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DAT402

Using Performance Insights to Optimize Database Performance

Kyle Hailey
Principal Product Manager
Amazon RDS

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Agenda

What is Performance Insights?

Sampling

Average active sessions (AAS)

Bottleneck analysis

Exploring Performance Insights

What is Performance Insights?

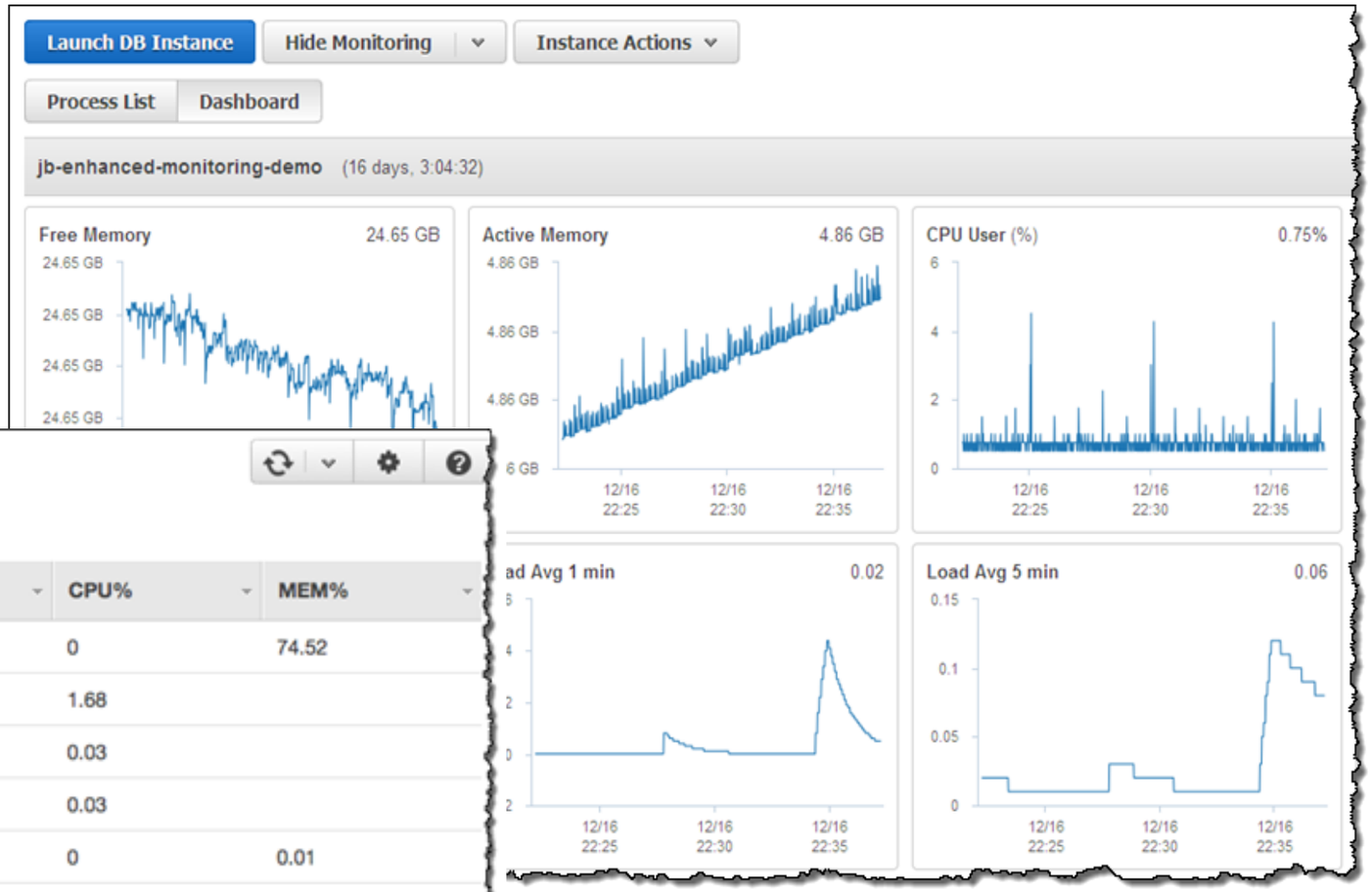
What is Amazon RDS Performance Insights?

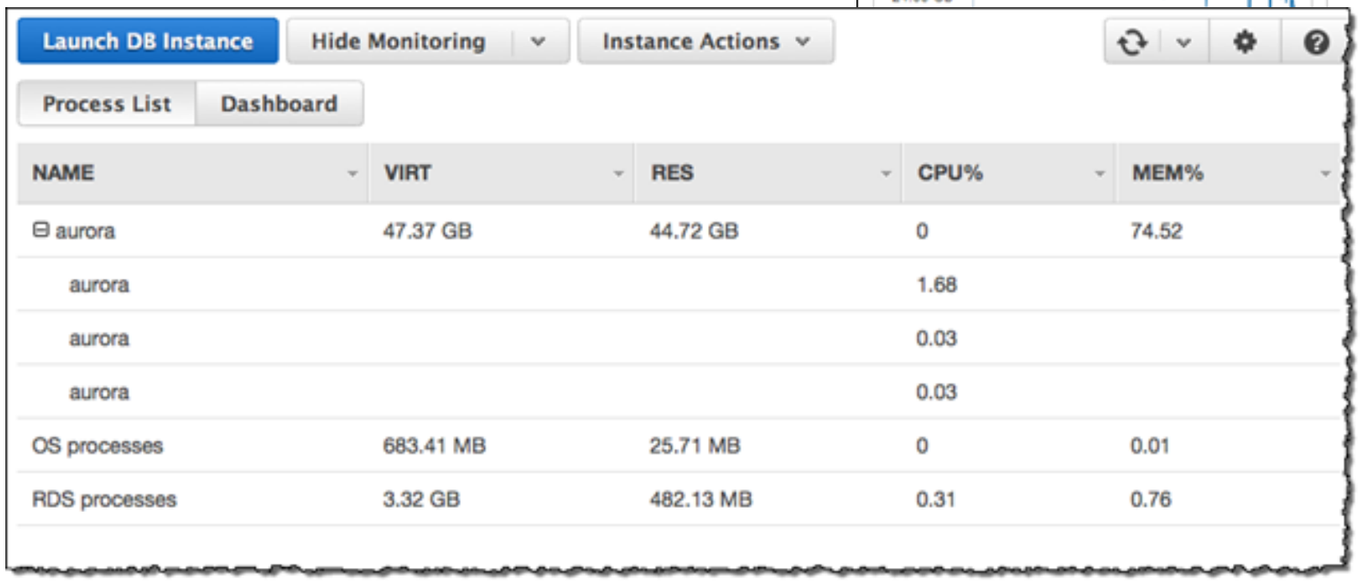
Customers asked for

- Visibility into performance of Amazon Relational Database Service (Amazon RDS) databases
  - Want to optimize cloud database workloads
- Easy tool
  - Often only part-time DBA or no DBA
- Single pane of glass

First step: Amazon RDS Enhanced Monitoring

- Released 2016
  - OS metrics
  - Process/Thread list
  - Up to 1 second granularity





NAME	VIRT	RES	CPU%	MEM%
⊟ aurora	47.37 GB	44.72 GB	0	74.52
aurora			1.68	
aurora			0.03	
aurora			0.03	
OS processes	683.41 MB	25.71 MB	0	0.01
RDS processes	3.32 GB	482.13 MB	0.31	0.76

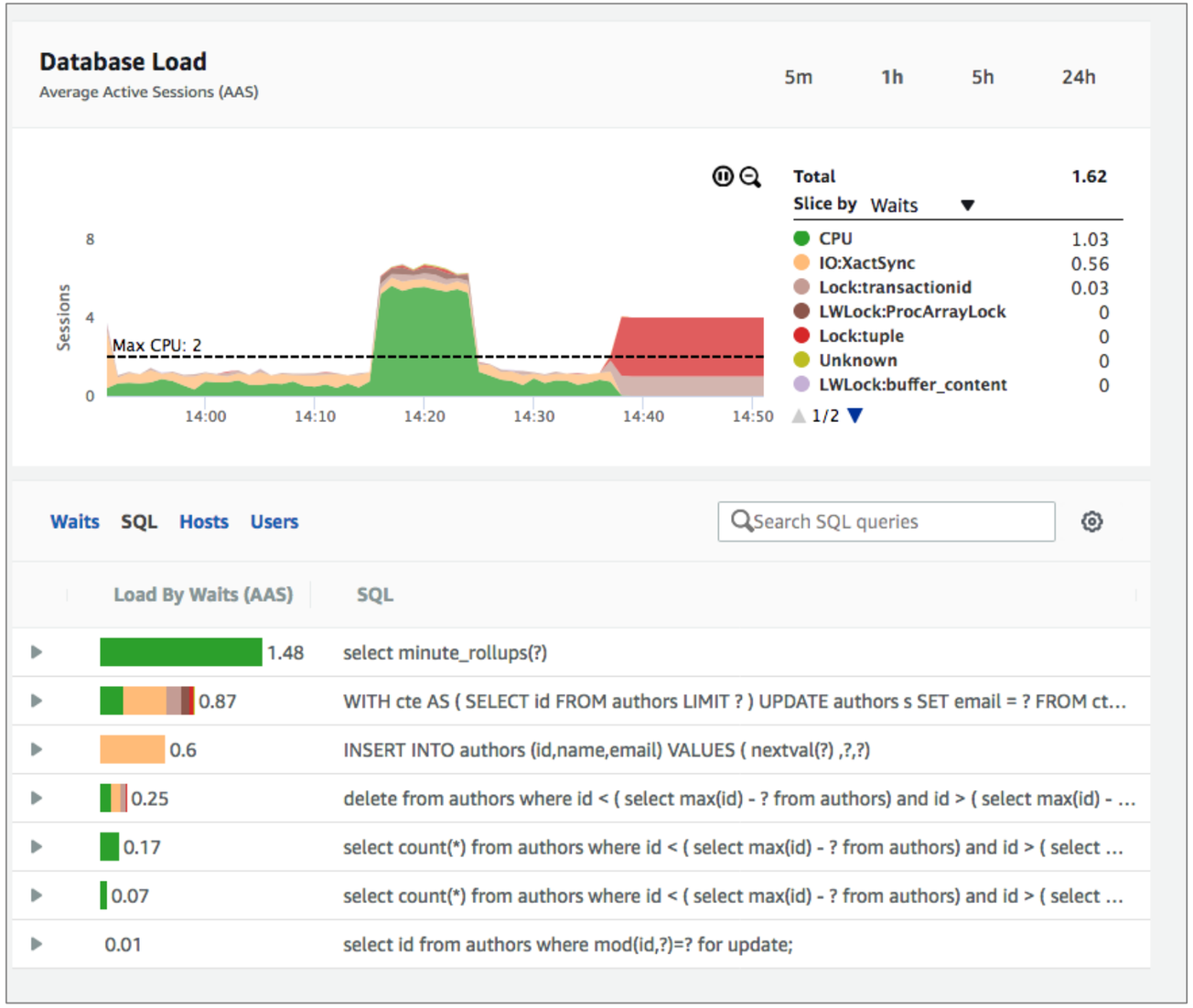
Introducing: Performance Insights

- Dashboard
  - DB load
  - Adjustable timeframe
  - Filterable by attribute (SQL, User, Host, Wait)
  - SQL causing load
- Phased Amazon RDS delivery
  - Amazon Aurora, Amazon RDS for MySQL, PostgreSQL, Oracle, SQL Server, MariaDB
- Guided discovery of performance problems
  - For both beginners & experts
  - Core metric “**database load**”

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)

Performance Insights dashboard



Sampling

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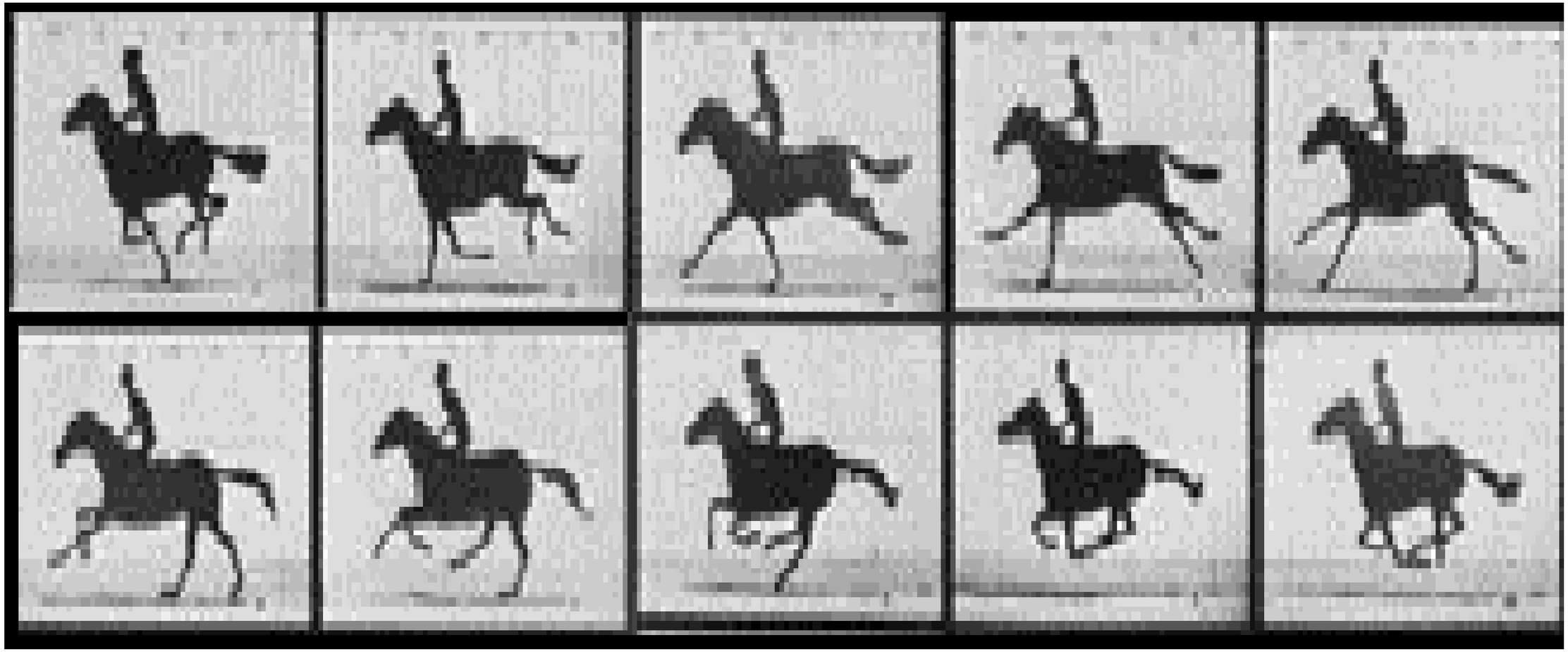
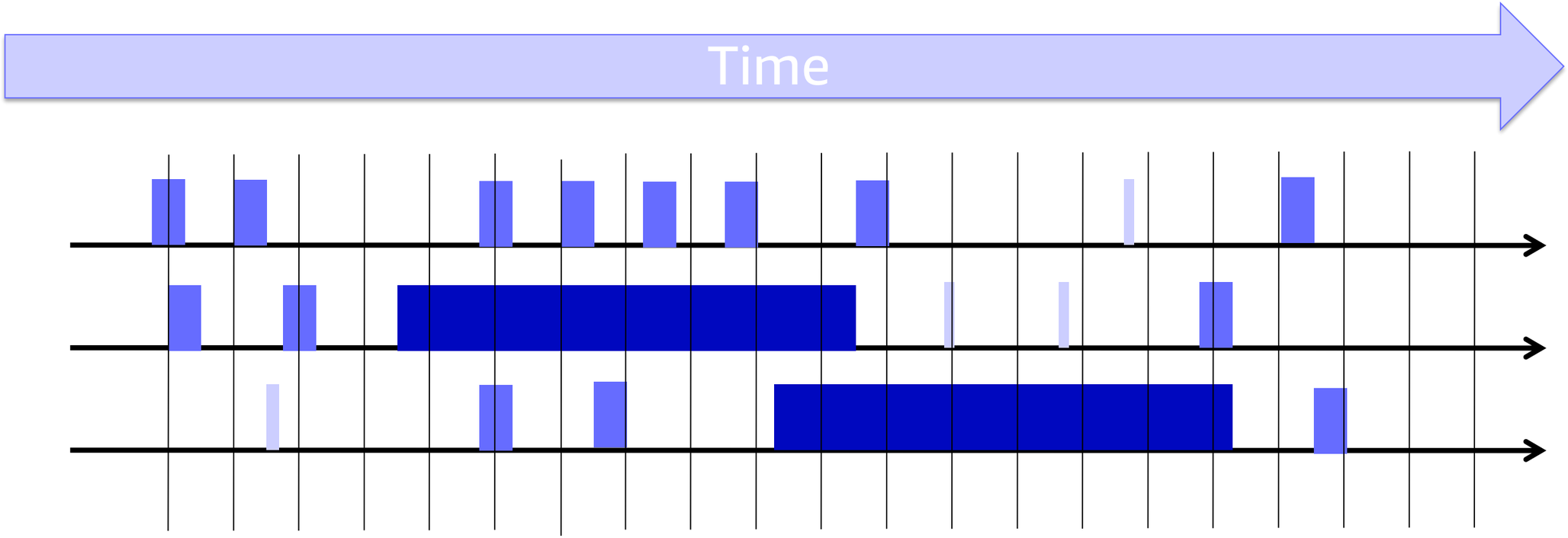
Sampling is like film

