

Workload XM 2.1.3

Workload XM Cluster Optimization

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Working with Workload XM

Tasks for identifying and troubleshooting job and query abnormalities and failures, optimizing workloads, and improving job performance with Workload XM.

The content is divided into sections and topics that provide all the tasks associated with identifying and troubleshooting job and query abnormalities and failures, optimizing workloads, and improving job performance with Workload XM.

Specifying a time range

Choose a time period in which your workload results are displayed in Workload XM for analysis and troubleshooting.

About this task

Describes how to specify a time period for displaying current or historical data about your cluster and the jobs performed in that cluster.

By default, Workload XM displays workload data for the last 24 hours. If there is no data available during that time, Workload XM displays the nearest date range that is available.

Procedure

1. Verify that you are logged in to the Cloudera Data Platform.
2. In a supported browser, log in to Workload XM.
3. From the **Your Enterprise Data Cloud** landing page, select the **Workload Manager** tile.
4. In the **Clusters** page, select the cluster required for analysis.
5. From the time-range list in the Cluster Summary page, do one of the following:
 - For a predefined period, select one of the default periods of time that meets your requirements .
 - For an exact date and time range, select **Customize** and then either, enter the date and time range using the YYYY/MM/DD HH:MM:SS format for the beginning and the ending time period, or in the calendar element, select the beginning and ending time period.
6. Click **Ok**, which clears any existing workload data from the chart and table components for the existing period of time.

Results

All charts and tables in Workload XM are updated to reflect the workload data for the chosen time period.

Troubleshooting Abnormal Job Durations

Identify areas of risk from unusual job durations running on your cluster.

About this task

Describes how to locate and troubleshoot abnormal job duration time periods.

Steps with examples are included that explain how to further investigate and troubleshoot the cause of an abnormal job duration time period.

Procedure

1. Verify that you are logged in to the Cloudera Data Platform.

2. In a supported browser, log in to Workload XM.
3. From the **Your Enterprise Data Cloud** landing page, select the **Workload Manager** tile.
4. In the Clusters page do one of the following:
 - In the Search field, enter the name of the cluster whose workloads you want to analyze.
 - From the Cluster Name column, locate and click on the name of the cluster whose workloads you want to analyze.
5. From the time-range list in the Cluster Summary page, select a time period that meets your requirements.
6. Display the number of jobs with an abnormal duration that executed within the selected period by clicking the **Abnormal Duration** health check bar in the **Suboptimal Jobs** graph.



Tip: Any jobs that fall outside of the baseline duration are marked as slow. You can hover over the graph to see how many jobs triggered each health check.



The Job page opens, listing all the jobs that have triggered the **Abnormal Duration** Health check.

7. To specify a specific amount of time in which the job either ran less than or more than the Health check rule, from the **Duration** list, either select a predefined time duration or select **Customize** and enter the minimum or maximum time period.

The screenshot shows the 'Jobs' section of the Workload XM interface. At the top, there are filters for Type (All), Status (All), Health Check, and Duration. A dropdown menu for Duration is open, showing options like 'All', '0s - 1h 0m 0s', '1h 0m 0s - 5h 0m 0s', '5h 0m 0s +', and 'Customize'. An orange arrow points to the 'Customize' option. Another orange arrow points to a tooltip message: 'Choose a duration range from the Duration list, or choose Customize to enter a custom maximum-minimum duration range.' To the right of the Duration dropdown is a table showing Health Issues and Execution IDs for various jobs.

8. To view more details about a job, from the **Job** column, select a job's name and then click the **Health Checks** tab. The Baseline Health checks are displayed.

9. To display more information about the job's duration, from the **Baseline** column, select **Duration**.

The following reveals that for this example the job finished much slower than the baseline:

The screenshot shows the 'Log Analysis' section of the Workload XM interface. At the top, there are tabs for Overview, Health Checks (which is selected), Execution Details, Baseline, and Trends. Below the tabs, there are filters for Start Time (2/8/2019 1:08 PM), Duration (10m 44s), and User. On the left, there is a sidebar with sections for Baseline (Duration is selected), Skew (Task Duration is selected), and Resources (Task Wait Time). The main area shows a timeline of tasks with their start times and execution IDs. A callout box says 'Click to further investigate this job.' To the right, there is a chart titled 'Log Analysis Abnormal Duration' showing the duration of the job over time. An orange arrow points to the chart with the text 'Finished in 10m 44s, slower than the median duration 2m 8s. View all metrics.' Below the chart is a table of execution details.

10. To display more information about the length of time the processing tasks took within a job, from the **Baseline** column, select **Task Duration**.

