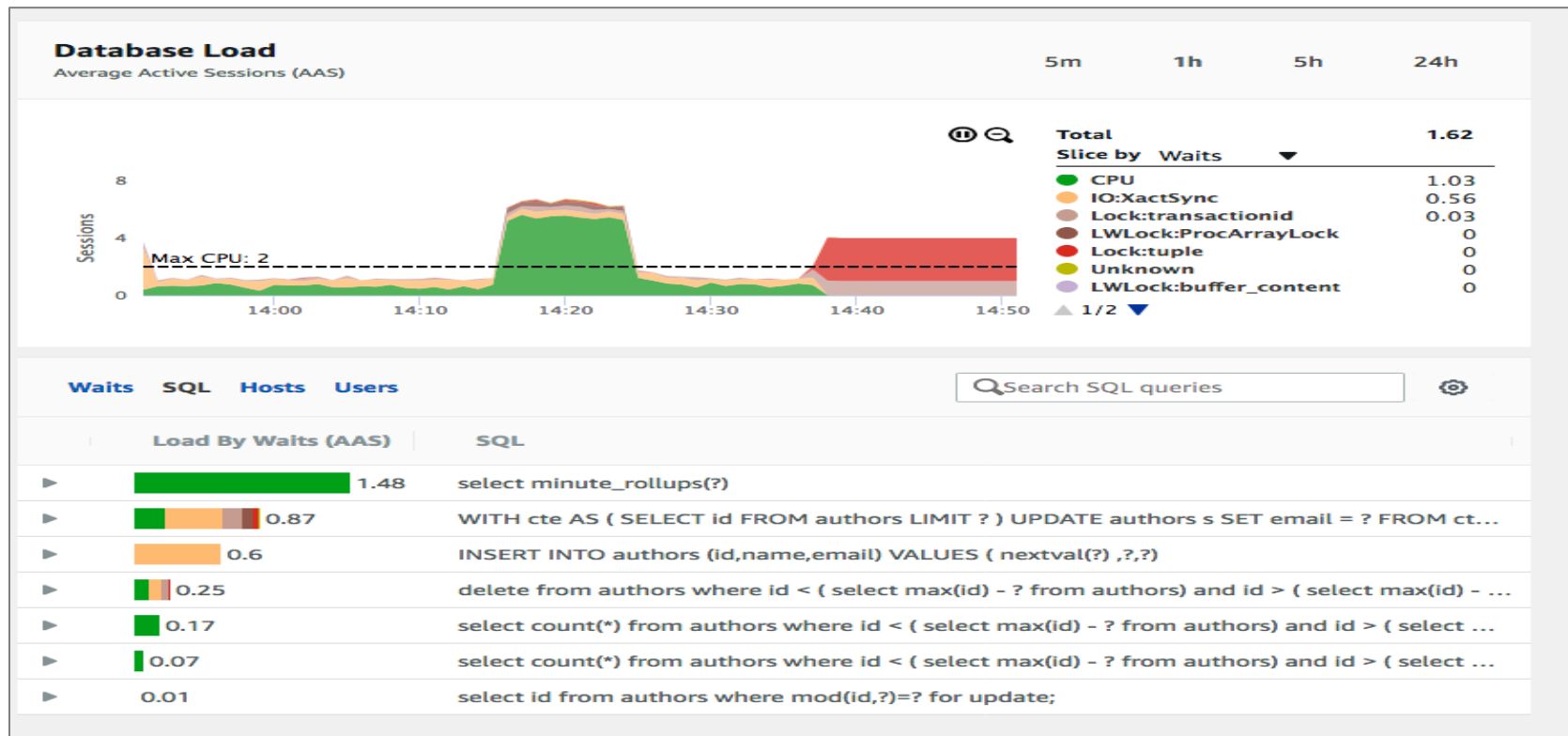
What is "Database Load"?