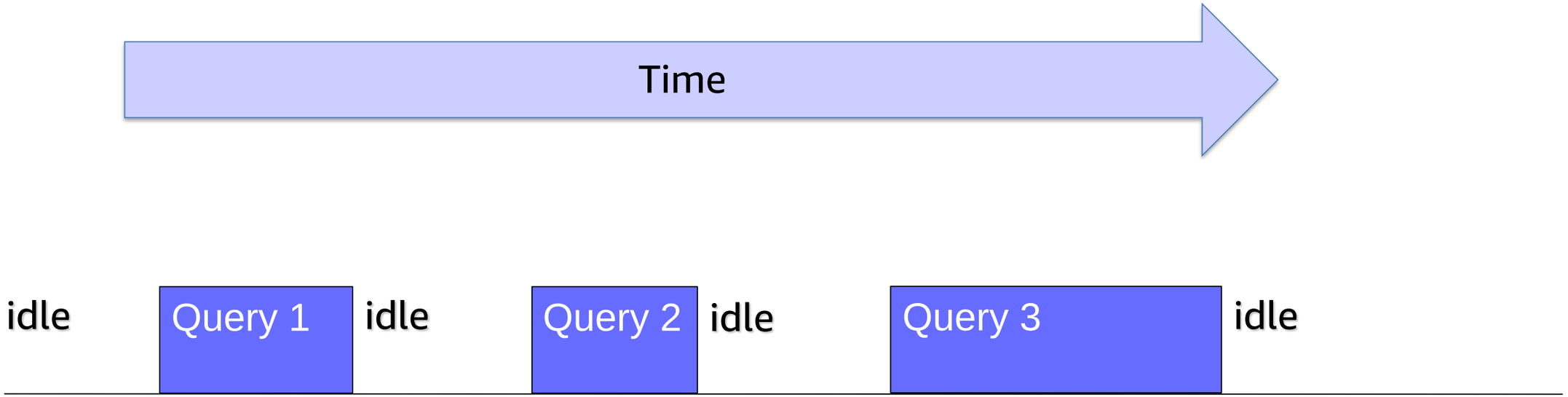


Sampling every second

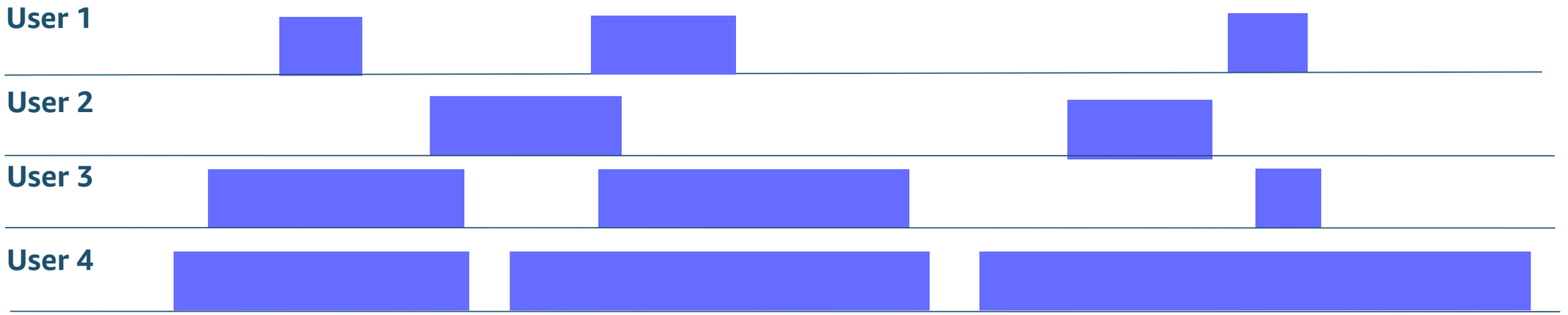


Fast query run rarely
Query run often
Slow query

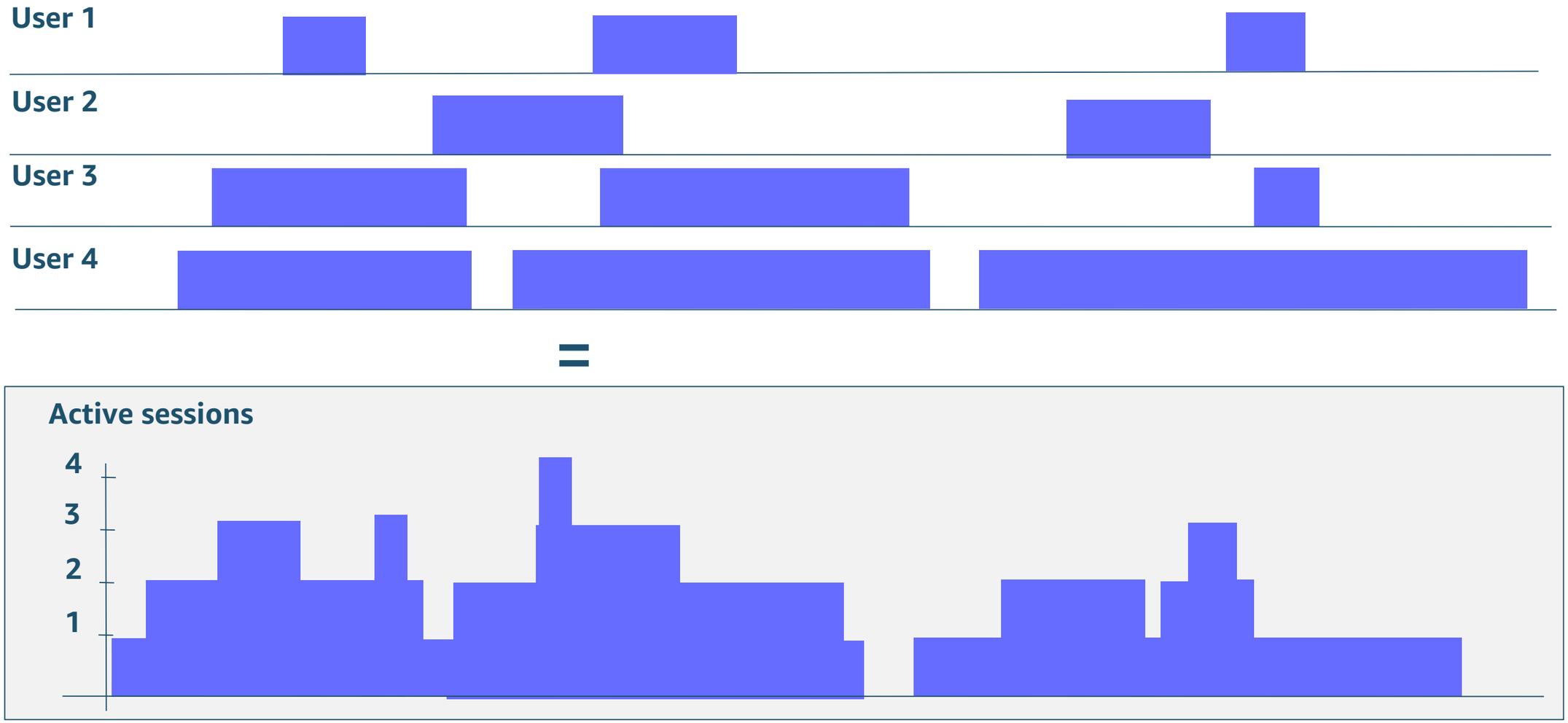
Active session state



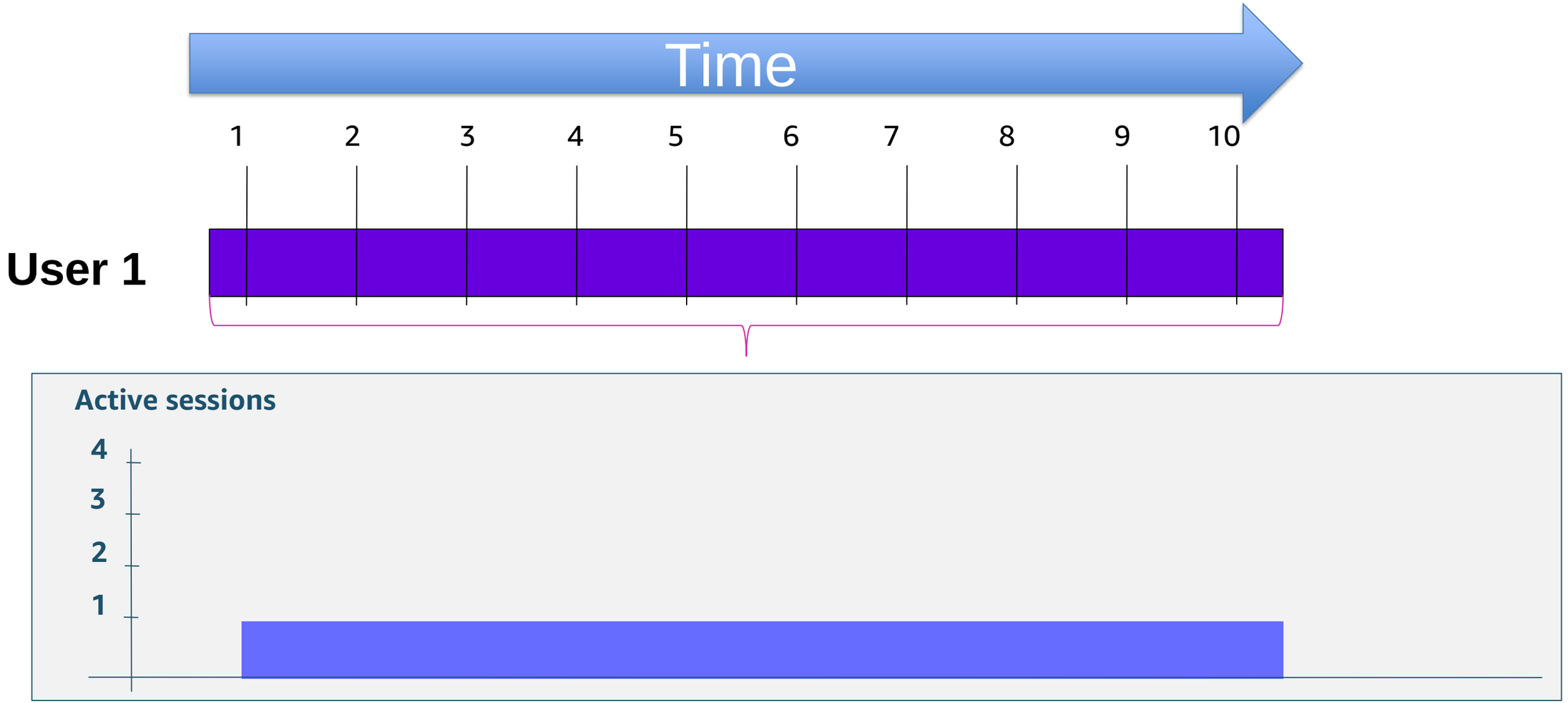
AAS load graph



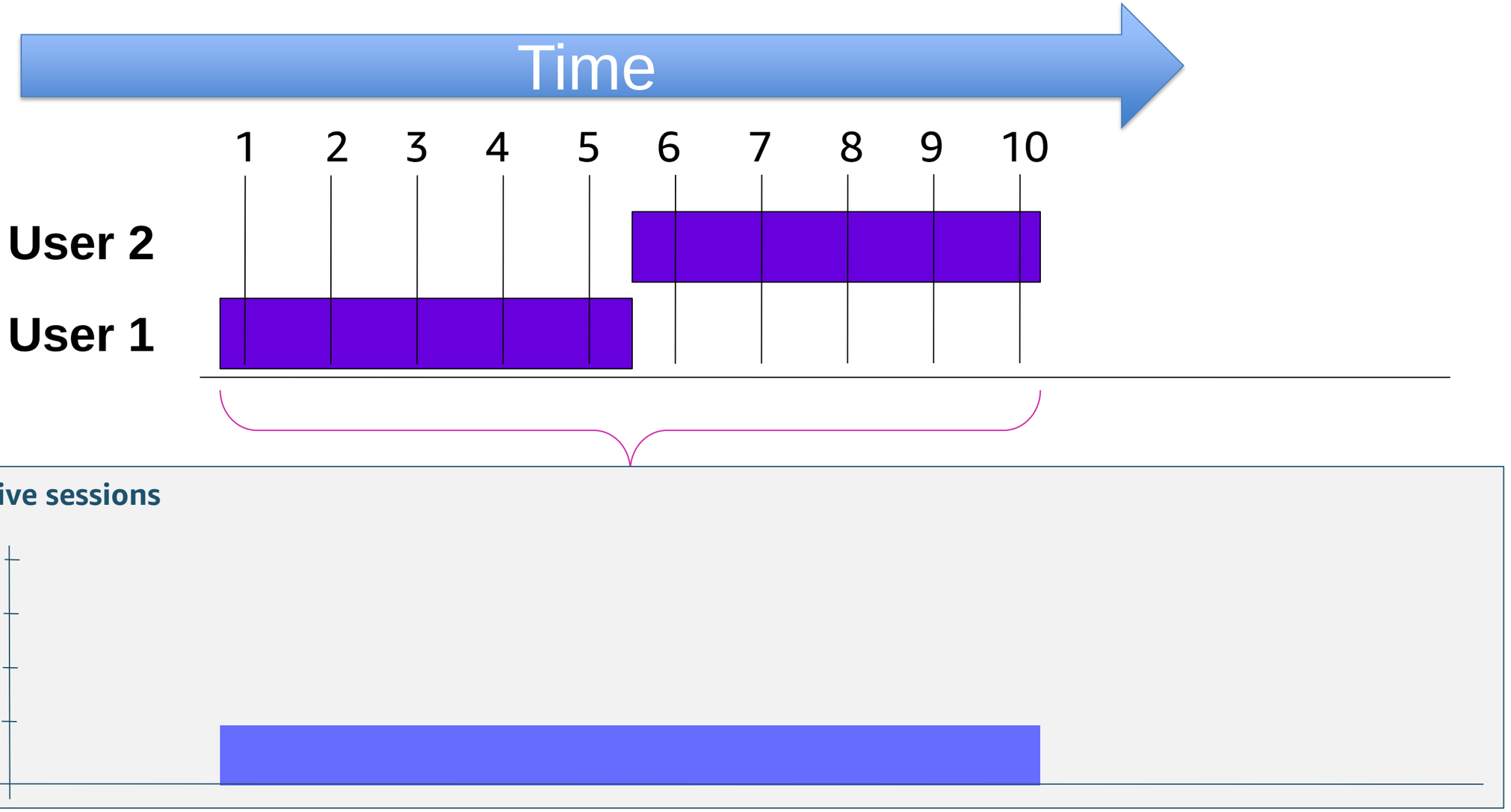
AAS load graph



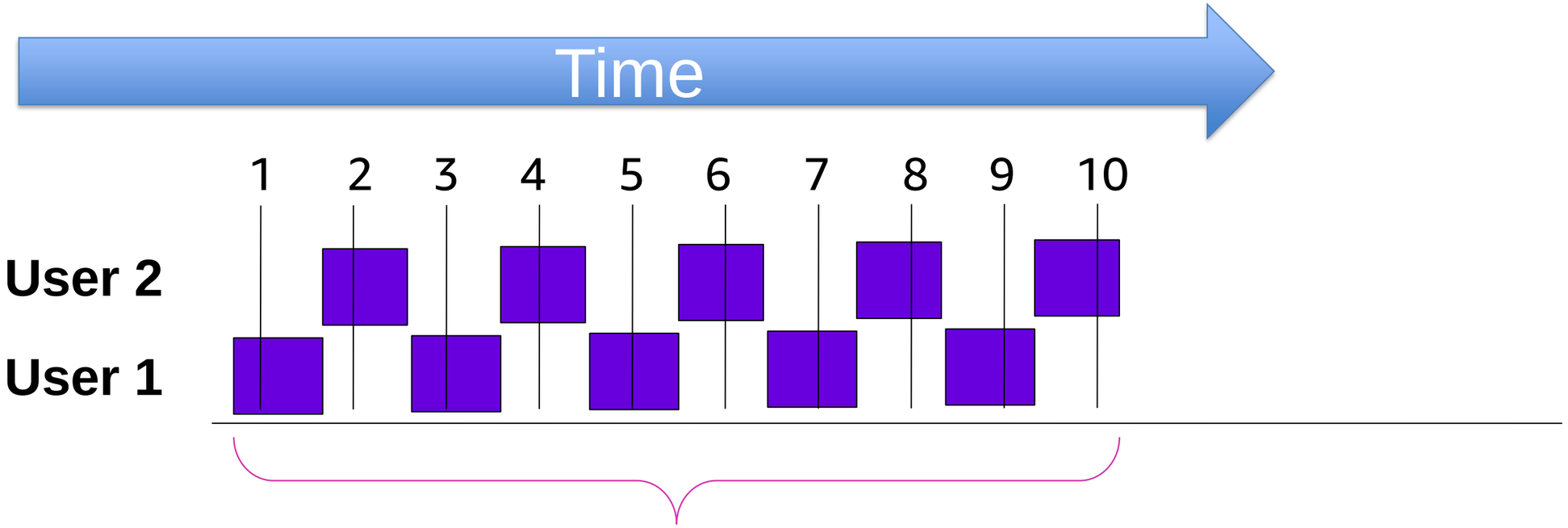
Active session