The following reveals that for this example a particular task took an abnormal amount of time to finish:

The screenshot shows the 'Log Analysis' interface with the 'Execution Details' tab selected. In the 'Baseline' section, 'Task Duration' is selected. A callout points to the 'Stage-2 Task Duration Skew' chart, which displays a distribution of task execution times. An arrow points to the 'Task Name' table below, which lists 'Task 160' as an outlier.

Task Name **Host** **Duration**

Task Name	Host	Duration
! Task 160	[REDACTED]	5m 46s

11. To display more information about the abnormal task, click the abnormal task, which opens the **Task Details** panel.

The following reveals that for this example the garbage collection for Task 160 is taking significantly more time than the average task:

The screenshot shows the 'Log Analysis' interface with the 'Execution Details' tab selected. In the 'Baseline' section, 'Task Duration' is selected. A callout points to the 'Task Details' table for Task 160, specifically highlighting the 'GC time elapsed' metric at 21m 53s.

Metric	Task	Average
GC time elapsed	21m 53s	22s 206ms
CPU time spent	7h 34m	10m 16s
Successful Attempt Duration	26m 11s	6m 26s
Wait Duration	3s 985ms	10m
Data written (Local)	167.2 MiB	102 MiB
Map output materialized bytes	79.1 MiB	49.2 MiB
Duration	26m 15s	16m 26s
Data read (Local)	342.9 MiB	261.7 MiB
Map output bytes	781.9 MiB	612.2 MiB
Spilled Records	12.2M	9.7M

12. To display more information about the garbage collection for this job example, from the **Baseline** column, select **Task GC Time**.

13. In the Task GC Time page, click the **Execution Details** tab and then click one of the MapReduce stages:

The screenshot shows the 'Execution Details' tab of the Workload XM interface. A table lists four tasks: Stage-1, Stage-2, Stage-2, and Stage-2. The first task, 'Stage-1', is highlighted with a red box. The table includes columns for time, status, and duration.

20:51	HV insert overw...	54m 37s	
20:51	MR Stage-1	49m 9s	
21:40	MR Stage-2	4m 47s	
21:45	MR Stage-2	26s	

14. In the **Summary** panel, click **View Configurations** and then locate the configuration for the garbage collection by entering part of the MapReduce memory configuration property name in the Search field:

The screenshot shows the 'Summary' panel of the Workload XM interface. It displays a table of tasks and a 'Configurations' section. In the 'Configurations' section, there is a search bar containing 'map.memory' with a red box around it. The search results show a single entry: 'mapreduce.map.memory.mb'.

20:51	HV Insert overw...	54m 37s	
20:51	MR Stage-1	49m 9s	
21:40	MR Stage-2	4m 47s	
21:45	MR Stage-2	26s	

Configurations

Search map.memory

Type part of the configuration property name to search for it.

mapreduce.map.memory.mb

The configuration for the garbage collection reveals that the setting is 1024, which might be causing the mapper JVM to have insufficient memory as well as triggering too many garbage collections. Increasing this number will improve cluster performance and remove this task as a potential risk.

Troubleshooting Failed Jobs

Steps for troubleshooting uncompleted workloads running on your cluster.

About this task

Describes how to locate and troubleshoot jobs that have failed to complete.

Steps with examples are included that explain how to further investigate and troubleshoot the root cause of an uncompleted job.

Procedure

1. Verify that you are logged in to the Cloudera Data Platform.
2. In a supported browser, log in to Workload XM.
3. From the **Your Enterprise Data Cloud** landing page, select the **Workload Manager** tile.
4. In the Clusters page do one of the following:
 - In the Search field, enter the name of the cluster whose workloads you want to analyze.
 - From the Cluster Name column, locate and click on the name of the cluster whose workloads you want to analyze.

5. From the navigation panel, select **Jobs** under Data Engineering.
6. From the **Health Check** list in the Jobs page, select **Failed to Finish**, which filters the list to display a list of jobs that did not complete.

Cloudera Workload XM

Type	Job	Status	Duration	User	Health Issue
HV	[REDACTED]	Passed All Health Checks	8 AM PDT	51s 406ms	Data Processing
HV	[REDACTED]	Failed to Finish	8 AM PDT	49s 608ms	
MR	[REDACTED]	Baseline	8 AM PDT	1m 20s	
HV	[REDACTED]	Duration	7 AM PDT	1m 8s	Abnormal Data
MR	[REDACTED]	Input Size	04/19/2018 2:37 AM PDT	1m 45s	Data Processing
		Output Size			
		Succeeded			

7. To view more details about why the job failed to complete, from the **Job** column, select a job's name and then click the **Health Checks** tab.
- The Baseline Health checks are displayed.
8. From the **Health Checks** panel, select the **Failed to Finish** health check.