- All engines have a connections list showing
  - Active
  - Idle
- We sample every second
  - For each active session, collect
    - SQL
    - State: CPU, I/O, lock, commit log wait, and more
    - Host
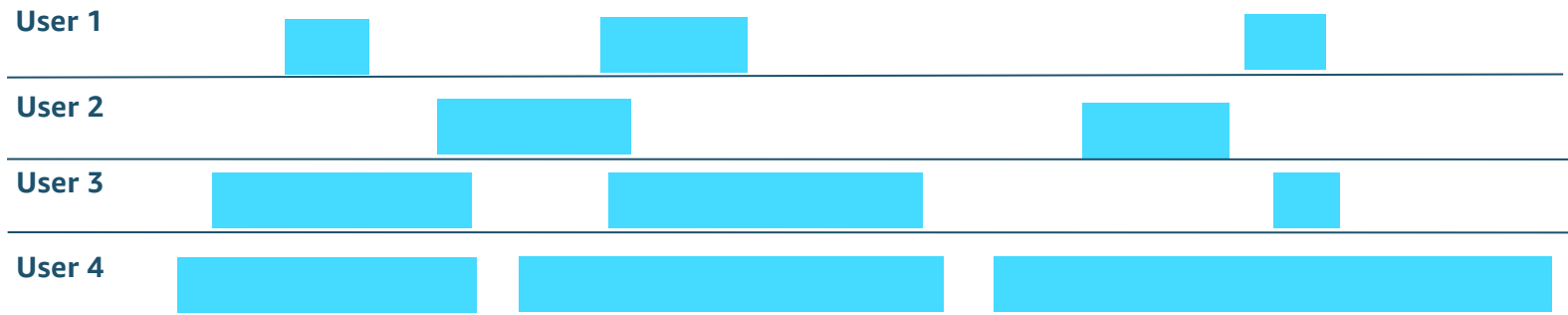   - User
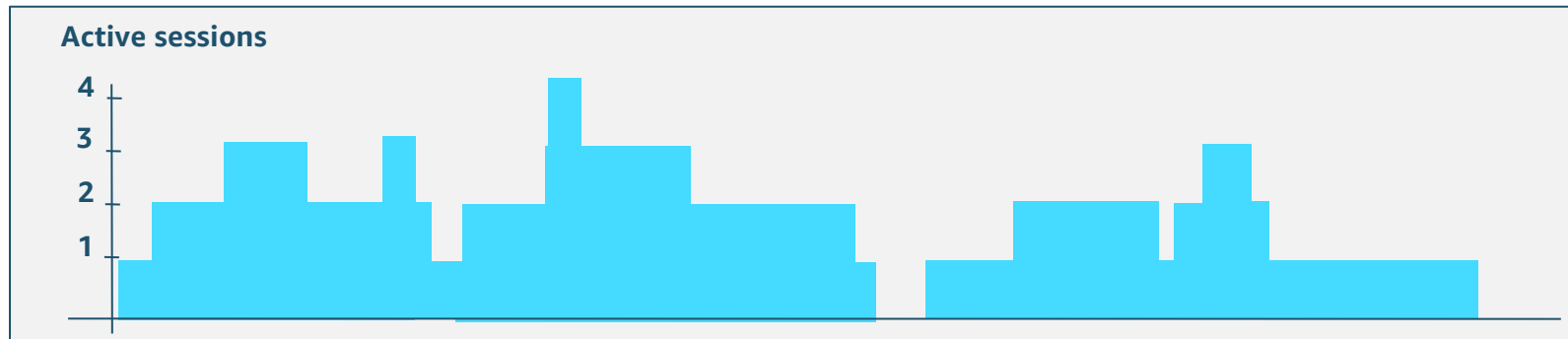- Expose as "average active sessions" (AAS)