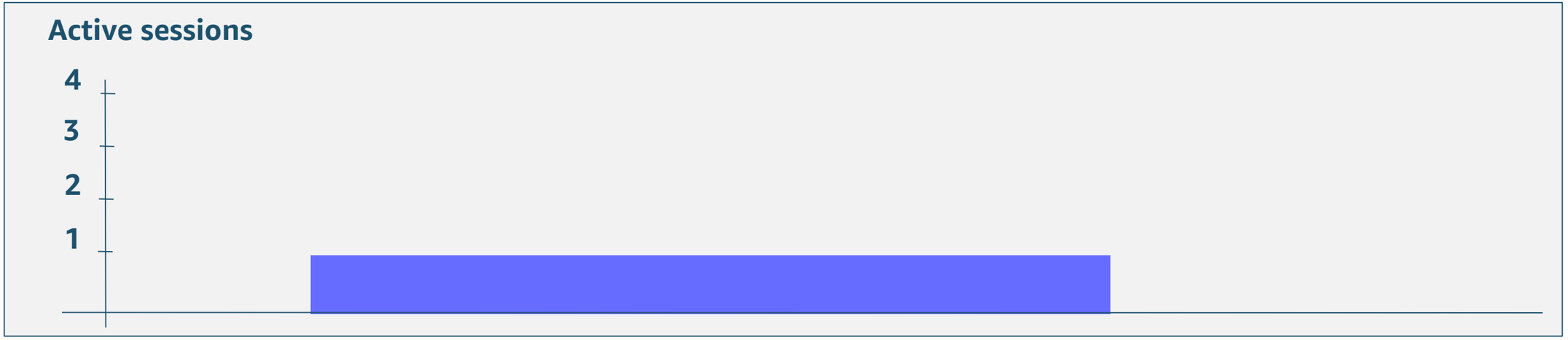


Active session

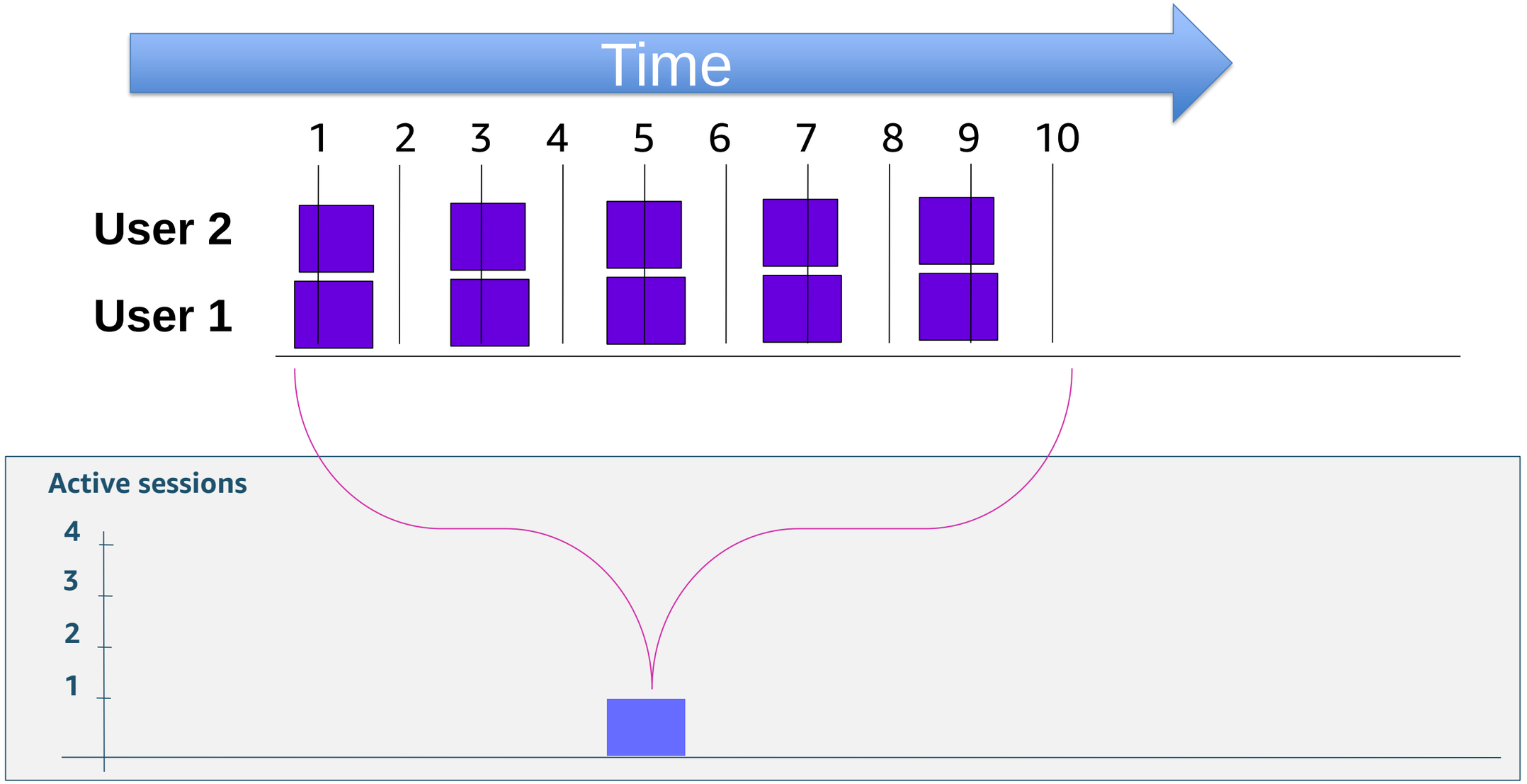


Active session

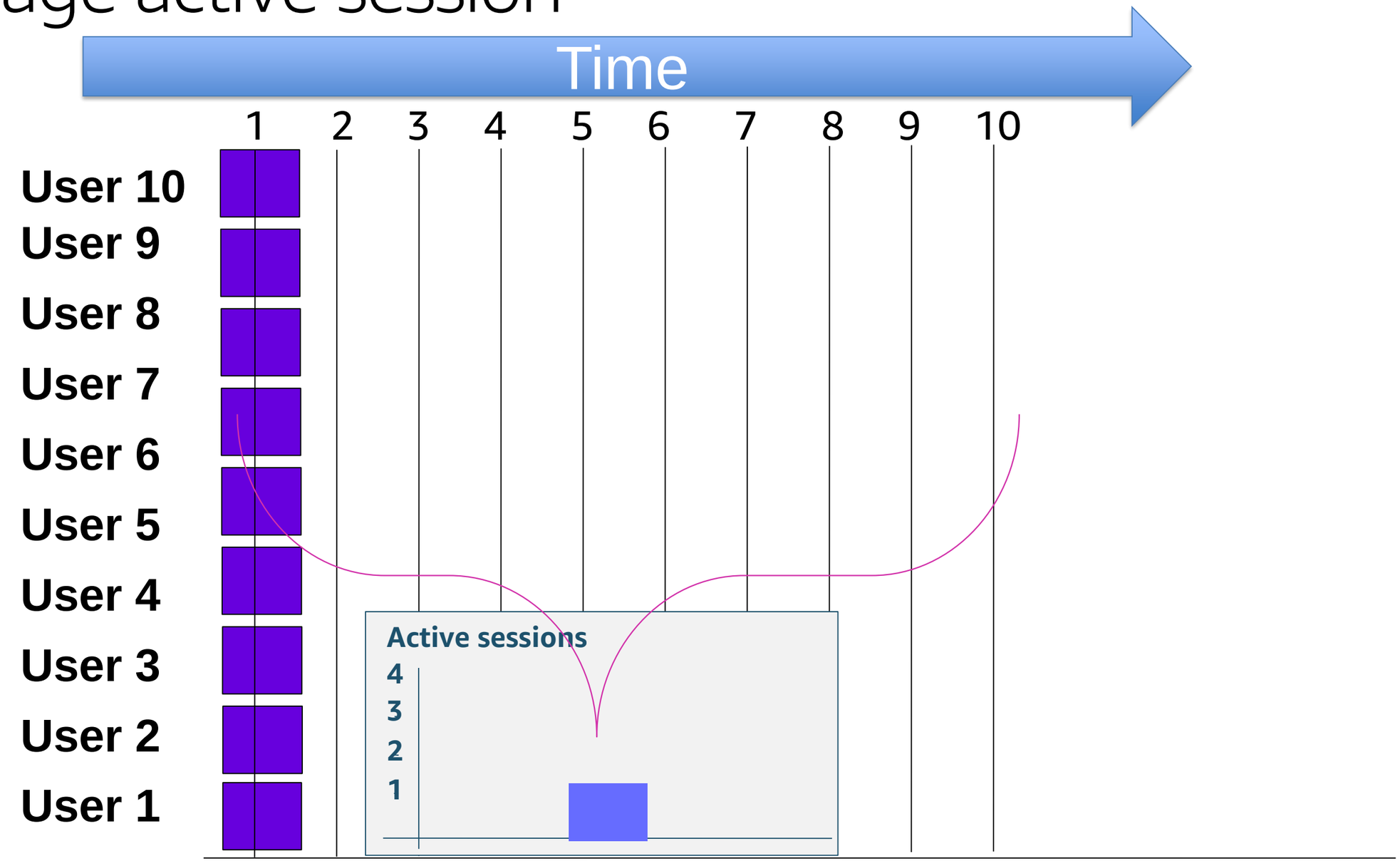




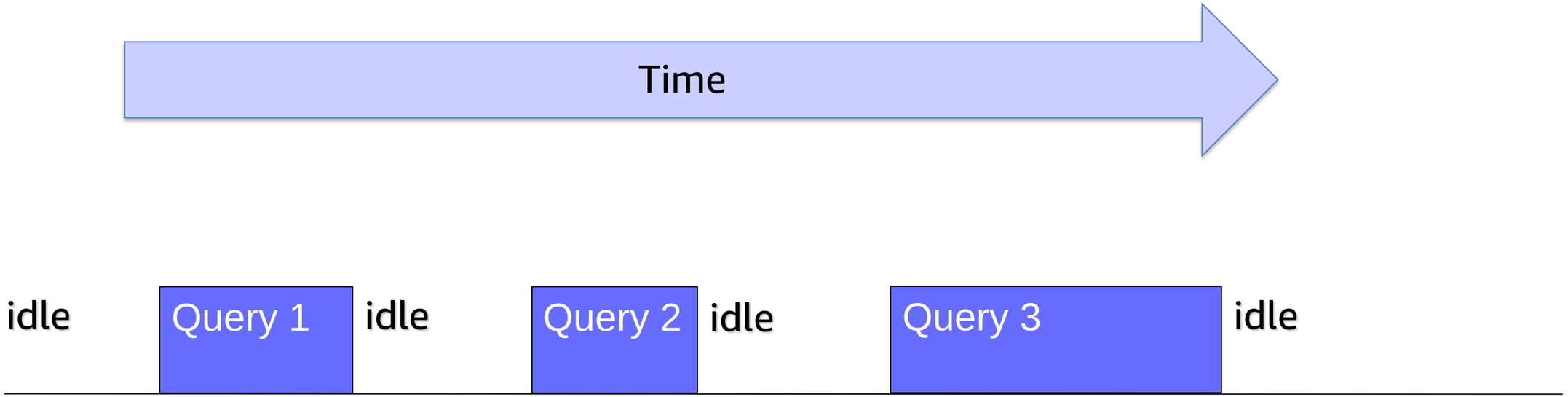
Average active session



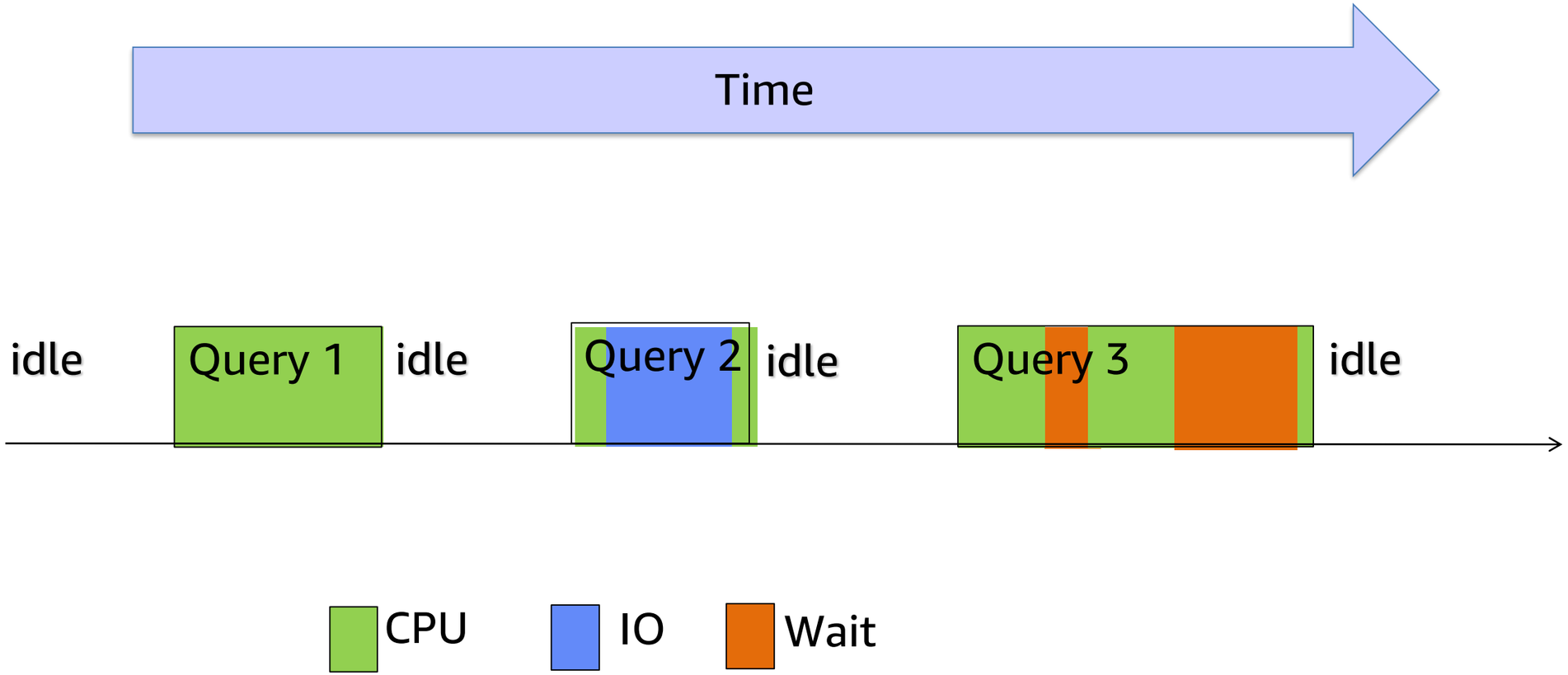
Average active session



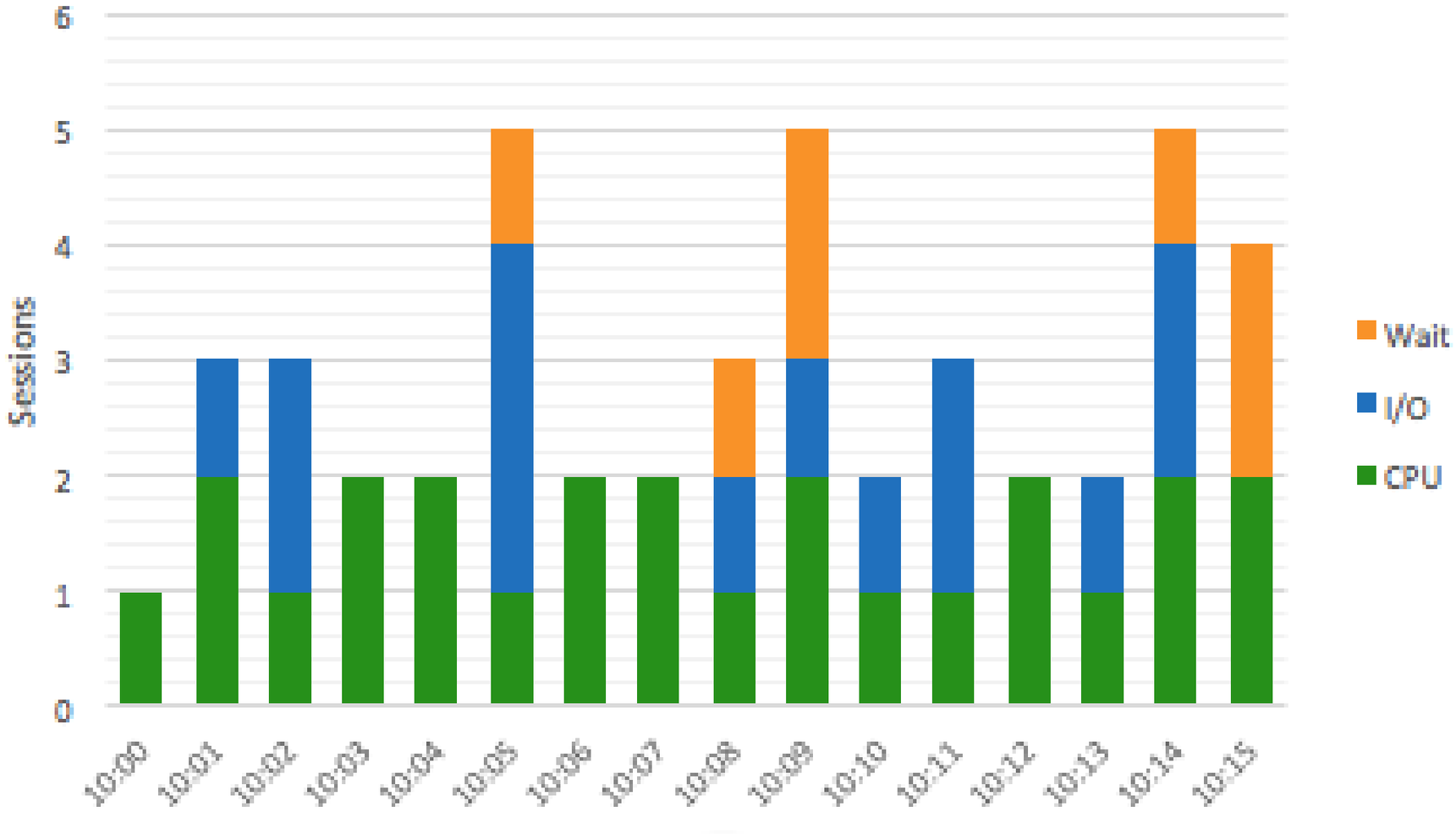
Active session state



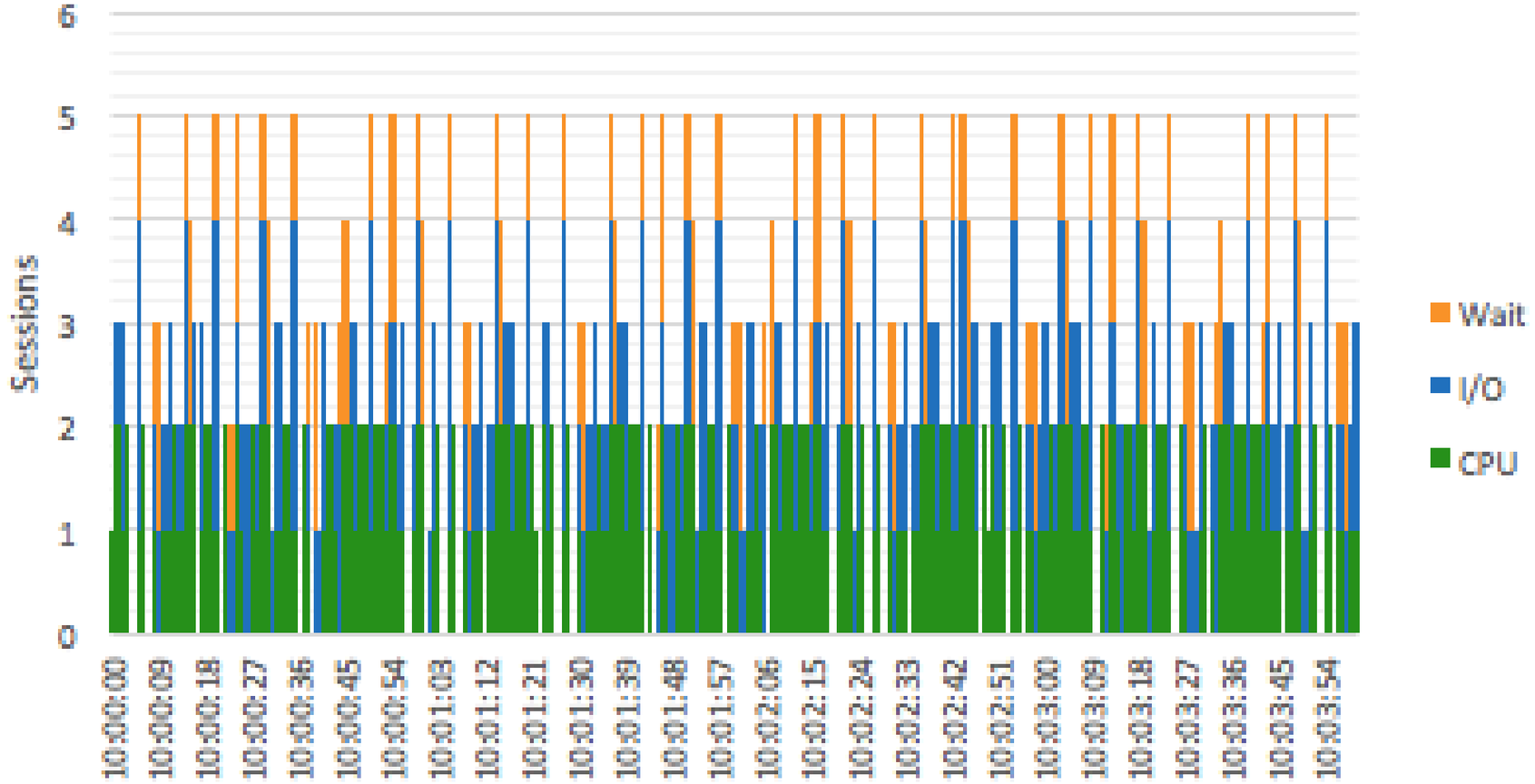