The following reveals that for this example the failure occurred in the **Map Stage** of the job process:

Health Check	Start Time	End Time	Duration	Description	Action
Failed to Finish	03:39	03:39	3m 4s	Map Stage	View Execution Details
Baseline	03:39	03:39	3m 4s	Failed to Finish	
Duration	03:39	03:39	3m 4s	Operation failed to finish.	
Input Size	03:39	03:39	3m 4s	This health check determines whether a job succeeded or failed.	
Output Size	03:39	03:39	3m 4s	Check Execution Details for more information.	

Click Map Stage and then click Execution Details.

9. To display more information about the Map Stage process, click **Map Stage** and then from the Map Stage panel, click **Execution Details**.

10. To see all the failed tasks, in the **Summary** panel, click on the number value in the **Failed** field:

The screenshot shows the 'Execution Details' tab selected in the top navigation bar. Below it, the date and time are 4/16/2018 3:39 AM, duration is 3m 4s, and there are filter and ID search options. Under 'Expand All', three tasks are listed: 'HV insert overw...' (3m 4s), 'MR Stage-1' (3m 4s), and 'Map Stage' (2m 52s). To the right, a summary table includes 'Completed' (11 / 12), 'Failed' (1), and 'Average Map Time' (1m 30s). An orange arrow points to the 'Failed' count (1).

03:39	! HV insert overw...	3m 4s	
03:39	- ! MR Stage-1	3m 4s	
03:39	! Map Stage	2m 52s	

Summary	Stage-1 / Map Stage		
Map Tasks			
Completed	11 / 12		
Failed	! 1 ← Click the number of Failed tasks.		
Average Map Time	1m 30s		

11. For each failed attempt, display the error message by selecting each task.

For this example, the following Task KILL is received. Killing attempt! error message reveals that for this example more information is required to answer why a KILL task was received. To further troubleshoot the root cause, understanding what triggered the error is required. To investigate further, open the associated log file by clicking **Logs**.

The screenshot shows the 'Execution Details' tab selected. A failed task 'Map Stage' is selected. The summary table shows 'Attempt 0' and 'Host' 'at1c1r1data03.vldb-bo.secureworks.net'. An orange arrow points to the 'Logs' link under the 'Attempt' column. Below the table, an 'Error Message' section displays 'Task KILL is received. Killing attempt!'.

03:39	! HV insert overw...	3m 4s	
03:39	- ! MR Stage-1	3m 4s	
03:39	! Map Stage	2m 52s	

Attempt	Host	Start Time	Duration
0 Attempt 0	at1c1r1data03.vldb-bo.secureworks.net	3:39 AM	2m 48s

Click to view log file.

Logs

Task KILL is received. Killing attempt!

Determining the Cause of Slow and Failed Queries

Identifying the cause of slow query run times and queries that fail to complete.

About this task

Describes how to determine the cause of slow and failed queries.

Steps with examples are included that explain how to further investigate and troubleshoot the cause of a slow and failed query.