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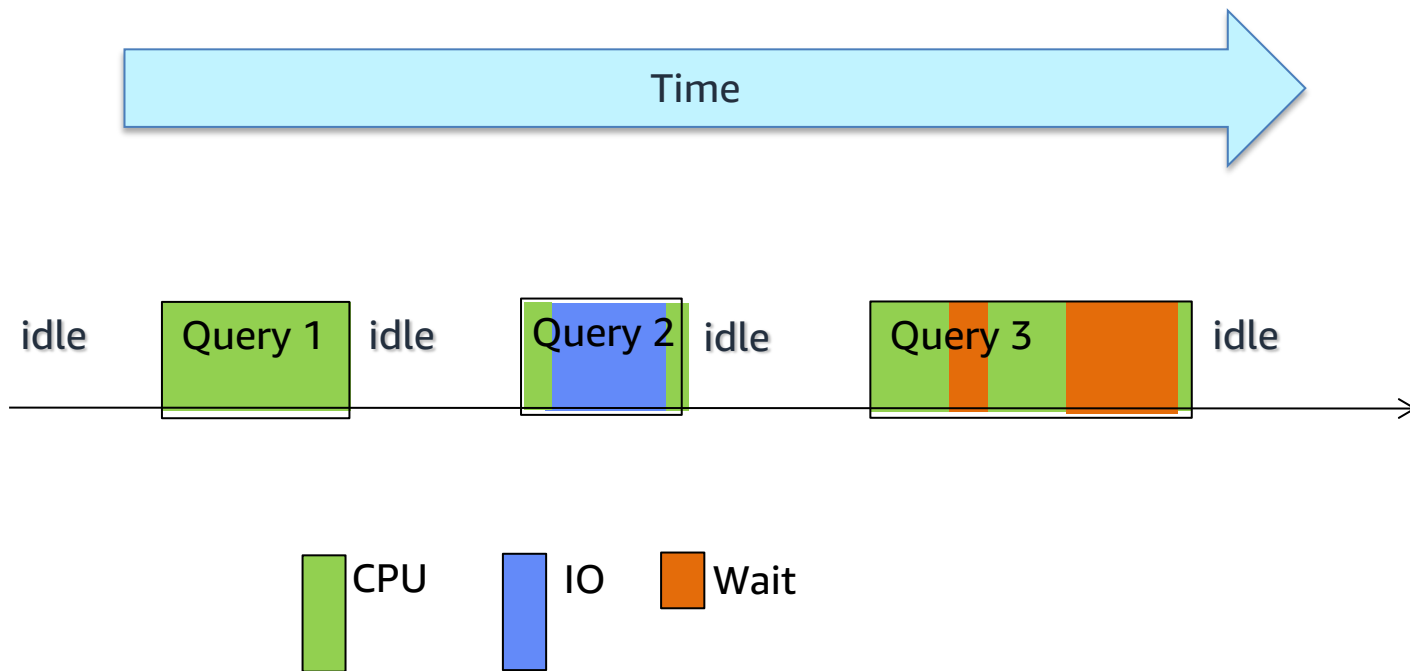
Performance Insights **–Sampling**
Sampling every second

Fast query run rarely

Query run often

Slow query
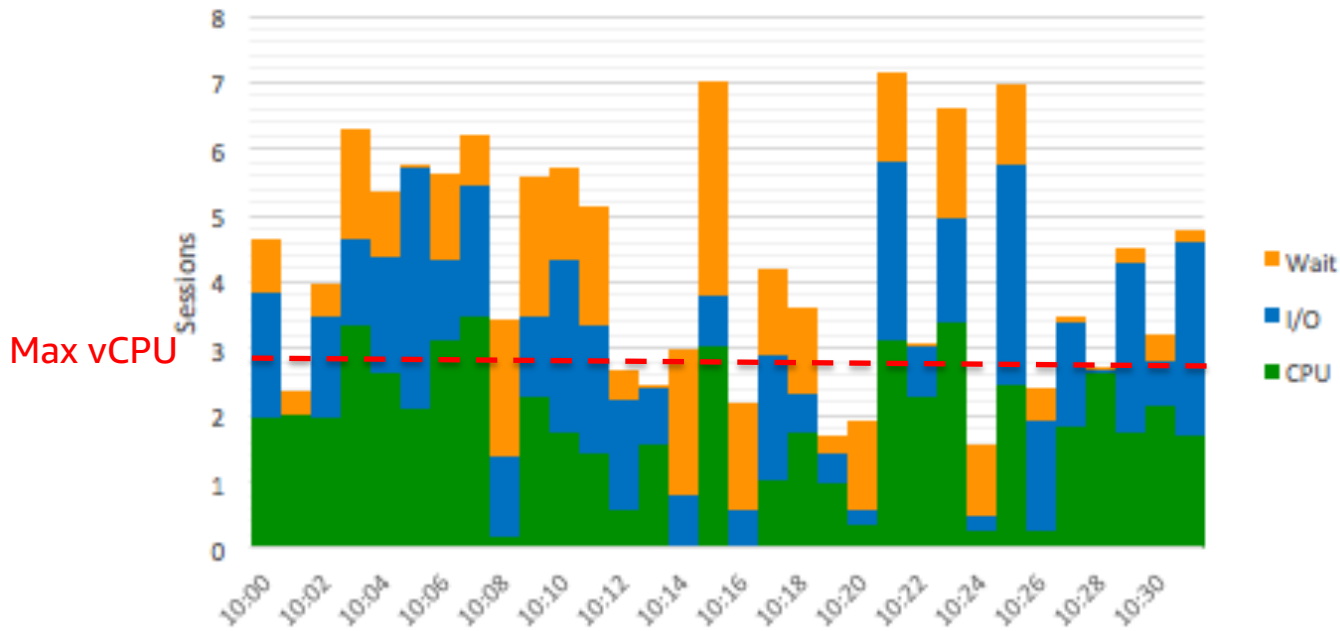
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AAS load graph

Active session state

Performance Insights –Max vCPU **chart**

AAS compared to Max CPU

Performance Insights - **Yardstick**

AAS < 1
    Database is not blocked

AAS ~= 0
    Database basically idle. Problems are in the APP not DB

AAS < # of CPUs
    CPU available
    Are any single sessions 100% active?