Active session state



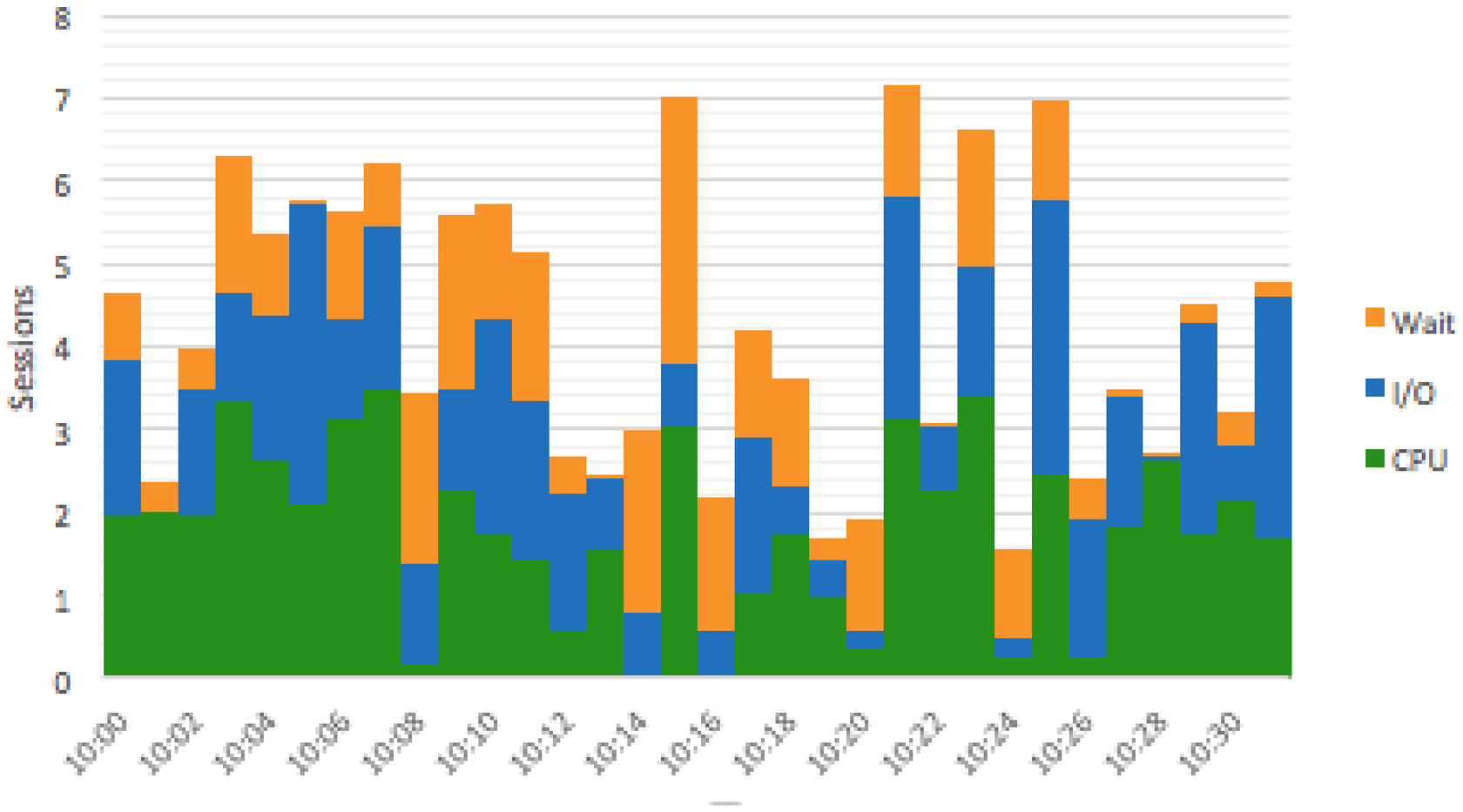
AAS by session state



Showing per second samples

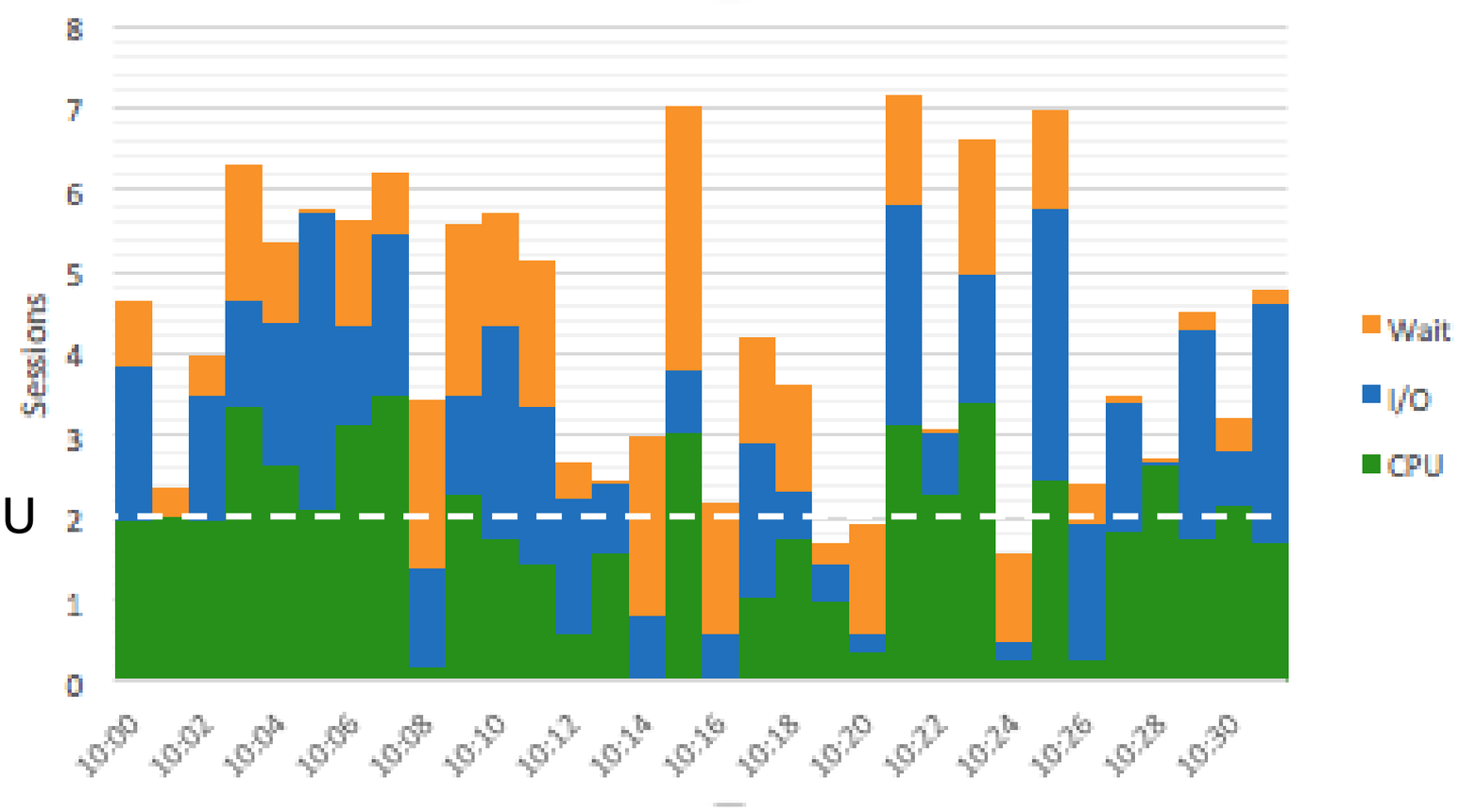


AAS over one minute averages



AAS compared to max CPU

Max vCPU

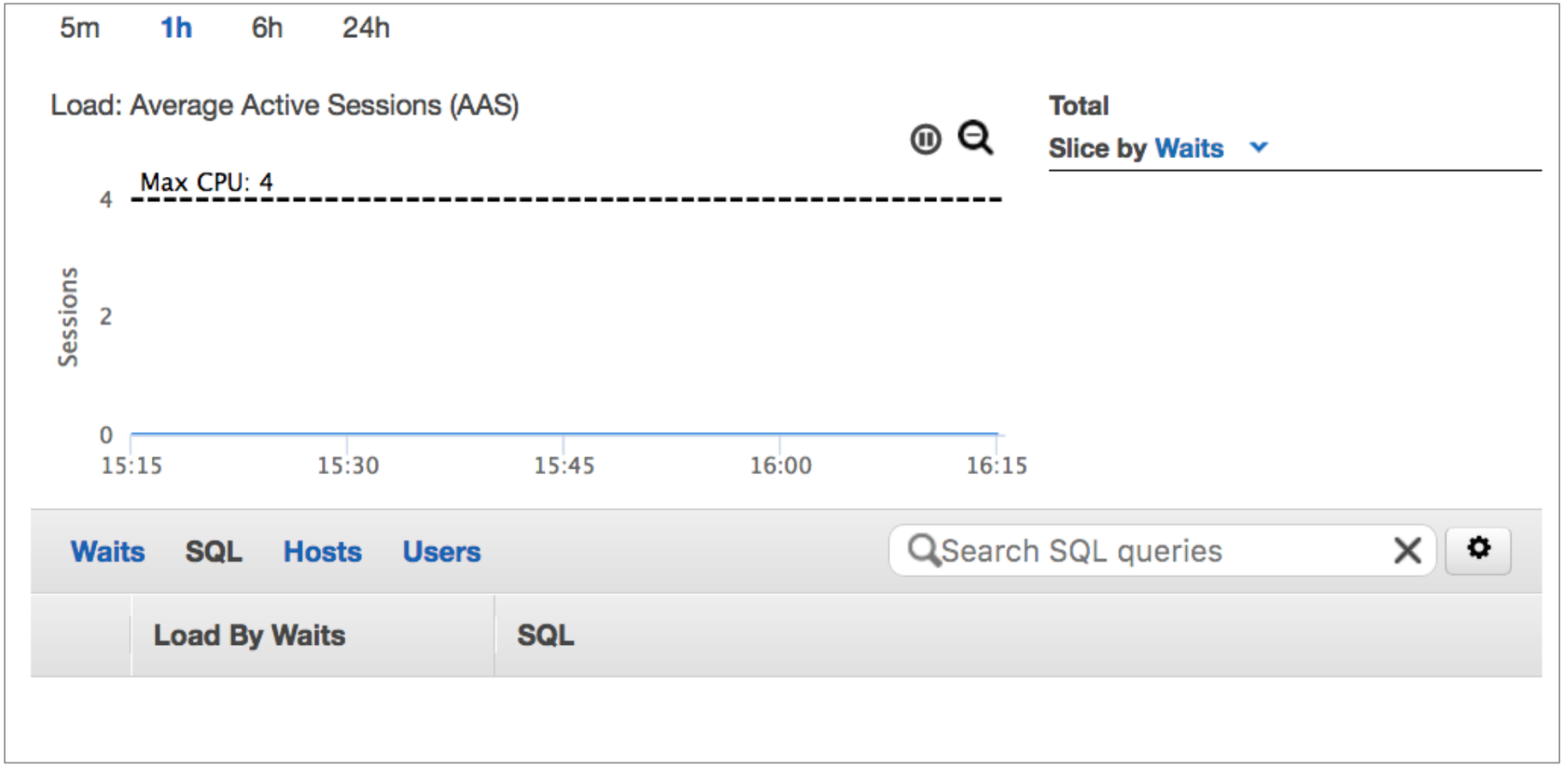


Average active sessions

AAS rules: Using CPU count as 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