Procedure

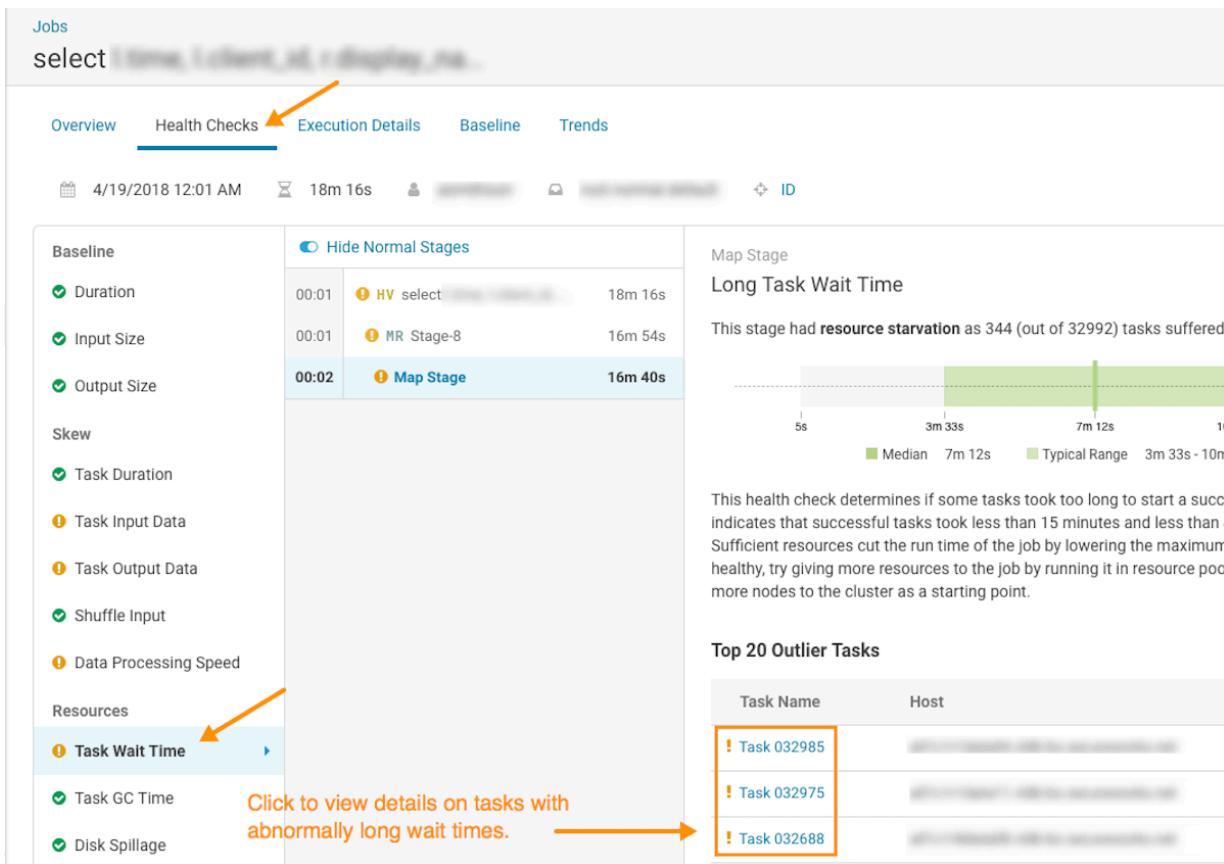
1. Verify that you are logged in to the Cloudera Data Platform.
2. In a supported browser, log in to Workload XM.
3. From the **Your Enterprise Data Cloud** landing page, select the **Workload Manager** tile.
4. In the Clusters page do one of the following:
 - In the Search field, enter the name of the cluster whose workloads you want to analyze.
 - From the Cluster Name column, locate and click on the name of the cluster whose workloads you want to analyze.
5. From the navigation panel under Data Engineering, select **Jobs**.
6. From the **Health Check** list in the Jobs page, select **Task Wait Time**, which filters the list to display a list of jobs with longer than average wait times to execute a process.

The screenshot shows the Cloudera Workload XM interface. On the left, there's a sidebar with 'Data Warehouse' and 'Data Engineering' sections. Under 'Data Engineering', 'Jobs' is selected and highlighted in blue. The main area is titled 'Jobs' and shows a table of tasks. At the top of the table, there are filters for 'Type', 'Status', 'Health Check', 'Duration', and 'Range'. The 'Health Check' dropdown is open, and 'Task Wait Time' is selected, highlighted with a yellow box and a mouse cursor. The table lists several tasks with columns for Type (HV, MR), Job name, Status (Succeeded), Start Time, and Duration (e.g., 1m 45s). To the right of the table, there's a section for 'Output Size' and 'Resources'.

7. To view more details, from the **Job** column, select a job's name and then click the **Health Checks** tab.
The Baseline Health checks are displayed.

- From the **Health Checks** panel, select the **Task Wait Time** health check.

The following reveals that for this example the long wait time occurred in the **Map Stage** of the job process due to insufficient resources:



- To display more information about the Map Stage tasks that are experiencing longer than average wait times to execute, click one of the tasks listed under **Outlier Tasks**.

The following reveals that for this outlier task example, the **Wait Duration** time is above average, as confirmed by comparing this time with the time taken when the task successfully completes. Where, the successful value

is displayed in the **Successful Attempt Duration** field and is significantly better than the average time. This indicates that insufficient resources are allocated for this job.

Stage	Duration	Rack	Start Time	Duration
HV select	18m 16s			
MR Stage-8	16m 54s			
Map Stage	16m 40s			

Metric	Task	Average
Wait Duration	15m 20s	7m 9s
Duration	16m 5s	8m 8s
RECORDS_OUT_0	22K	12.8K
Input split bytes	551 B	797.73 B
Data written (HDFS)	6.5 MiB	5.2 MiB
Successful Attempt Duration	45s 10ms	59s 287ms
Map input records	6.1M	8M

Classifying Workloads for Analysis with Workload Views

The Workload View feature enables you to analyze workloads with much finer granularity. For example, you can analyze how queries that access a particular database or that use a specific resource pool are performing against your SLAs. Or you can examine how all the queries are performing on your cluster that are sent by a specific user.