AAS > # of CPUs
    Could have performance problems

AAS >> # of CPUS
    There is a bottleneck

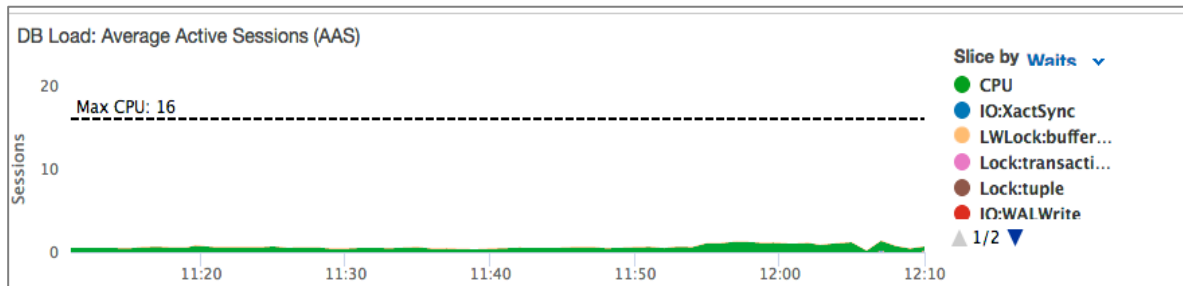aws

When users say the database is slow …
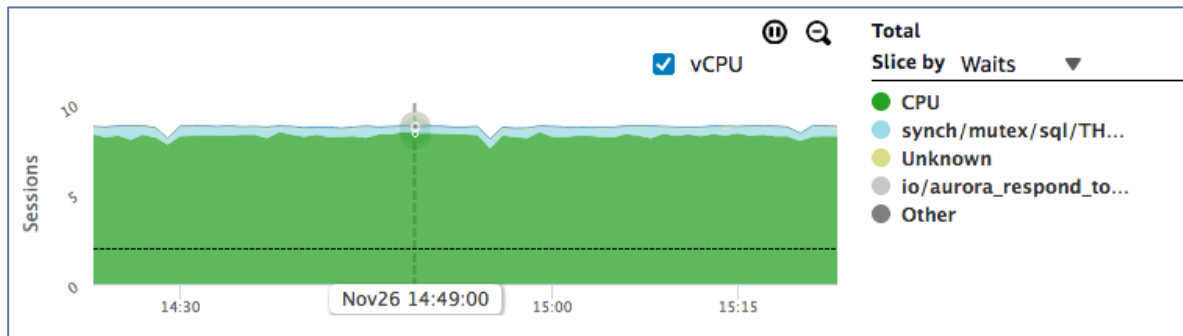

AAS = 0

You prove that it's not the database

Also useful for sizing

- If CPU load significantly less than #vCPU then oversized


- If CPU load Is > #vCPU undersized
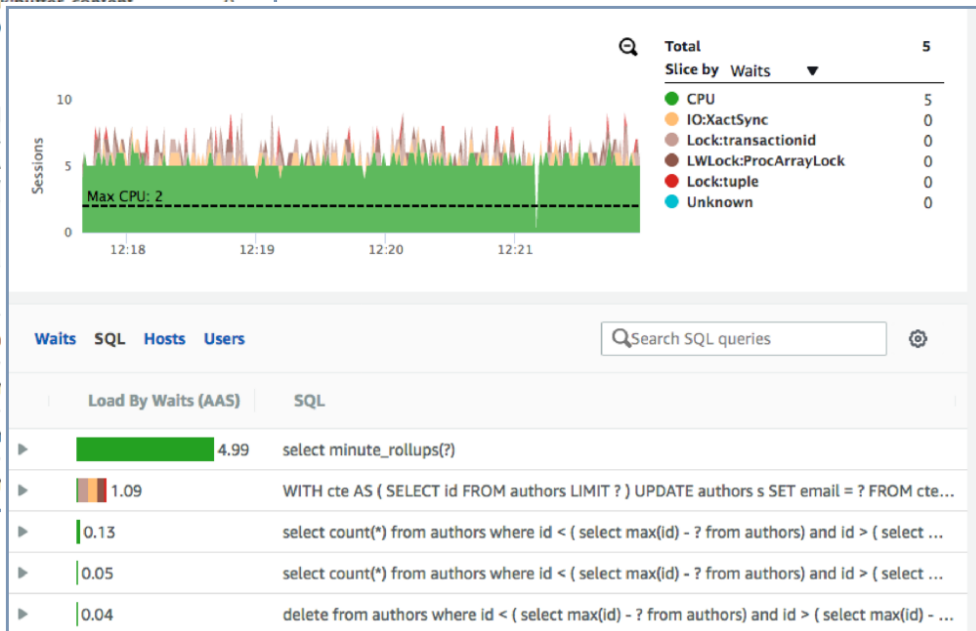
Performance Insights - Counters