When users say the database is slow …

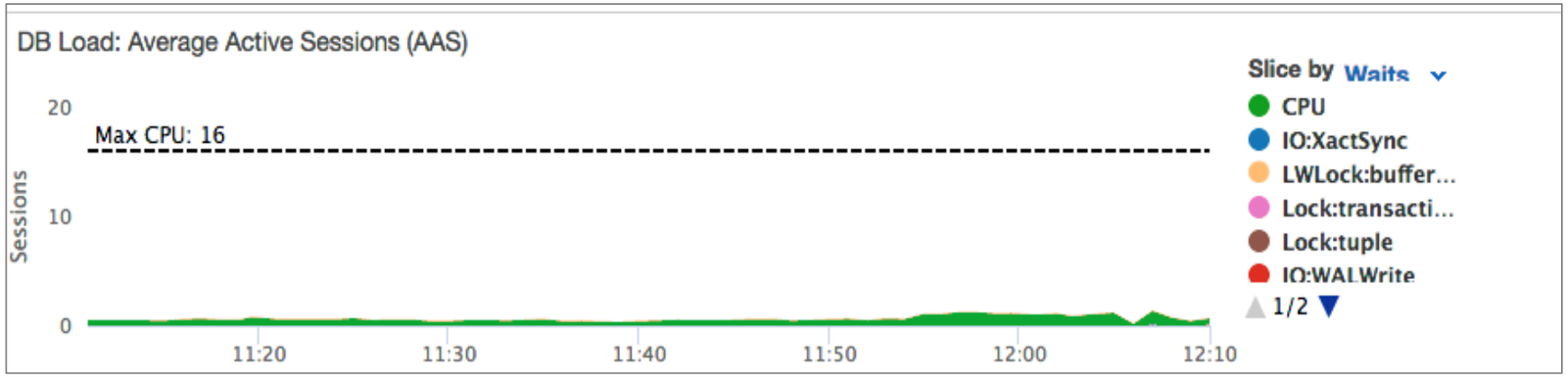


AAS = 0

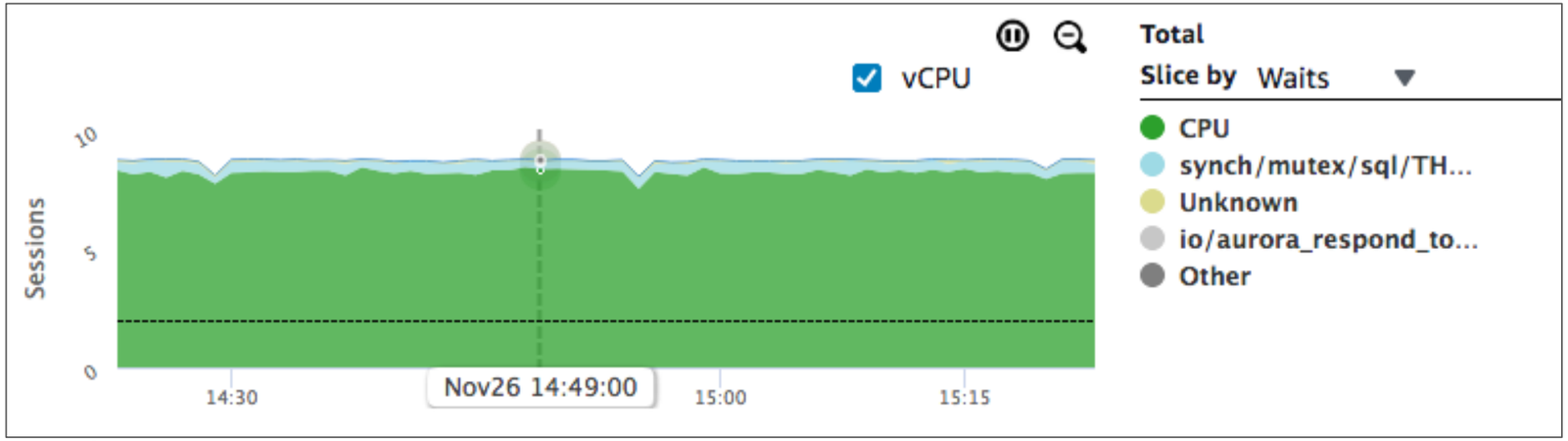
You prove that it's not the database

Also useful for sizing

- If CPU load significantly less than #vCPU then oversized



- If CPU load Is > #vCPU undersized



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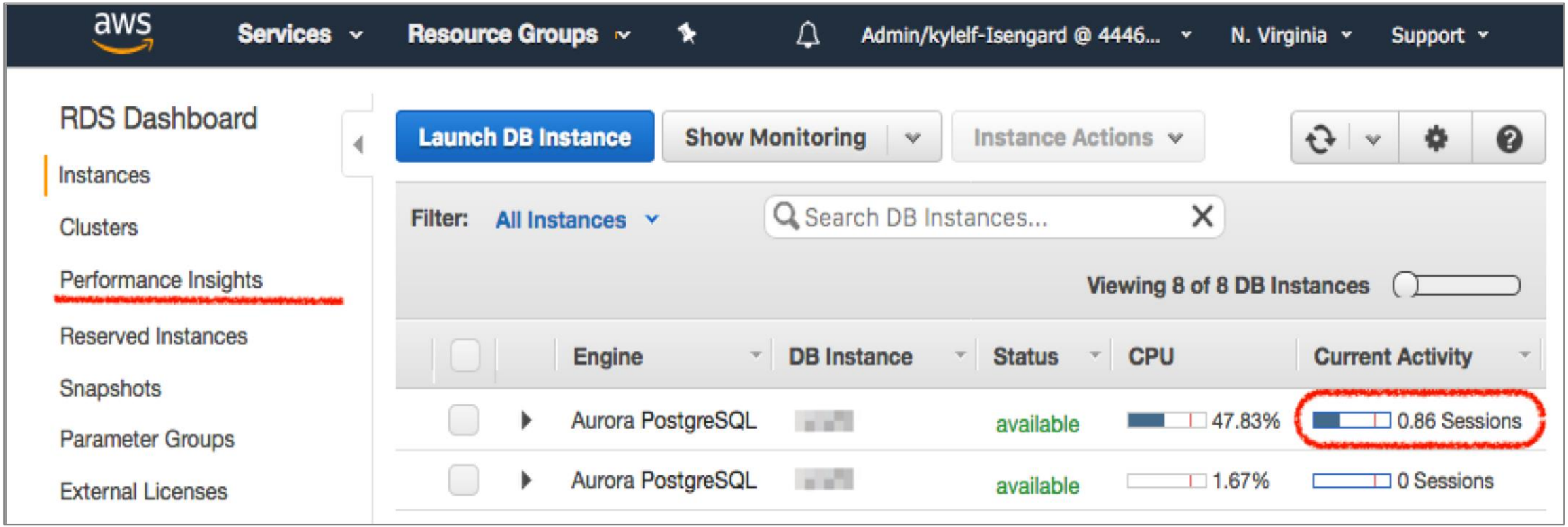
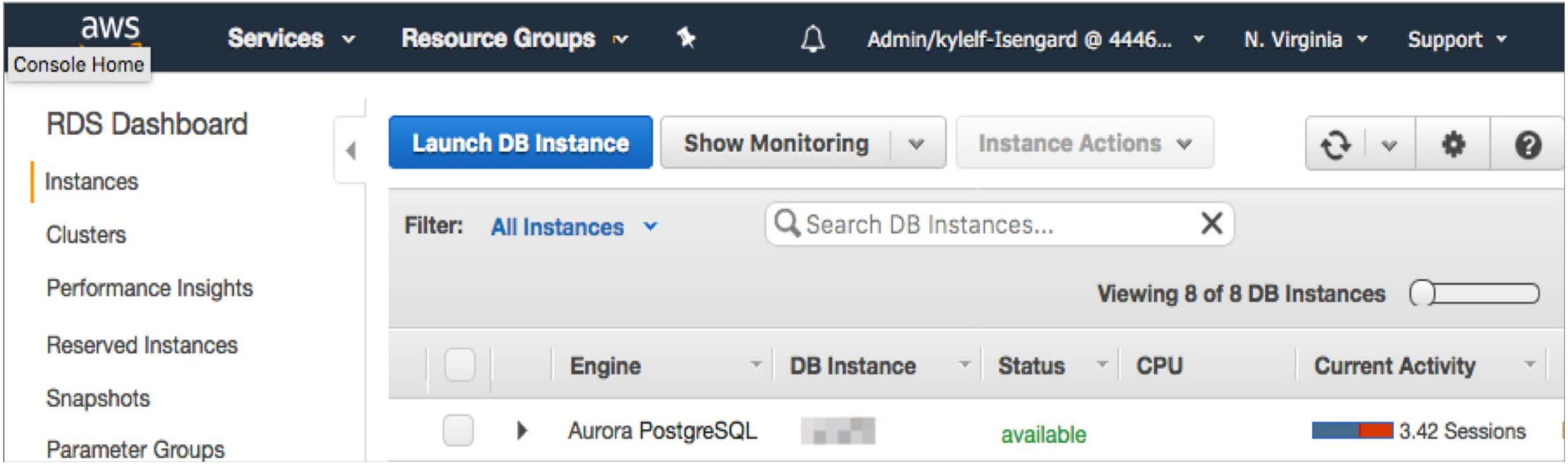
Accessing Performance Insights