Working with Auto Generated Workload Views

Steps for using the Workload XM default workload views.

About this task

Describes how to use the workload views that Workload XM automatically generates.

Procedure

- Verify that you are logged in to the Cloudera Data Platform.
- In a supported browser, log in to Workload XM.
- From the **Your Enterprise Data Cloud** landing page, select the **Workload Manager** tile.
- In the Clusters page do one of the following:
 - In the Search field, enter the name of the cluster whose workloads you want to analyze.
 - From the Cluster Name column, locate and click on the name of the cluster whose workloads you want to analyze.
- From the navigation panel under Data Warehouse, select **Workloads**.

6. In the Data Warehouse page, click the **Define New** list and then select **Select recommended views**:

Cloudera Workload XM Cluster_14

Data Warehouse Workloads

Status All Search workloads

Define New

Manually define view

Select recommended views

Criteria

_table

Table: ANY OF
bigdata.rrd

7. From the **Criteria** column, examine the criteria that are used to create the workload views, select the workload views required, and then click **Add Selected**:

Cloudera Workload XM Cluster_14

Add Recommended Workload Views

The recommendations are based on query frequency and regularity of users, pools, and tables during the last 7 days.

Workload Name	Criteria	Workload Queries	% of Total Queries	Recommended SLA	Warning Threshold
<input checked="" type="checkbox"/> jon_rootdefault_ta...	User: jon Pool: root.default Table: u_philip.employees	31966	23%	27ms	5%
<input checked="" type="checkbox"/> cops_rootdefault_...	User: cops Pool: root.default Table: default.metrics_production	4946	4%	8s	5%
<input checked="" type="checkbox"/> cops_rootdefault_...	User: cops Pool: root.default Table: default.customer_logs	4121	3%	5s	5%
<input checked="" type="checkbox"/> jon_rootdefault_ta...	User: jon Pool: root.default Table: u_jon.m_all_providers	3869	3%	9s	5%
<input checked="" type="checkbox"/> cops_rootdefault_...	User: cops Pool: root.default Table: default.usage_production	3346	2%	7s	5%

Review the Criteria.

Select which views you want to use.

Then click Add Selected.

Add Selected

The workload views you selected are saved and displayed on the Data Warehouse Workloads page.

8. To verify your workload views, from the navigation panel under Data Warehouse, select **Workloads** and then on the Data Warehouse Workload page locate the workload view you just added. When verified, click that workload to view its details:

The screenshot shows the 'Data Warehouse Workloads' section of the Cloudera Workload XM interface. On the left, there's a sidebar with links for Data Warehouse, Data Engineering, and Feedback. The 'Workloads' link is highlighted. The main area displays a table of workloads with columns for Status, Workload, Criteria, SLA, Warning Threshold, Missed SLA %, Failure %, Total Queries, and Action. One row in the table is highlighted, and a yellow arrow points to the 'jon_rootdefault_tables_23_3869' entry, with the text 'Click the workload name to view its details.' positioned above the arrow.

Status	Workload	Criteria	SLA	Warning Thresh...	Missed SLA %	Failure %	Total Queries	Action
●	MonitorSid	User: ANY OF ss, idalgic, mulyadi	30s	10%	23%	1%	2648	<button>Actions</button>
●	Clusterstats_Usage	Database: clusterstats	20s	20%	16%	1%	9884	<button>Actions</button>
●	Heavy_Users	User: ANY OF shashi, stephenf, mulyadi, mstephenson	5s	10%	15%	13%	30263	<button>Actions</button>
●	M002	User: ANY OF mulyadi, vidya, brad, GABOR.SUDAR, abhishekalluri, abreshears, mkohs, raman, joydeep, ss, vmm	1m	1%	15%	1%	2648	<button>Actions</button>
●	jon_rootdefault_tables_23_3869	User: jon Pool: root.default Table: u_jon.m_all_providers	9s	5%	15%	0%	6016	<button>Actions</button>
●	ms	User: mstephen	10s	20%	14%	2%	1147	<button>Actions</button>
●	cops_user	User: cops	5s	10%	12%	0%	2047472	<button>Actions</button>
●	DiagBundlesAnalysis	User: cops Statement Type: QUERY	5s	10%	12%	0%	1689191	<button>Actions</button>

Defining Workload Views Manually

Steps for manually defining your workload views.