Customize the Performance Insights Dashboard with up to 10 additional graphs

Counter	Type	Unit	Metric
tup_deleted	SQL	Tuples per second	db.SQL.tup_deleted
tup_fetched	SQL	Tuples per second	db.SQL.tup_fetched
tup_inserted	SQL	Tuples per second	db.SQL.tup_inserted
tup_returned	SQL	Tuples per second	db.SQL.tup_returned
tup_updated	SQL	Tuples per second	db.SQL.tup_updated
buffers_checkpoint	Checkpoint	Blocks per second	db.Checkpoint.buffers_checkpoint
checkpoints_req	Checkpoint	Checkpoints per minute	db.Checkpoint.checkpoints_req
checkpoint_sync_time	Checkpoint	Milliseconds per checkpoint	db.Checkpoint.checkpoint_sync_time
checkpoints_timed	Checkpoint	Checkpoints per minute	db.Checkpoint.checkpoints_timed
checkpoint_write_time	Checkpoint	Milliseconds per checkpoint	db.Checkpoint.checkpoint_write_time
maxwritten_clean	Checkpoint	Bgwriter clean stops per minute	db.Checkpoint.maxwritten_clean
active_transactions	Transactions	Transactions	db.Transactions.active_transactions
blocked_transactions	Transactions	Transactions	db.Transactions.blocked_transactions
max_used_xact_ids	Transactions	Transactions	db.Transactions.max_used_xact_ids
xact_commit	Transactions	Commits per second	db.Transactions.xact_commit