Accessing Performance Insights

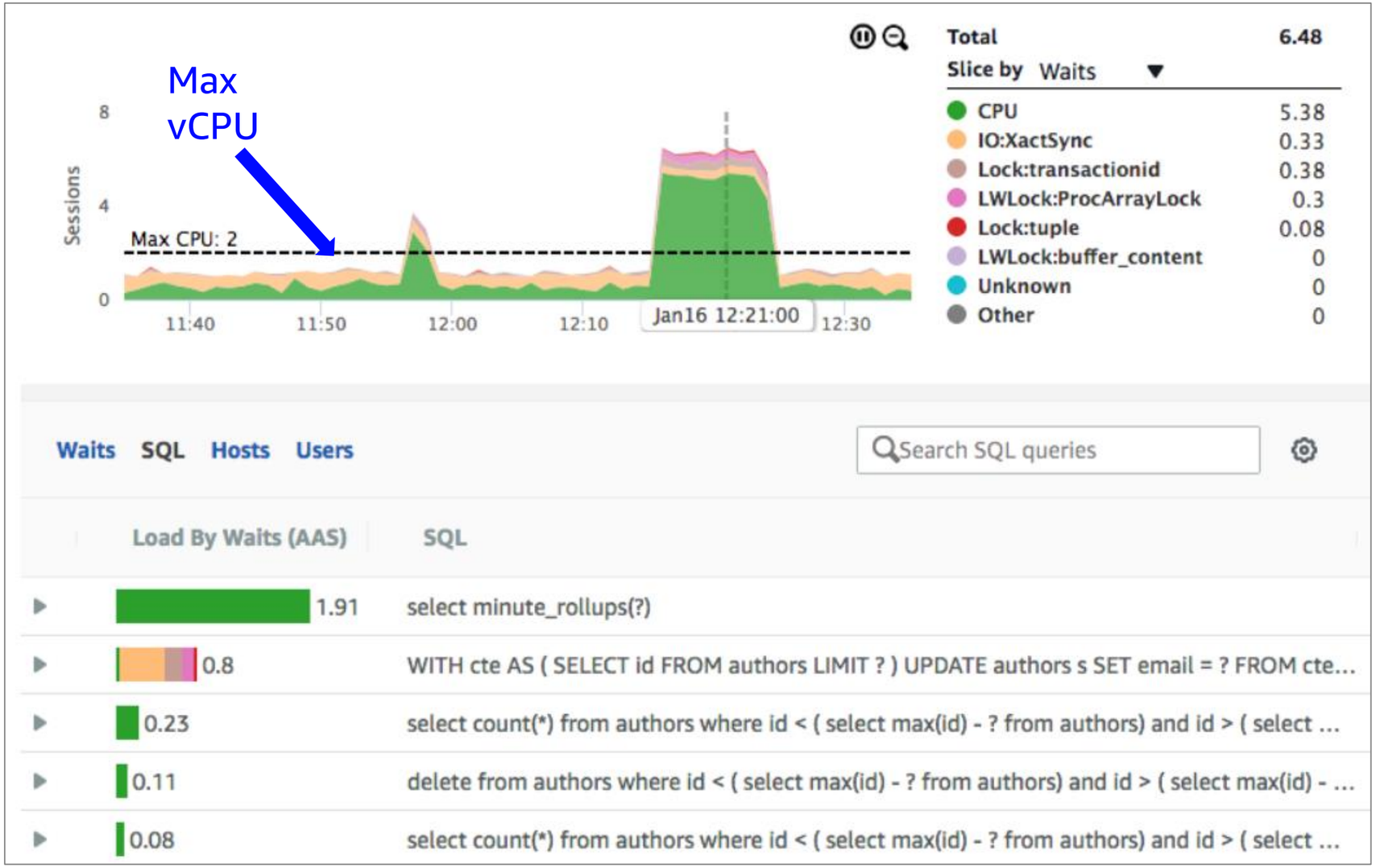


Access to Performance Insights

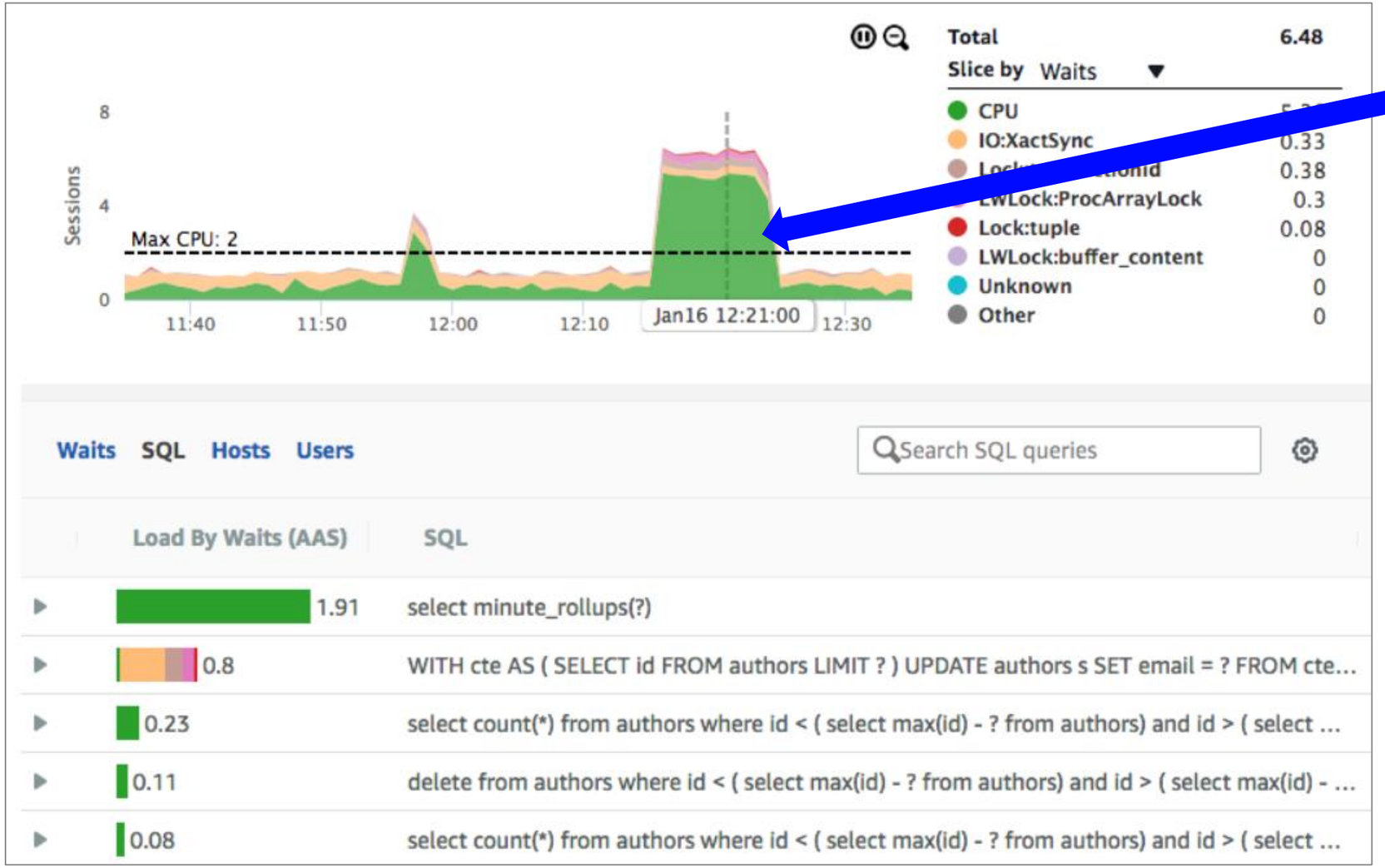


Customer use case: CPU bottleneck

Max vCPU

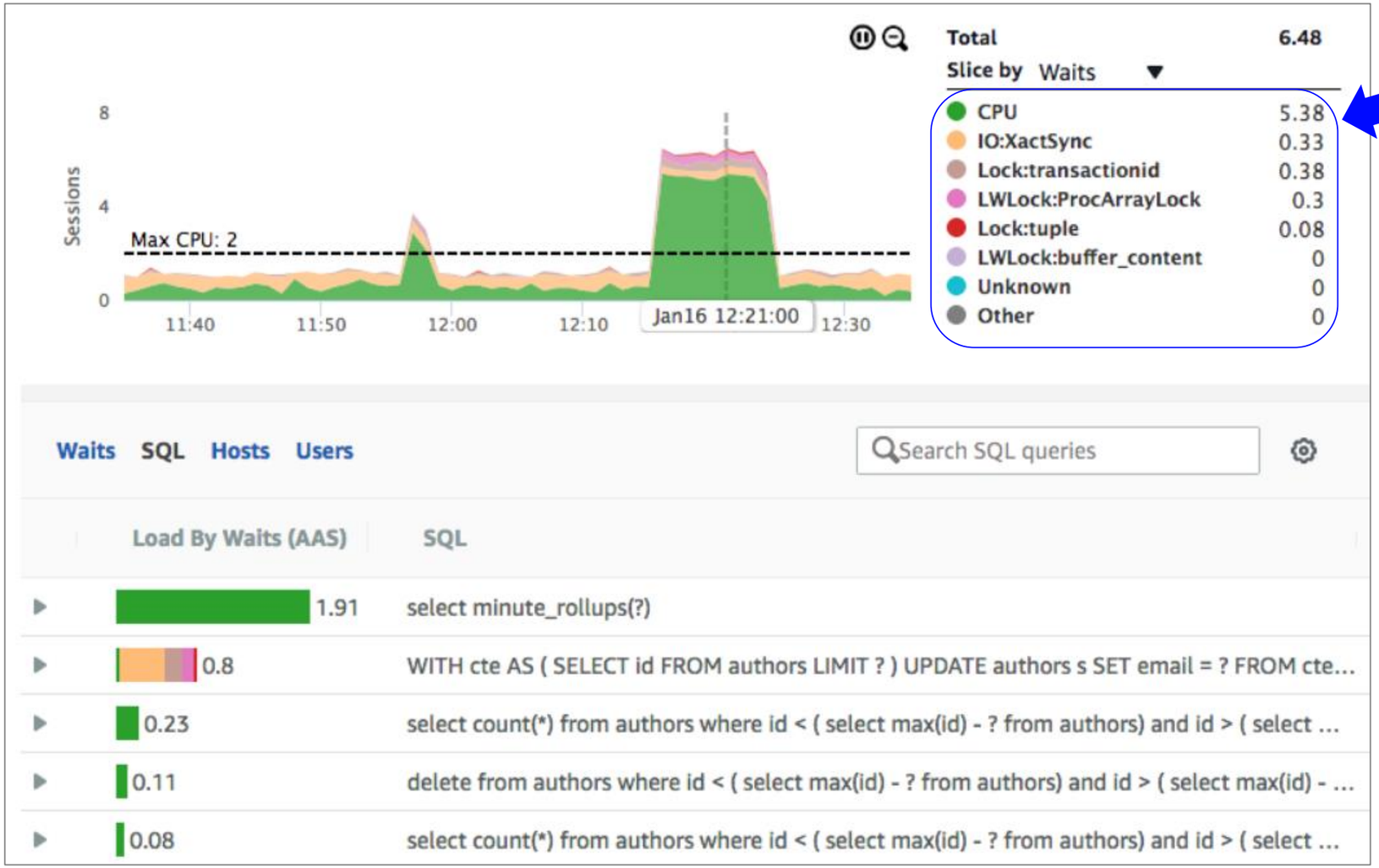


CPU bottleneck



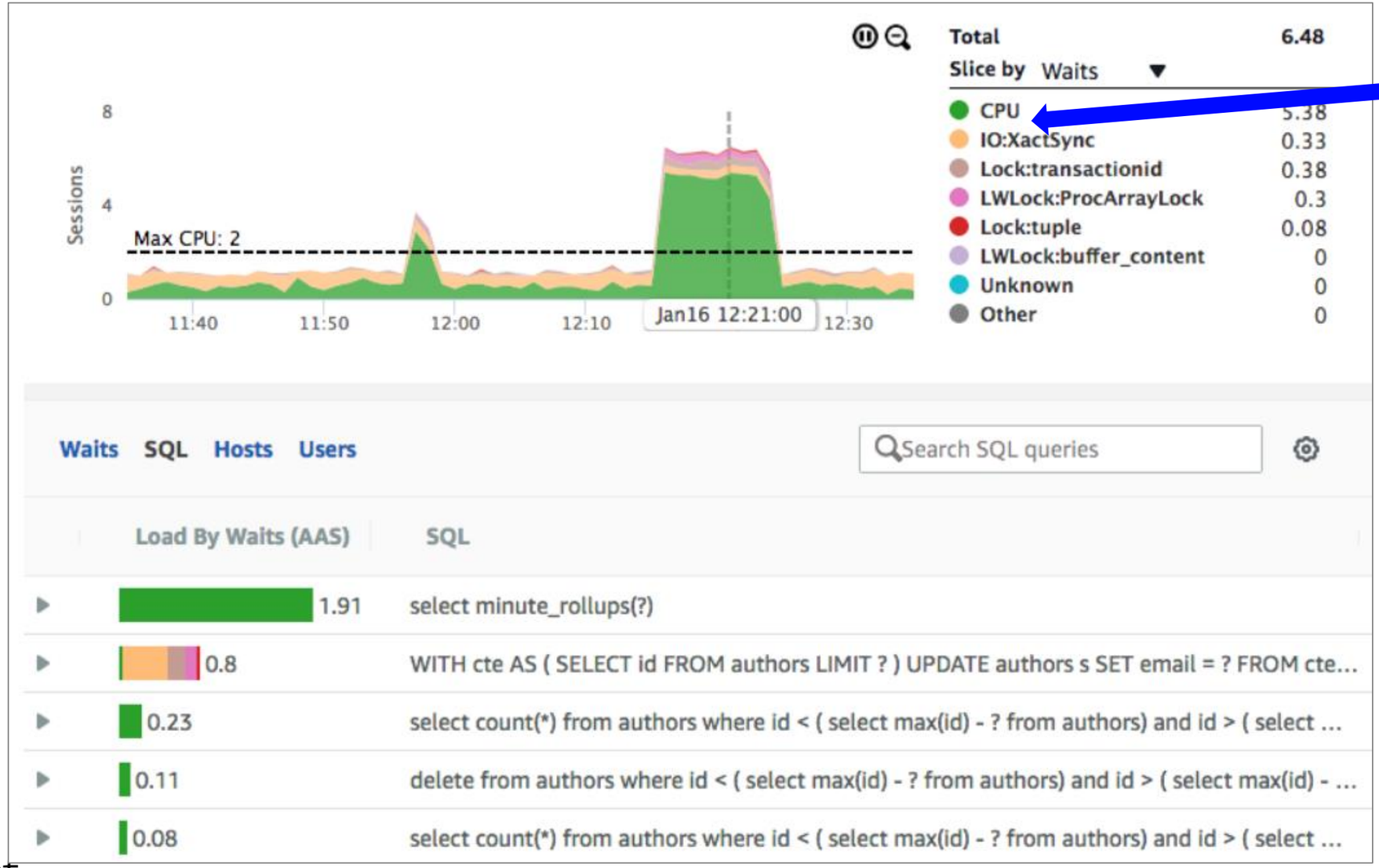
Bottleneck

Customer use case: CPU bottleneck



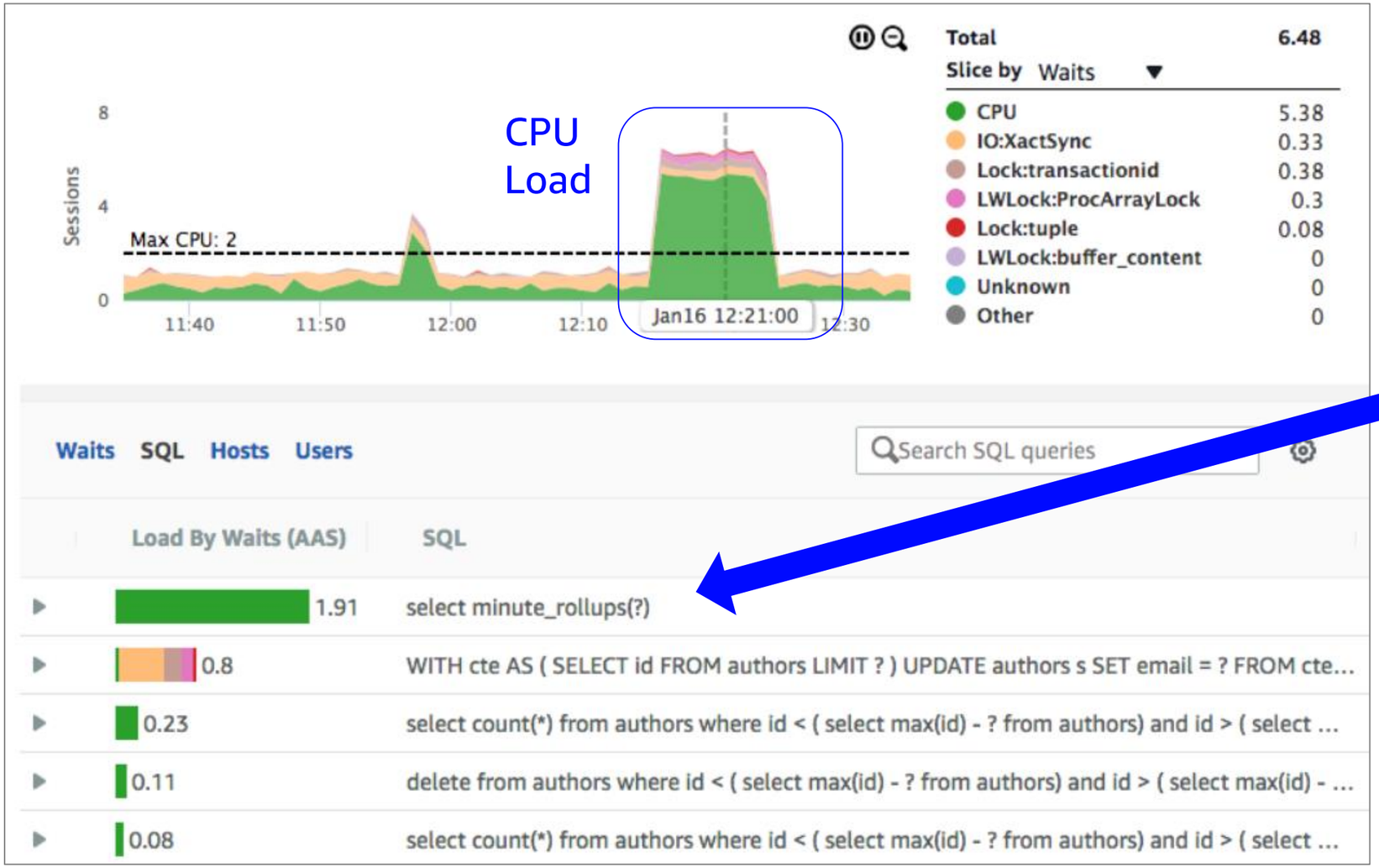
Wait States

CPU bottleneck



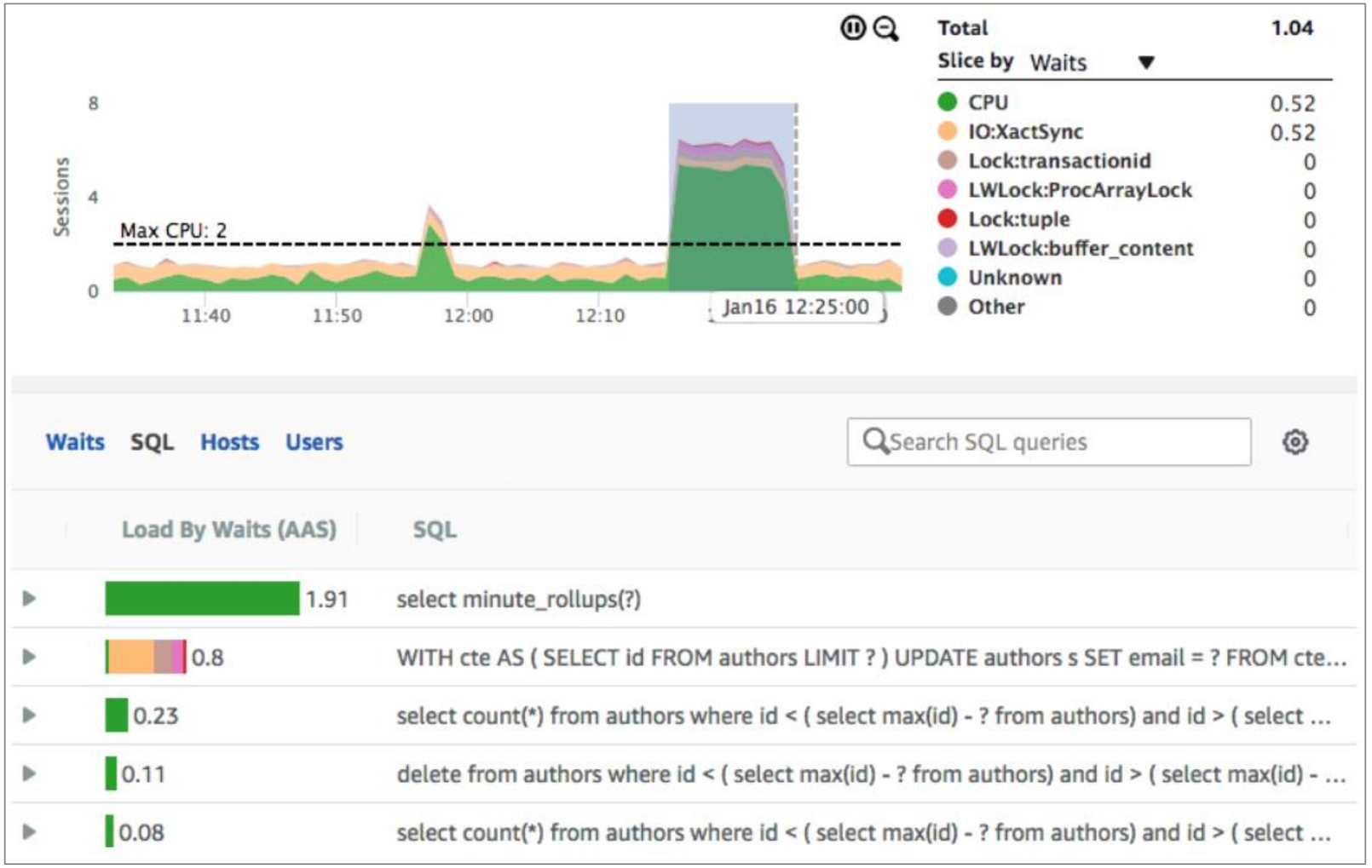
CPU

CPU bottleneck

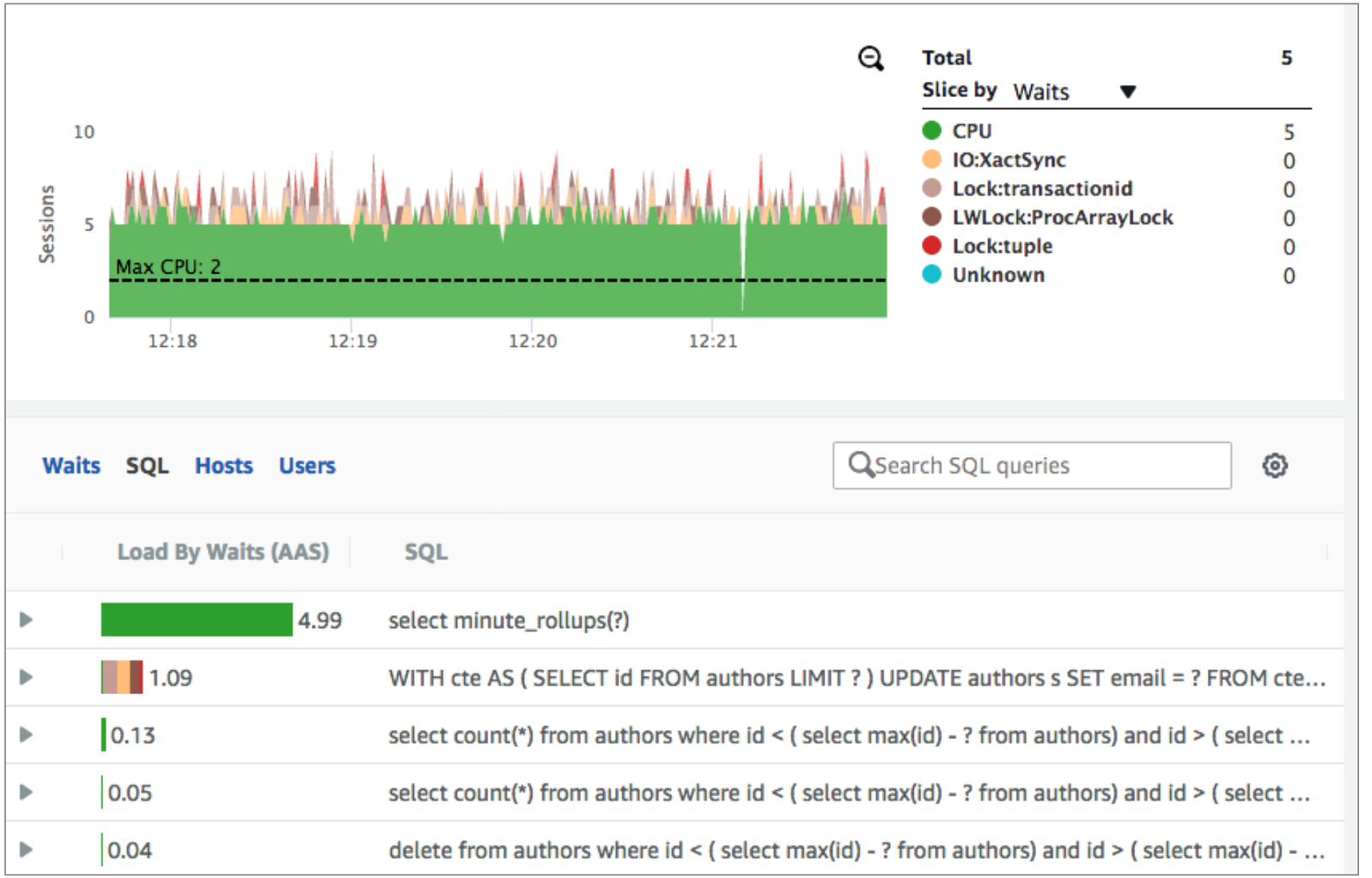


SQL with high CPU

Click and drag

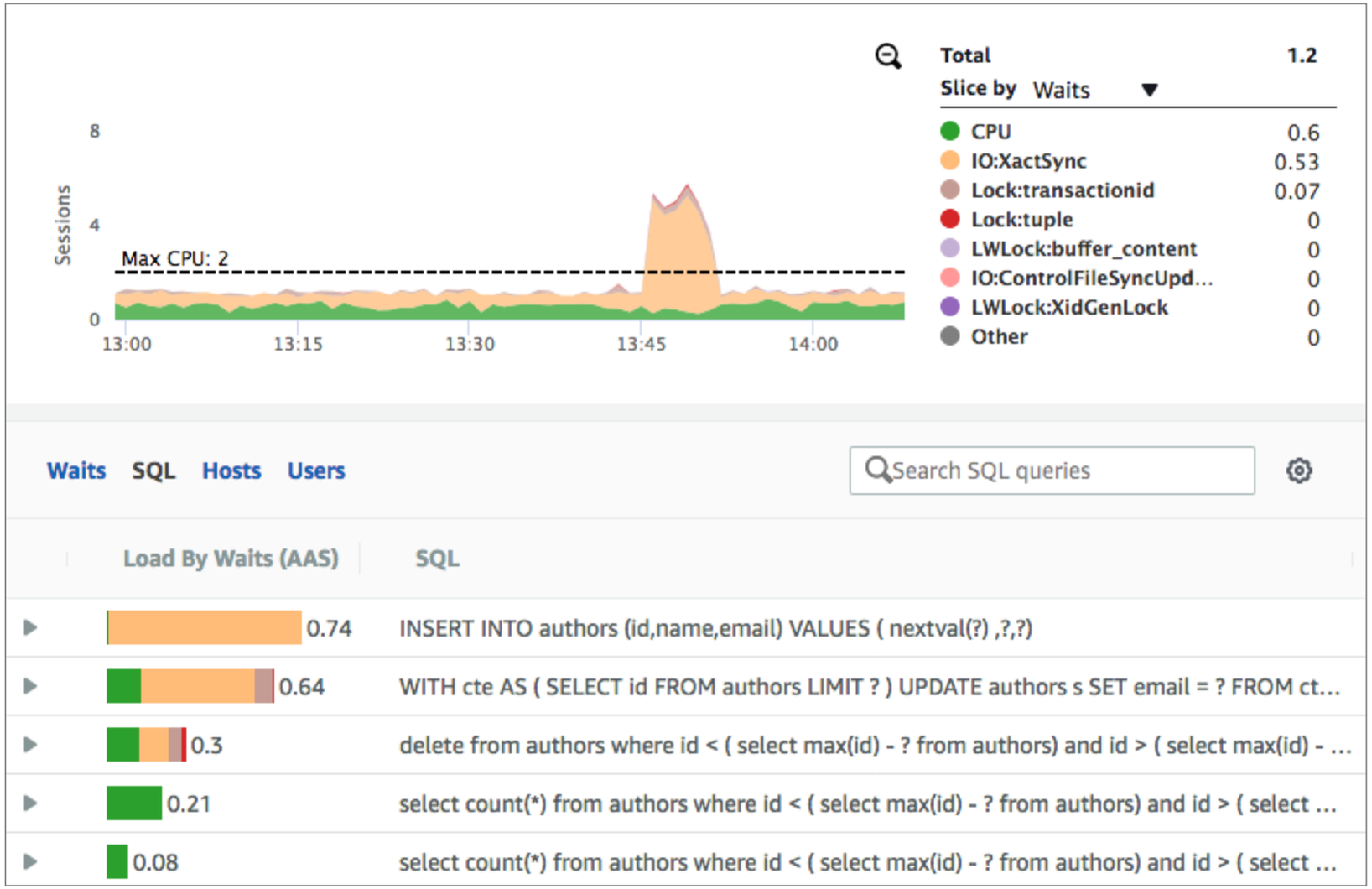


Zoom in

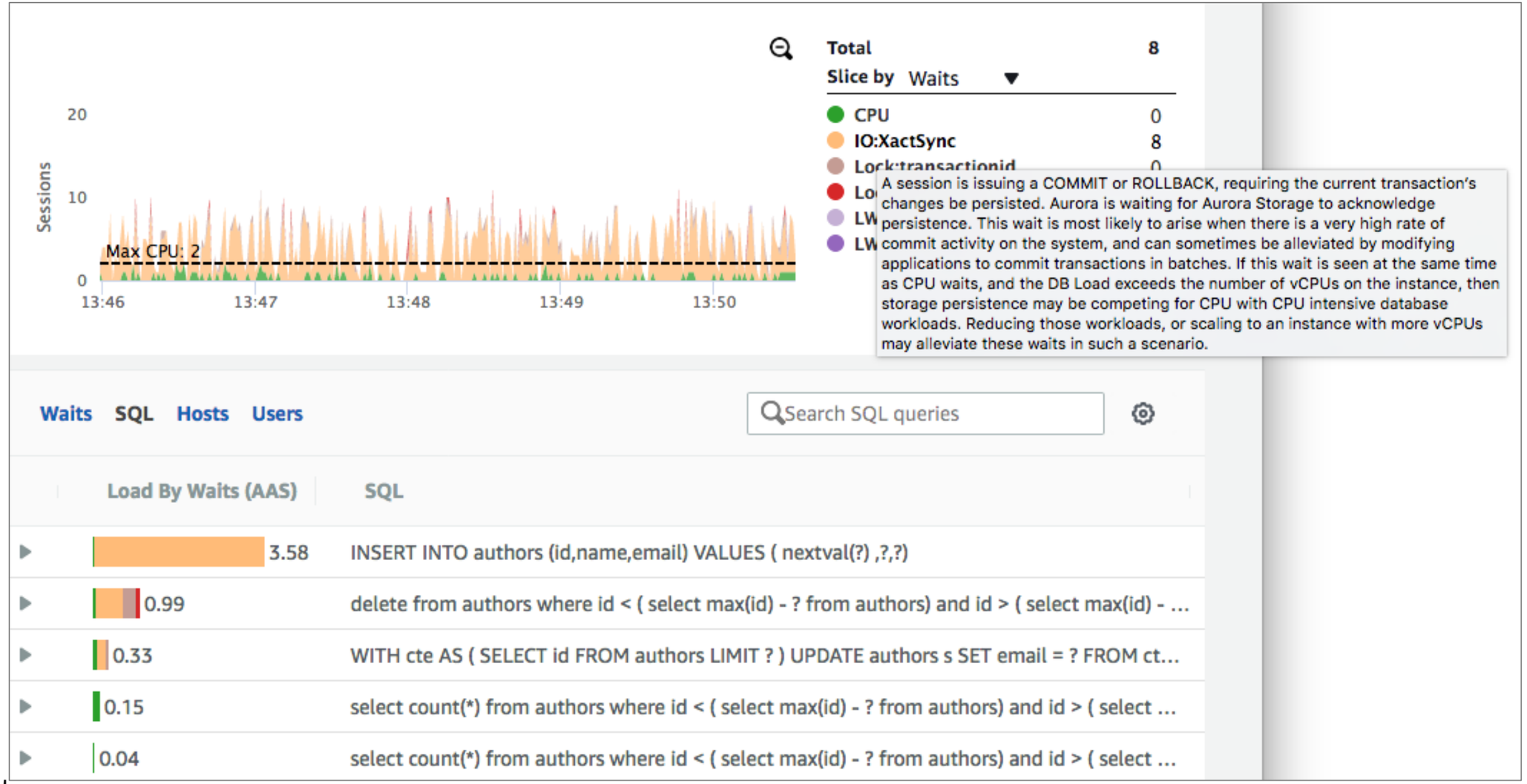


Customer use case: Wait bottleneck

Wait bottleneck

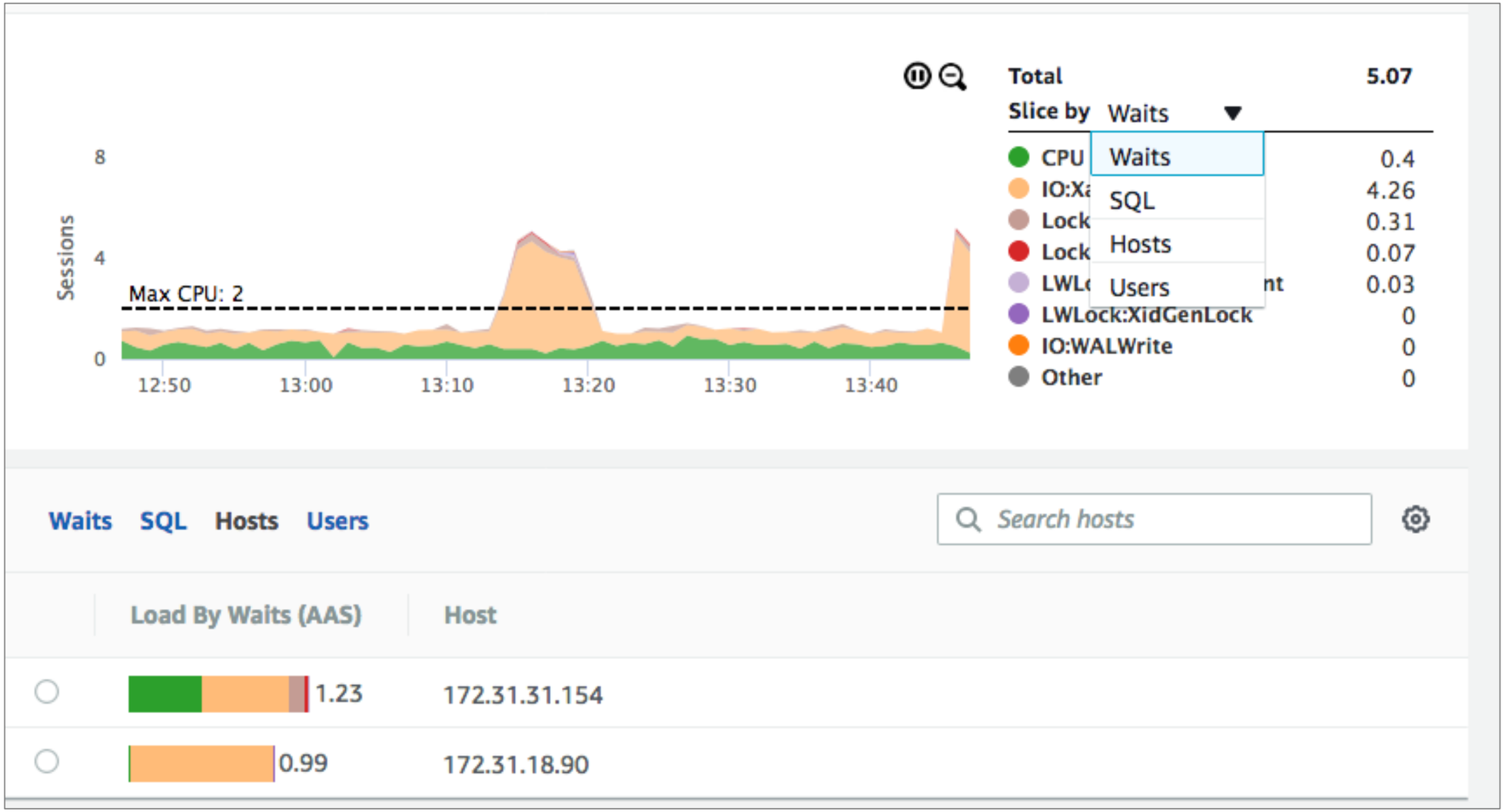