About this task

This task describes how to manually define your Workload Views.

To view this feature in action, watch the following video:

[Video: Classifying Workloads to Gain Insights](#)

Figure 1: Video: Classifying Workloads to Gain Insights

For better video quality, click **YouTube** in the lower right corner of the video player to watch this video on YouTube.com.

Procedure

1. Verify that you are logged in to the Cloudera Data Platform.
2. In a supported browser, log in to Workload XM.
3. From the **Your Enterprise Data Cloud** landing page, select the **Workload Manager** tile.
4. In the Search field of the Clusters page, enter the name of the cluster whose workloads you want to analyze.

5. From the time-range list in the Cluster Summary page, select a time period that meets your requirements.

The screenshot shows the Cloudera Workload XM interface for Cluster_14. On the left, there's a navigation panel with sections for Data Warehouse (Summary, Workloads), Data Engineering (Summary, Jobs), and Feedback. The main area is titled 'Summary' and contains 'Trend' and 'Outliers' sections. A large orange box highlights the top right corner where a dropdown menu is open. The menu lists time ranges: 'Default (03/08/2018 - 05/03/2018)', 'Today', 'Yesterday', 'Last 7 Days', 'Last 30 Days', 'Customize', 'missed SL...', and 'Failure %'. An orange arrow points upwards from the bottom of the menu towards the 'Default' option.

6. From the navigation panel under Data Warehouse, select **Workloads**, and then click the **Define New** list and select **Manually define view**.

This screenshot shows the same Cloudera Workload XM interface as above, but with a different focus. An orange arrow points to the 'Workloads' link in the Data Warehouse navigation panel. The main content area displays a message: 'You have not defined any workloads yet.' with a magnifying glass icon. A blue button labeled 'Define Workload' is visible. The rest of the interface, including the time range dropdown, remains the same as the previous screenshot.

The Define Data Warehouse Workload View opens, where you can define a set of criteria that enables you to analyze a specific set of queries.

For example, you can review all the failed queries using a specific database that are subject to a fifteen second SLA. For this example's view definition, a name is used that describes the view, as in **applog_db_under_15s**. Where the criteria will monitor queries that use the **applog** database, when **100** percent of these queries miss a

15s SLA, or when the total query execution time exceeds 15 seconds, then the workload is flagged with a failing status.:.

Cloudera Workload XM Cluster_14

Define Data Warehouse Workload View

* Name ⓘ applog_db_under_15s

* Criteria ⓘ Database = applog

* SLA ⓘ 15s Example: 1h 2m 3s 5ms

* Warning Threshold ⓘ 100 % queries missed SLA Workload will be flagged in failing status when it reaches this threshold.

Preview

- Click **Preview**, which displays a summary of the queries matching this criteria:

Cloudera Workload XM Cluster_14

Define Data Warehouse Workload View

* Name ⓘ applog_db_under_15s

* Criteria ⓘ Database = applog

* SLA ⓘ 15s Example: 1h 2m 3s 5ms

* Warning Threshold ⓘ 100 % queries missed SLA Workload will be flagged in failing status when it reaches this threshold.

Preview

Date range of queries in the workload. 03/08/2018 - 05/03/2018

Cluster default date range is in the past, metrics reflect the status of the period.

Total Queries Missed SLA %

188 29%

Summary of queries that match the criteria.

8. When you are satisfied with the results, click **Save**.

The Data Warehouse Workloads page opens and your workload view appears in the **Workload** column.

The screenshot shows the Cloudera Workload XM interface. On the left, there's a sidebar with categories: Data Warehouse (Summary, Workloads), Data Engineering (Summary, Jobs), and Feedback. The 'Workloads' tab is selected. The main area is titled 'Data Warehouse Workloads'. It has a search bar and a 'Status All' dropdown. Below is a table with columns: Status, Workload, Criteria, SLA, Warning Thresh..., Missed SLA %, Failure %, Total Queries, and Action. There are three rows: 1) applog_db_under_1... (green status, Database = applog, 15s SLA, 100% warning, 29% missed, 4% failure, 188 total queries, Actions dropdown). 2) invest-db (red status, Database = int_prod, 300ms SLA, 20% warning, 40% missed, 9% failure, 30204 total queries, Actions dropdown). 3) invest-db-2 (red status, Database = int_prod, Statement Type = DDL, 300ms SLA, 20% warning, 32% missed, 3% failure, 21151 total queries, Actions dropdown). A red arrow points down to the 'Workload' column header.