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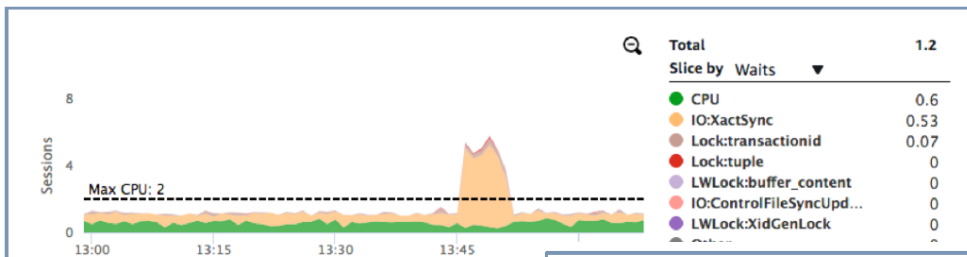# Performance Insights Example: CPU Bottleneck
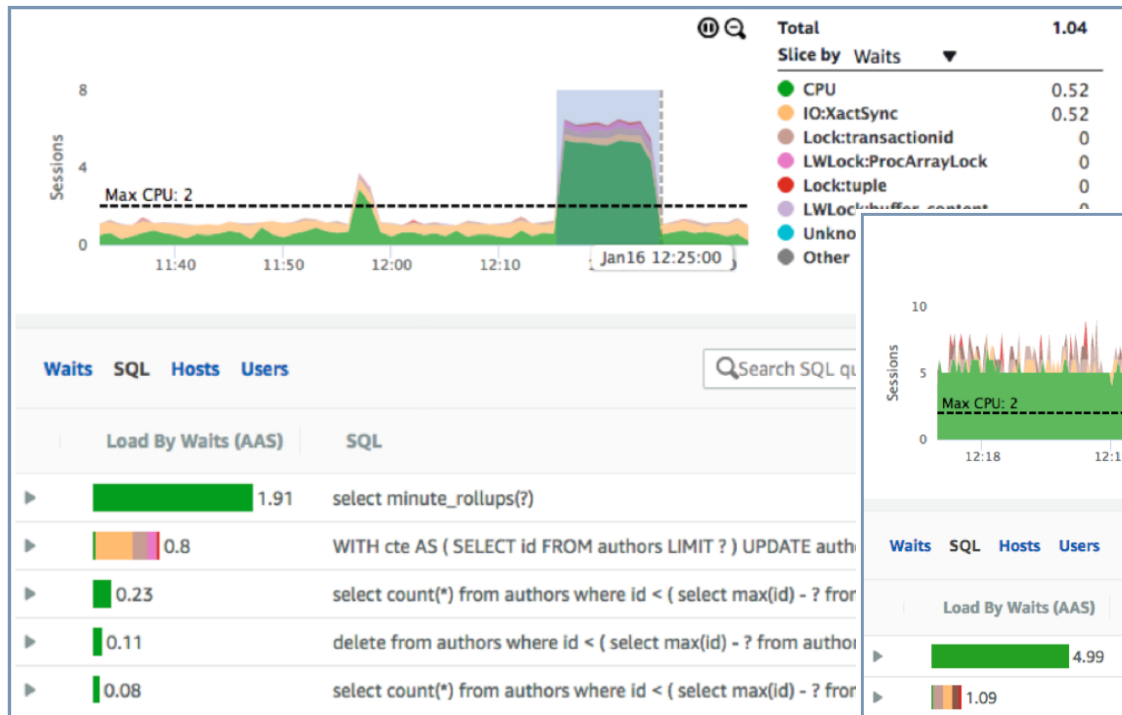
Zoom in by clicking and dragging along timeline
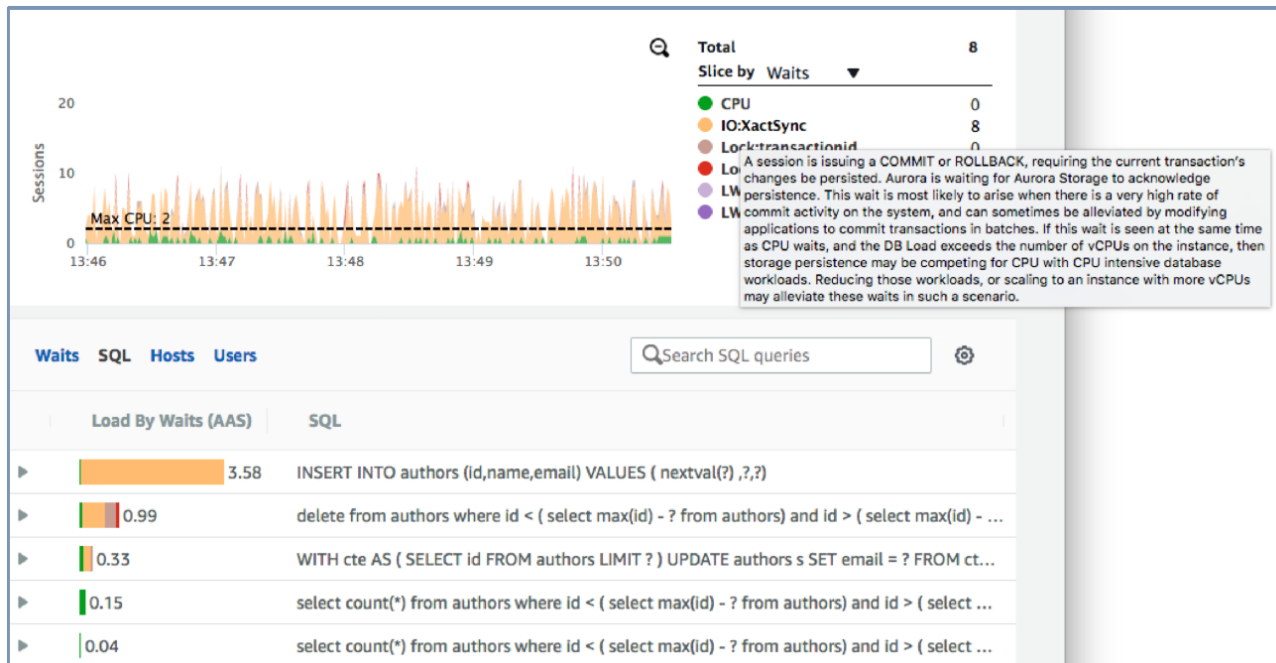
Identify problem statement