Wait bottleneck

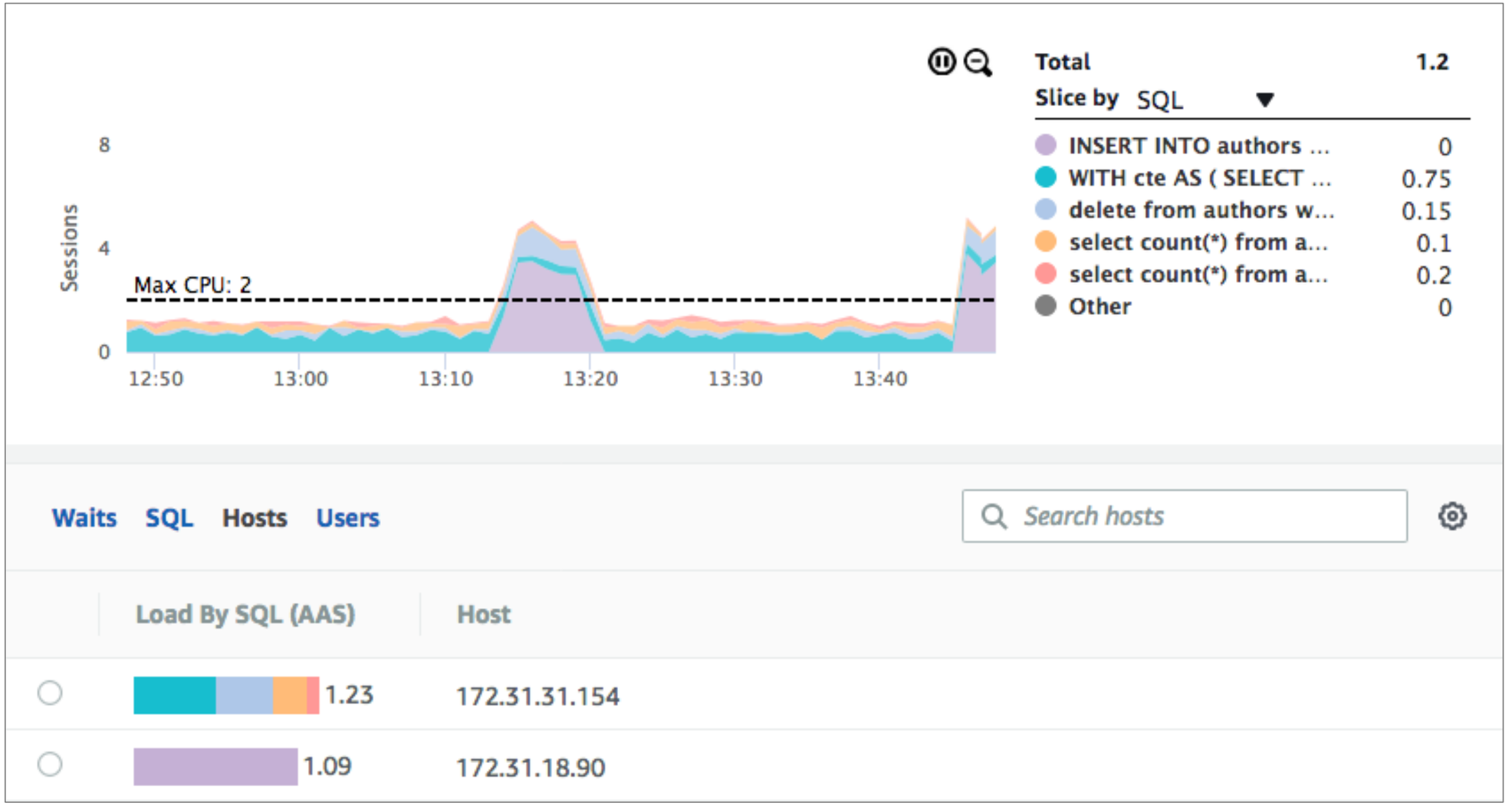


Dashboard: Other grouping dimensions

Other dimensions



Top host by SQL statement



Performance Insights across engines

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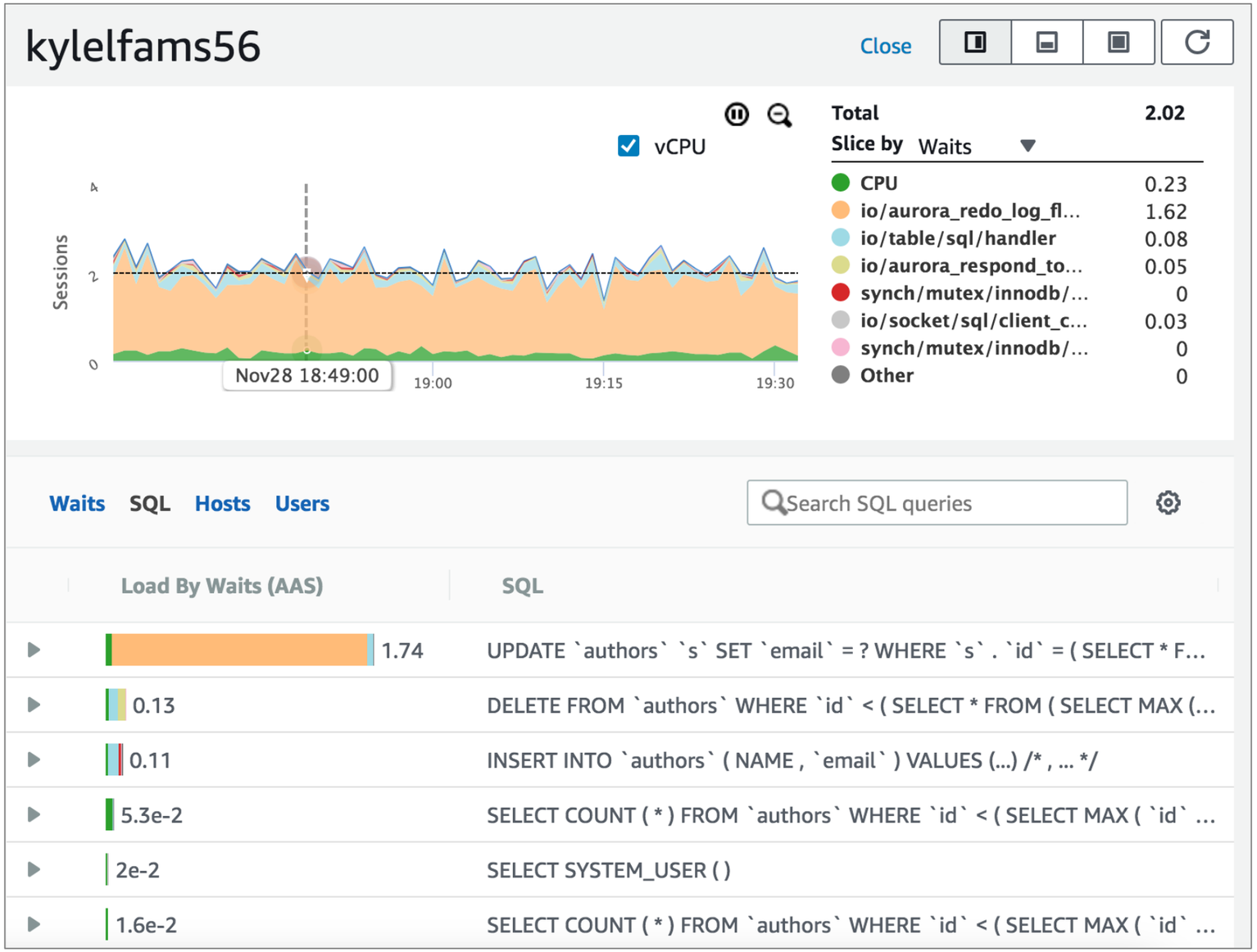
Performance Insights across DB engines

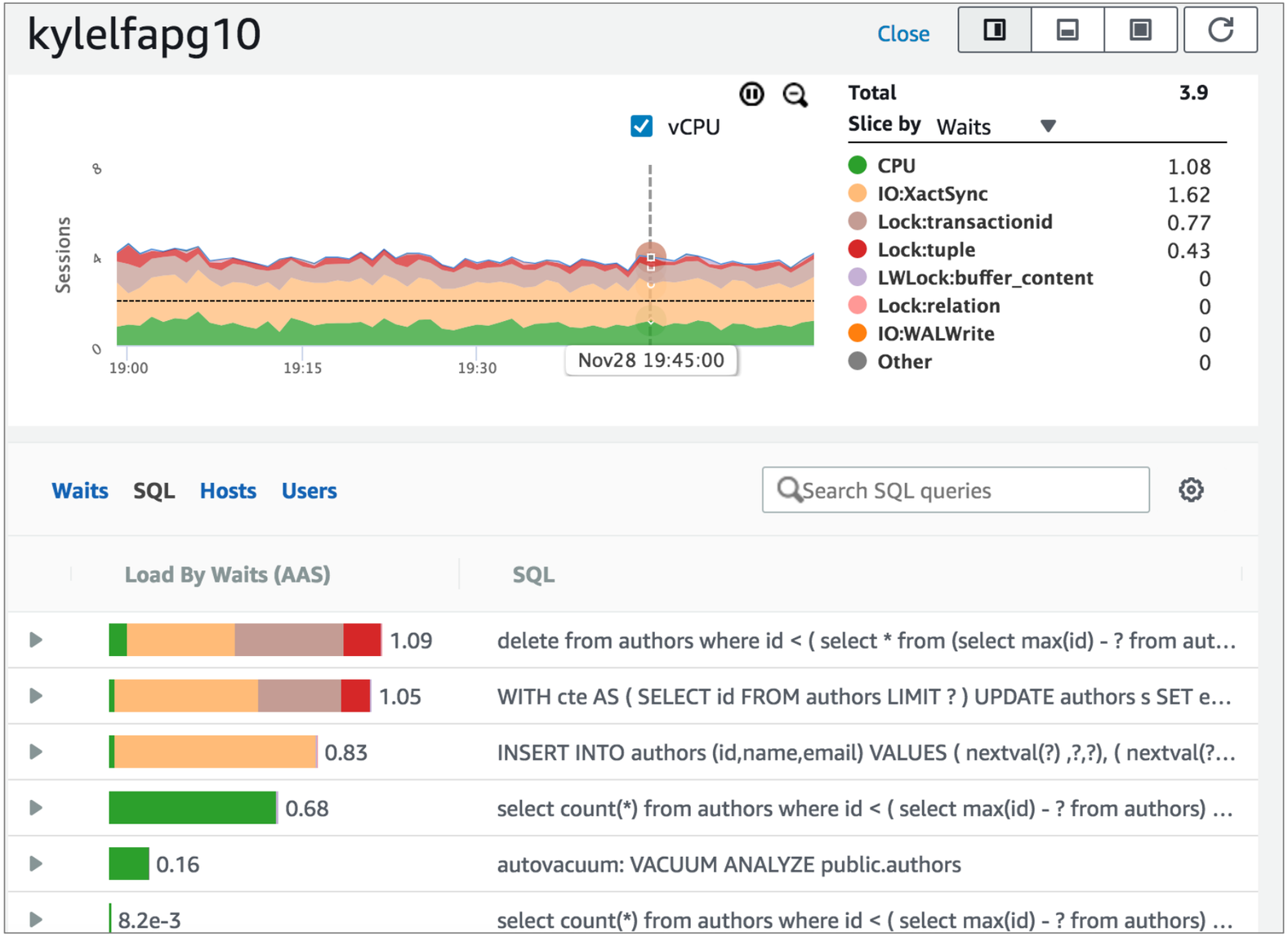
- Performance Insights supports
  - Amazon Aurora
    - MySQL
    - Postgres
  - Amazon RDS
    - MySQL
    - Postgres
    - Oracle
  - RDS SQL Server and MariaDB forthcoming
- Interface is the same across different engines
  - Allows DBA to do performance work across different engines easily
  - Dashboard content same
    - Only difference is the wait event names, which are engine dependent