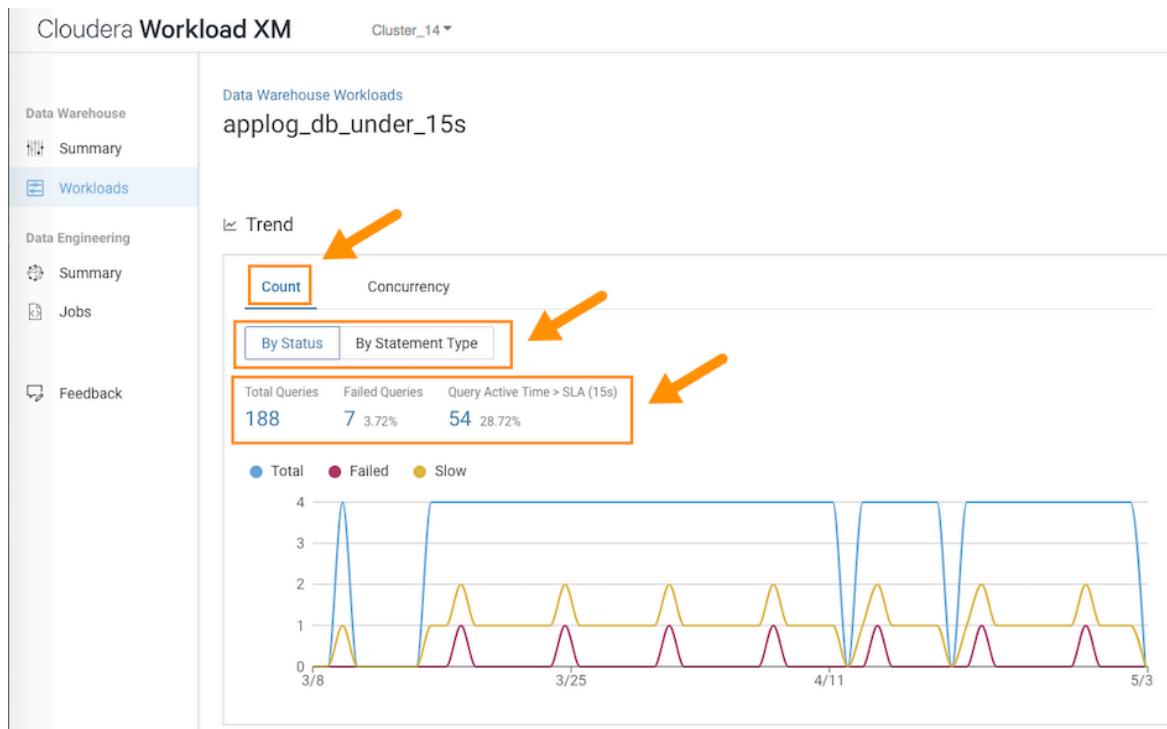
Status	Workload	Criteria	SLA	Warning Thresh...	Missed SLA %	Failure %	Total Queries	Action
green	applog_db_under_1...	Database = applog	15s	100%	29%	4%	188	Actions
red	invest-db	Database = int_prod	300ms	20%	40%	9%	30204	Actions
red	invest-db-2	Database = int_prod Statement Type = DDL	300ms	20%	32%	3%	21151	Actions

Tip: When you have a long list of Workload views you can locate a specific view by clicking the up or the down arrow next to the **Workload** column heading, which sorts the column alphabetically in ascending or descending order.