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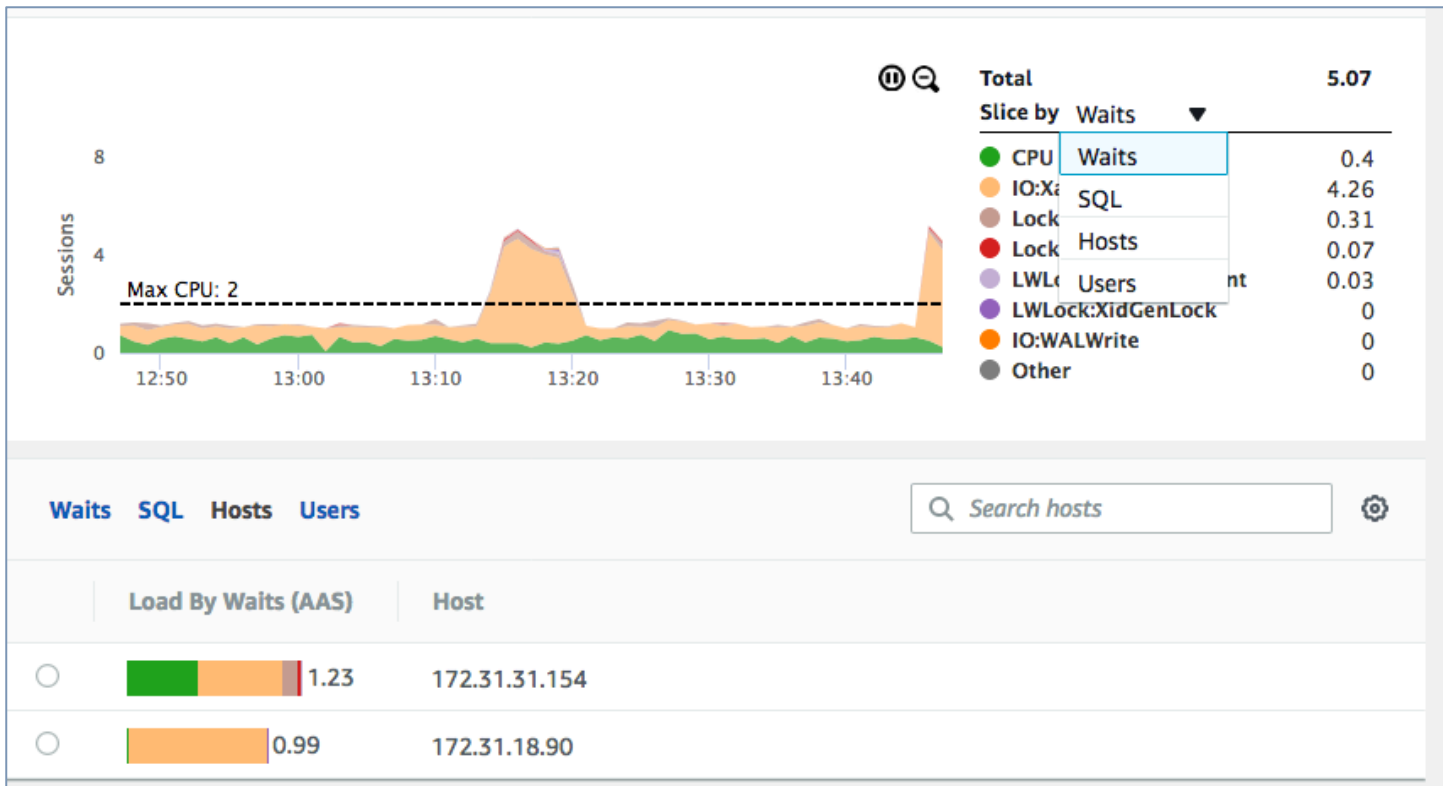# Performance Insights Example: Wait Bottleneck