What’s available

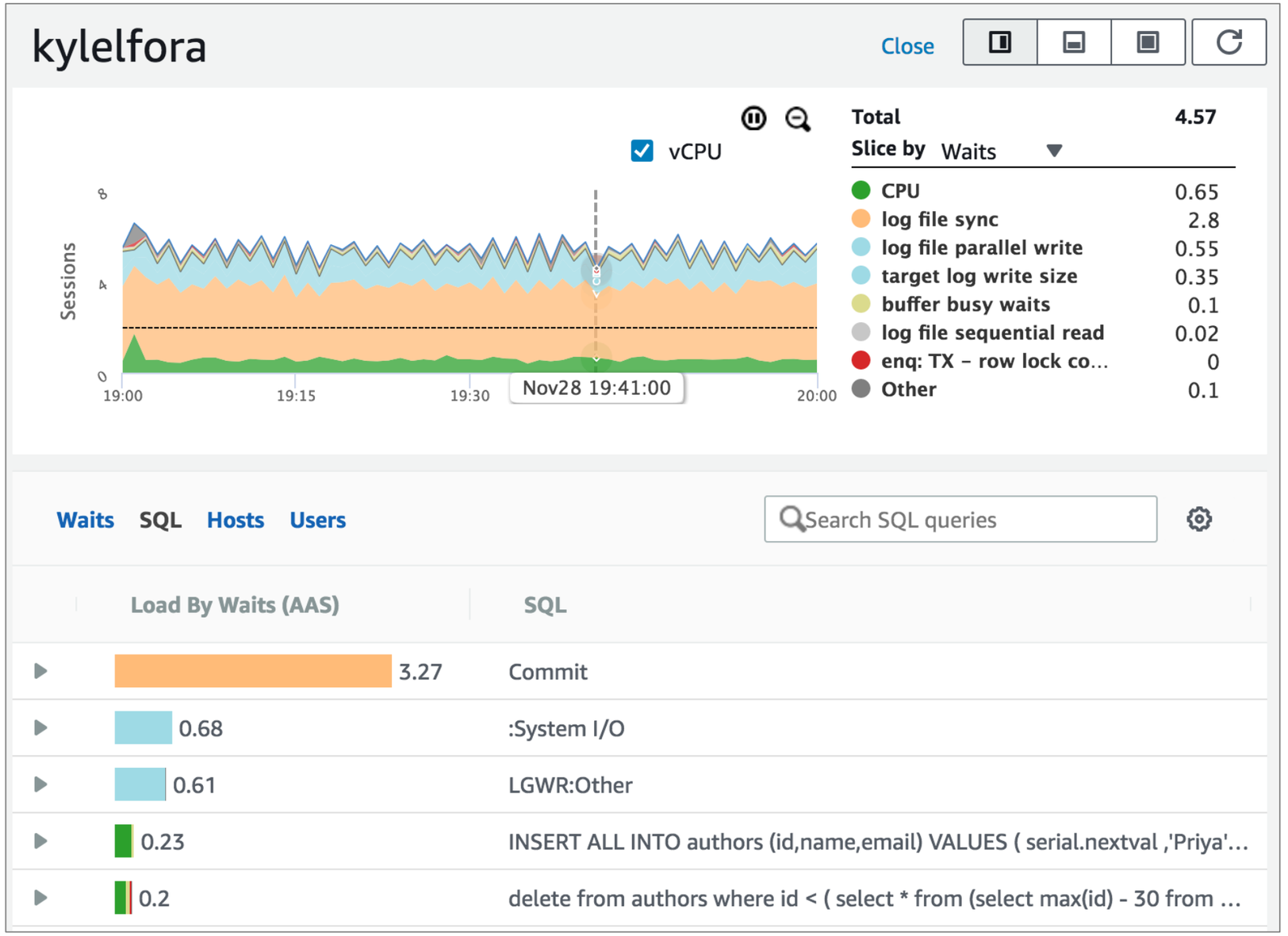
Amazon Aurora MySQL—Five users



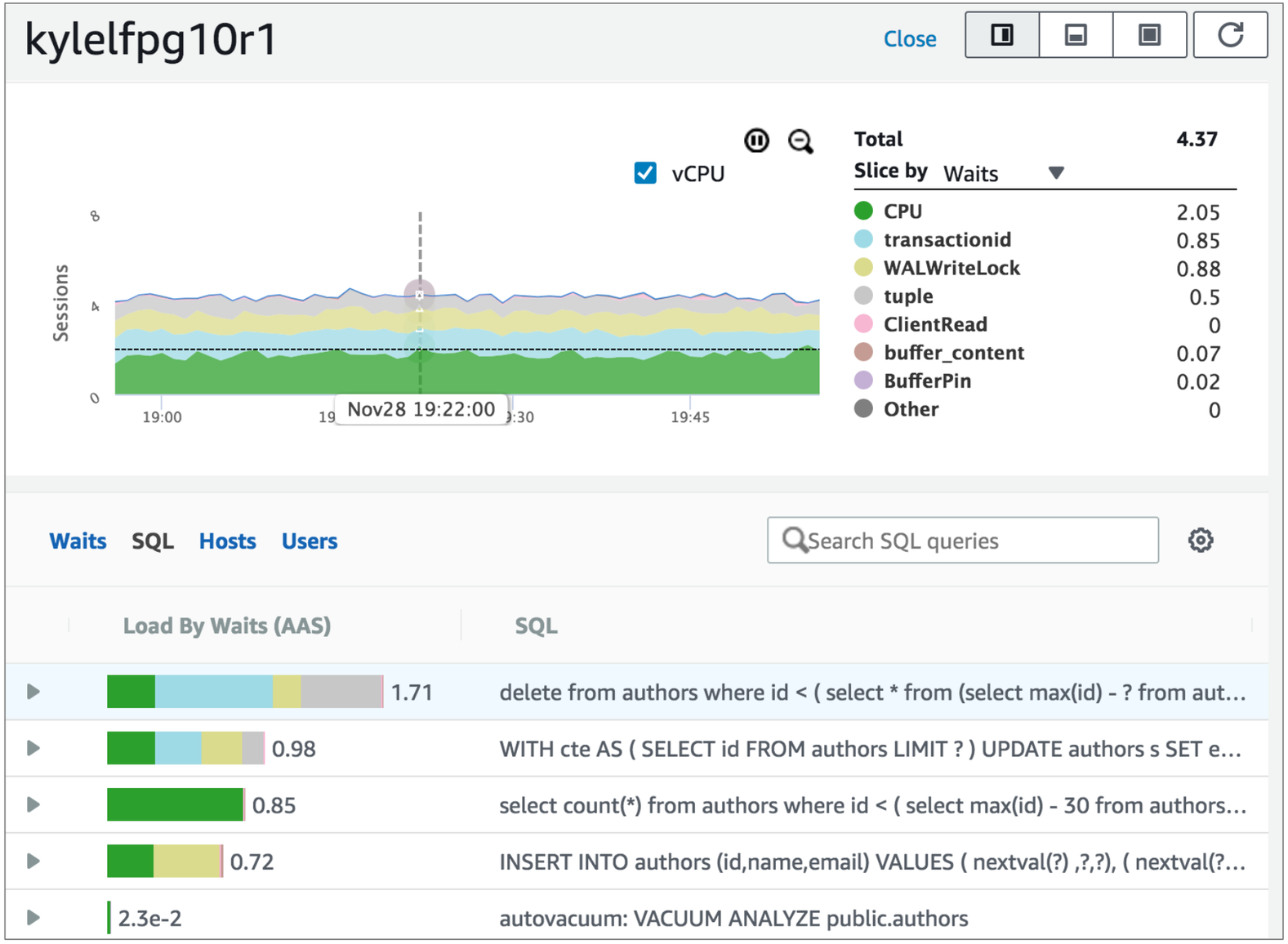
Amazon Aurora PostgreSQL—Five users



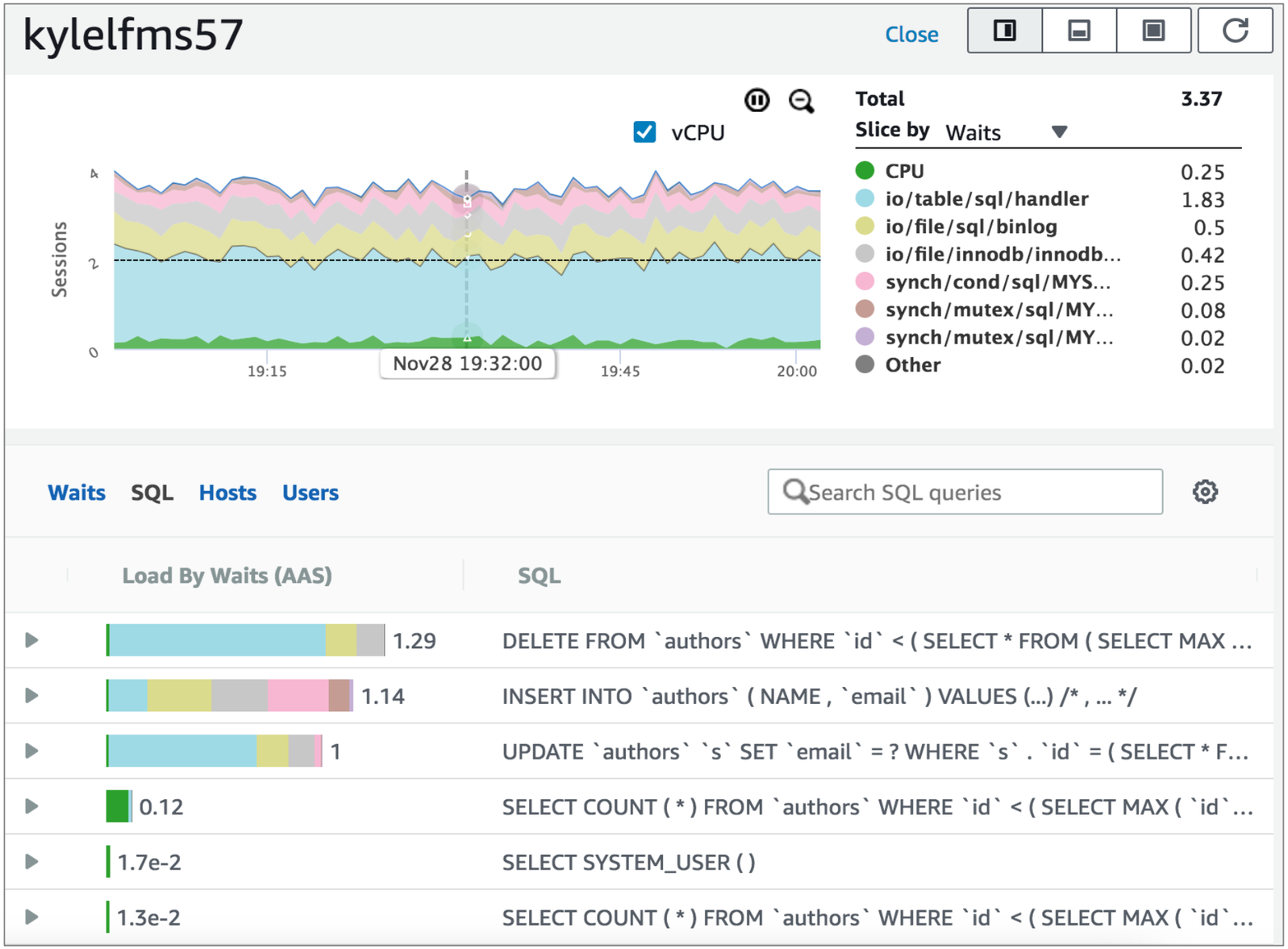
Oracle—Five users



PostgreSQL —Five users



MySQL—Five users



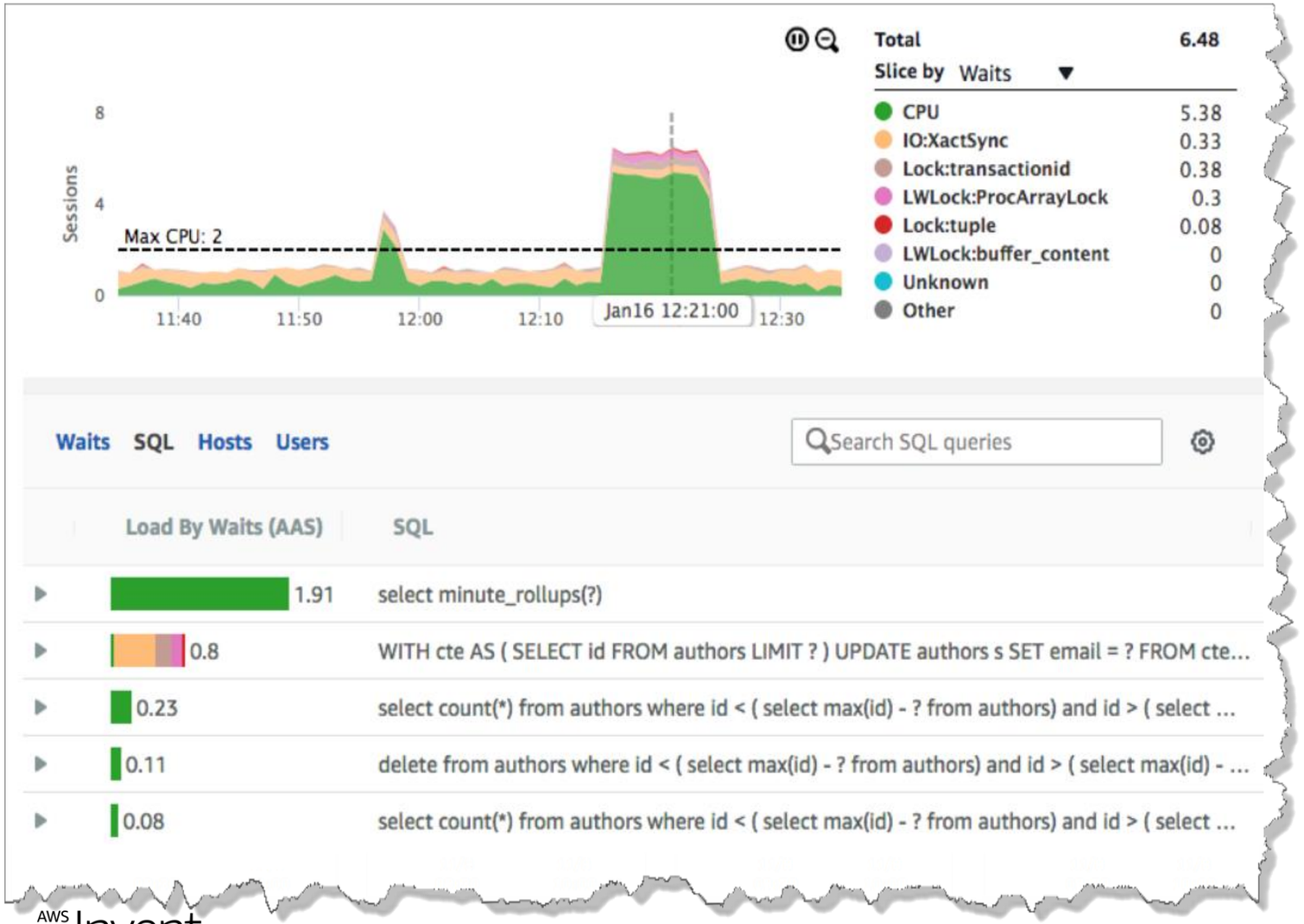
What is available?

- Available
  - Engines
    - Amazon Aurora PostgreSQL
    - Amazon Aurora MySQL 5.6 1.17.3 and higher
    - Amazon RDS for PostgreSQL 10
    - Amazon RDS for MySQL 5.6.41+ and 5.7.22+
    - Amazon RDS for Oracle
  - Functionality
    - DB load chart
    - Top N table
  - Wait, user, host, SQL
  - API/SDK
  - Long-term data retention
  - Alerts through Amazon CloudWatch

What is Coming

- Available
  - Engines
    - Amazon Aurora PostgreSQL
    - Amazon Aurora MySQL 5.6 1.17.3 and higher
    - Amazon RDS for PostgreSQL 10
    - Amazon RDS for MySQL 5.6.41+ and 5.7.22+
    - Amazon RDS for Oracle
  - Functionality
    - DB load chart
    - Top N table
  - Wait, user, host, SQL
  - API/SDK
  - Long-term data retention
  - Alerts through Amazon CloudWatch
- Coming
  - Engines
    - Amazon Aurora MySQL 5.7
    - Amazon RDS for MariaDB
    - Amazon RDS for SQL server
  - Functionality
    - SQL execution plan
    - SQL stats
    - OS and DB statistics

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

- Questions:
  - rdspi@amazon.com

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Demo

"With Performance Insights, we have been able to quickly isolate slow and underperforming queries."

Matt Finlayson
Vice President of Engineering
Cloudability

"Not only has [Performance Insights] saved us a lot of time in diagnosing queries, it has also helped us lower our costs. "

Steve Atherton
CTO
Catalyz

"One of the most valuable tools AWS provides for Aurora is Performance Insights. Our DBA uses this dashboard on a daily basis"

Stephen Sciarini
IT Manager
New Innovations

Before “our diagnostics process was laborious … With Performance Insights, we open one tool and quickly and easily see where we have problems.”

Grant Evans
DBA & AWS Administrator
Enova

Alexa + Performance Insights

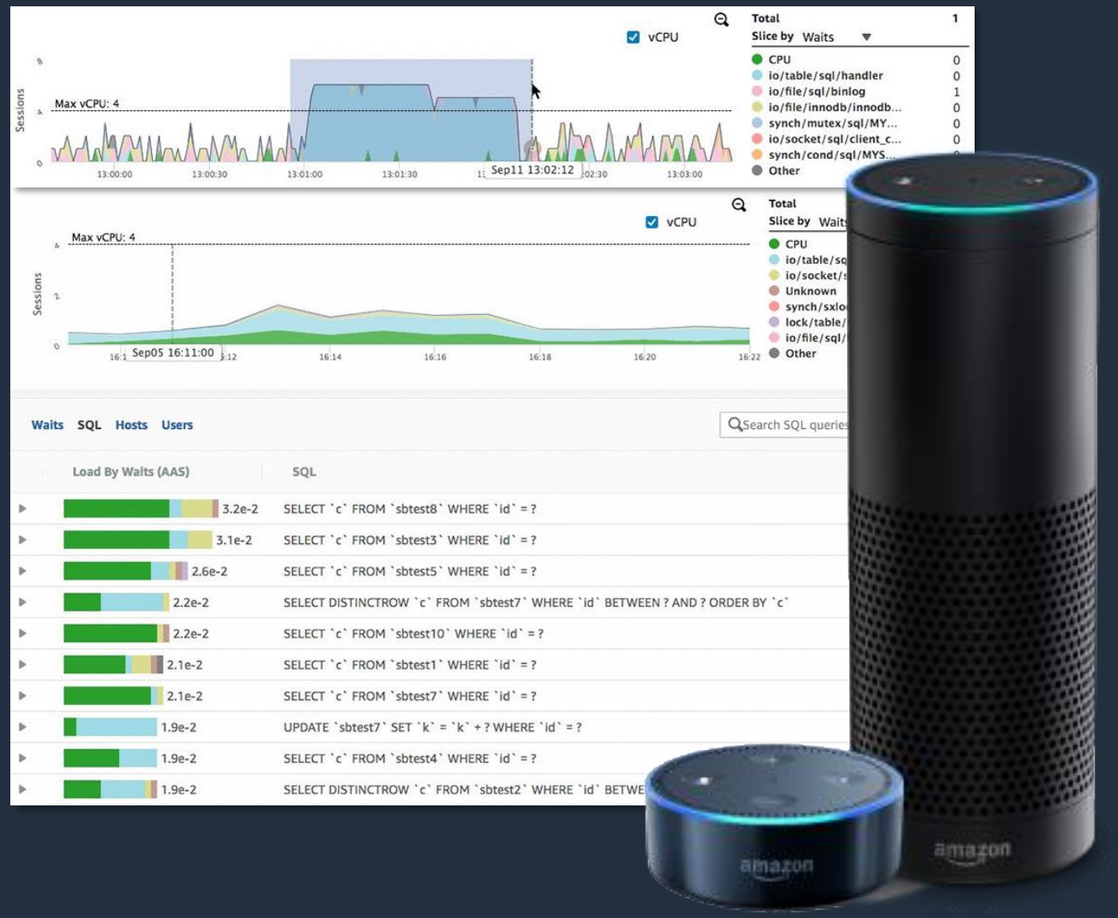
slalom

New integration between Alexa & Performance Insights can be your assistant DBA

Uses the Performance Insights API to identify bottlenecks in Amazon RDS

Get actionable suggestions such as on-demand scaling, DBA notifications & paging

Go to the Slalom booth (#1438) to see a live demo and learn more!



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Thank you!

Kyle Hailey
Principal Product Manager
Amazon RDS

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Please complete the session survey in the mobile app.

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