Get contextual help for wait events

Identify problem statement

Other dimensions

Top host by SQL statement

Performance Insights – Access

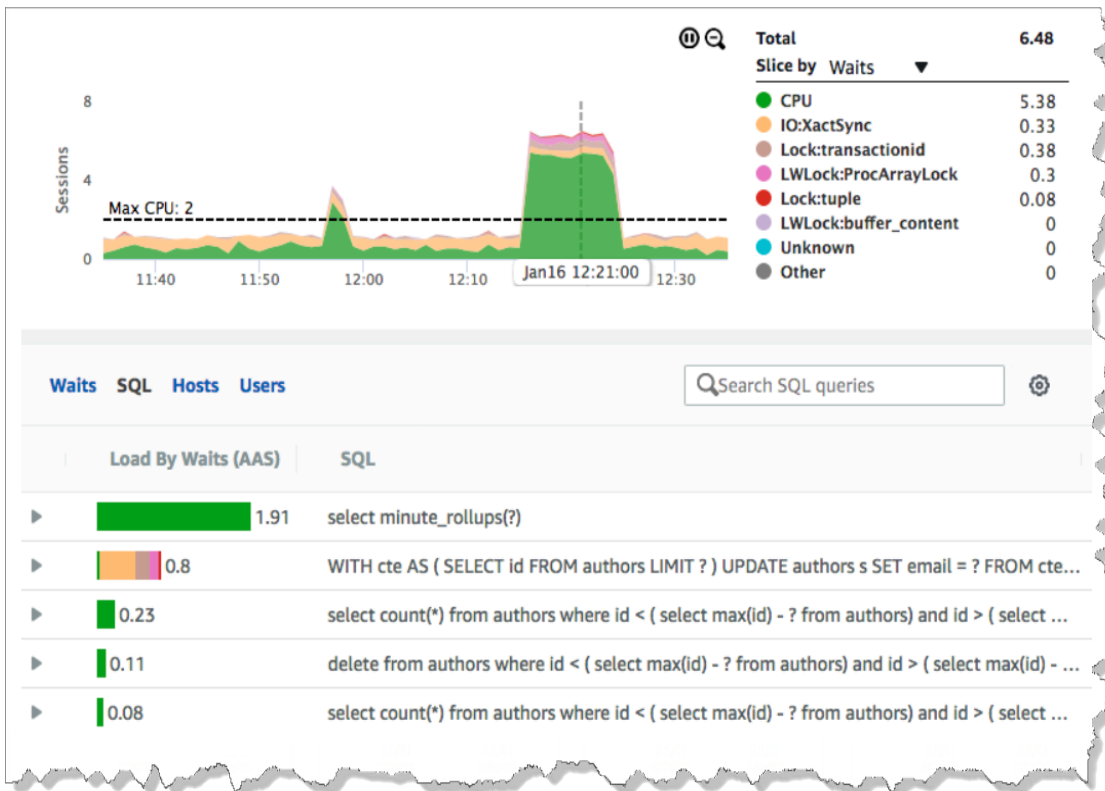In the RDS console there are two bar graphs (CPU & Sessions)

- These give a quick view of overall state of your RDS instance.
- Visible in the list of databases and details page
- Clicking on the link for Sessions brings you to Performance Insights

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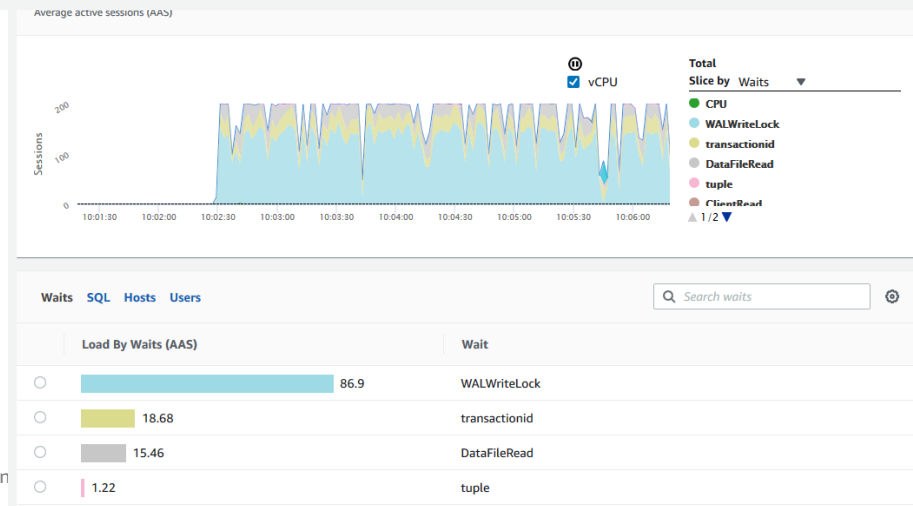
What is Coming

- SQL execution plan
- SQL stats

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Summary: Amazon RDS Performance Insights

- DB load: Average active sessions
  - Identifies database bottlenecks
  - Easy
  - Powerful
- Top SQL
  - Identifies source of bottleneck
- Enables problem discovery
  - Adjustable time frame
  - Hour, day, week, and longer

Publishing Logs to Cloud Watch Logs

- You can configure your Amazon Aurora database engine to publish log data to a log group in Amazon CloudWatch Logs.

- With CloudWatch Logs, you can perform real-time analysis of the log data, and use CloudWatch to create alarms and view metrics.

- You can use CloudWatch Logs to store your log records in highly durable storage, which you can manage with the CloudWatch Logs Agent

- With CloudWatch Logs, you can analyze the log data, and use CloudWatch to create alarms and view metrics and store your log records in highly durable storage.

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Thank you!