9. To view more information about the workloads using the view's formula, select the name of the workload view.

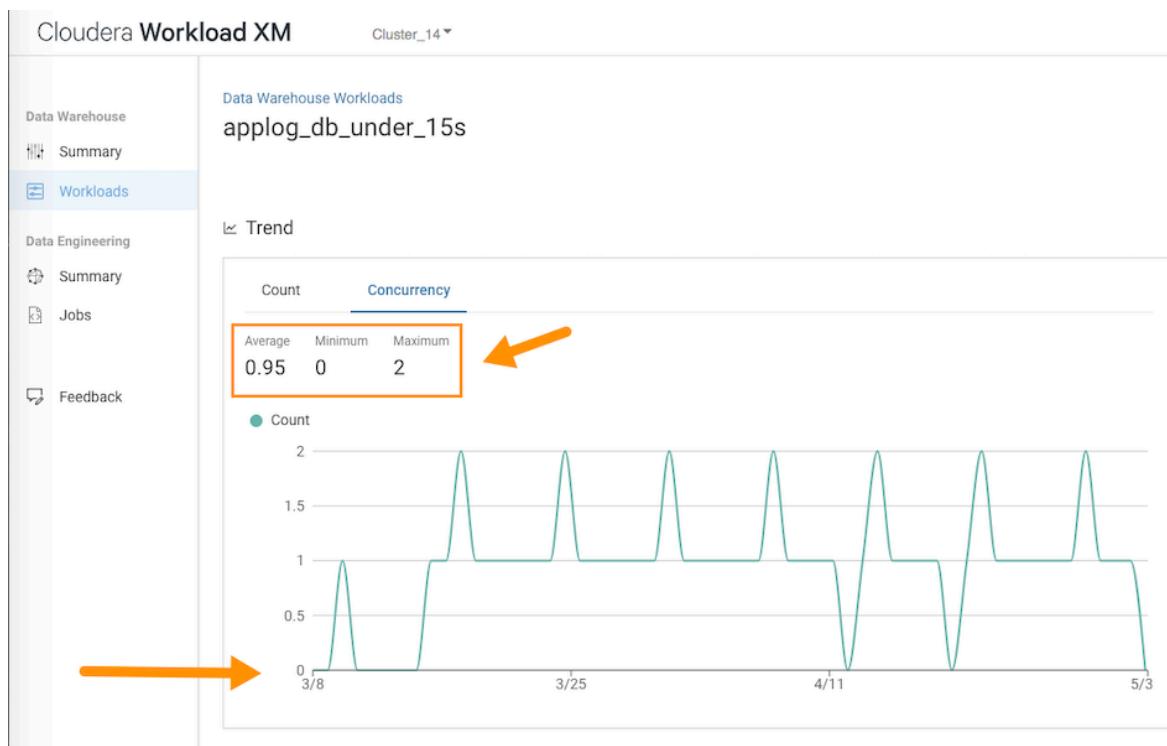
The details page for your workload view opens visually displaying the views details as charts and tabs that you can use to analyze, as in this example, which visually displays how this group of queries is meeting its SLA:

- In the Trend section, you can display the counts of executing queries, either **By Status** or **By Statement Type**.

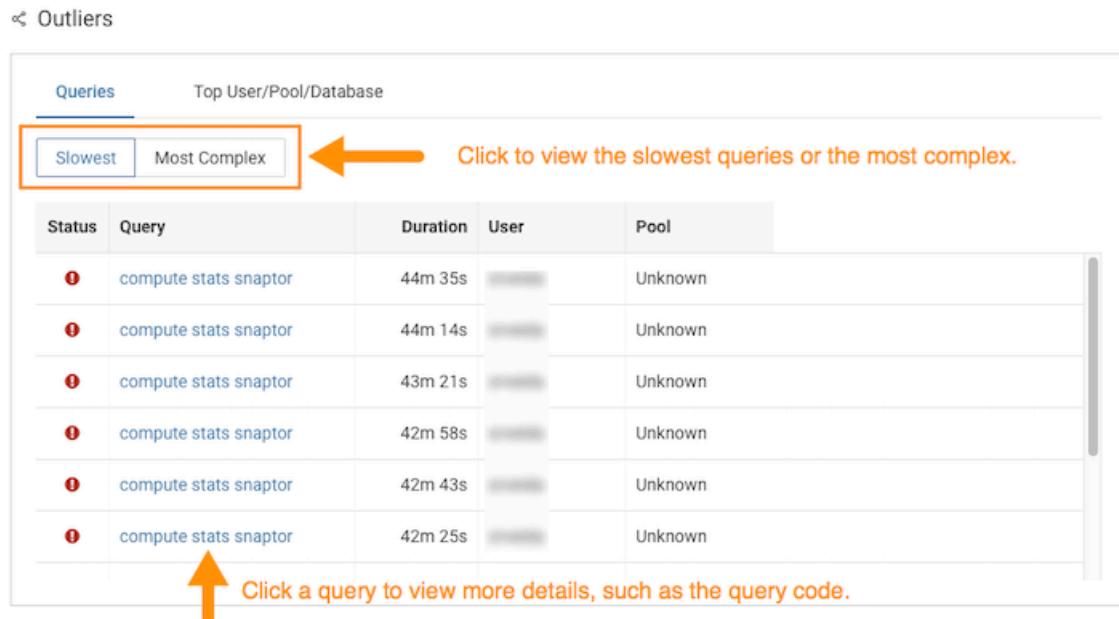


- To view further details, click the number under **Total Queries**, **Failed Queries**, and **Query Active Time**.
- To view the number of queries executing concurrently, click the **Concurrency** tab.

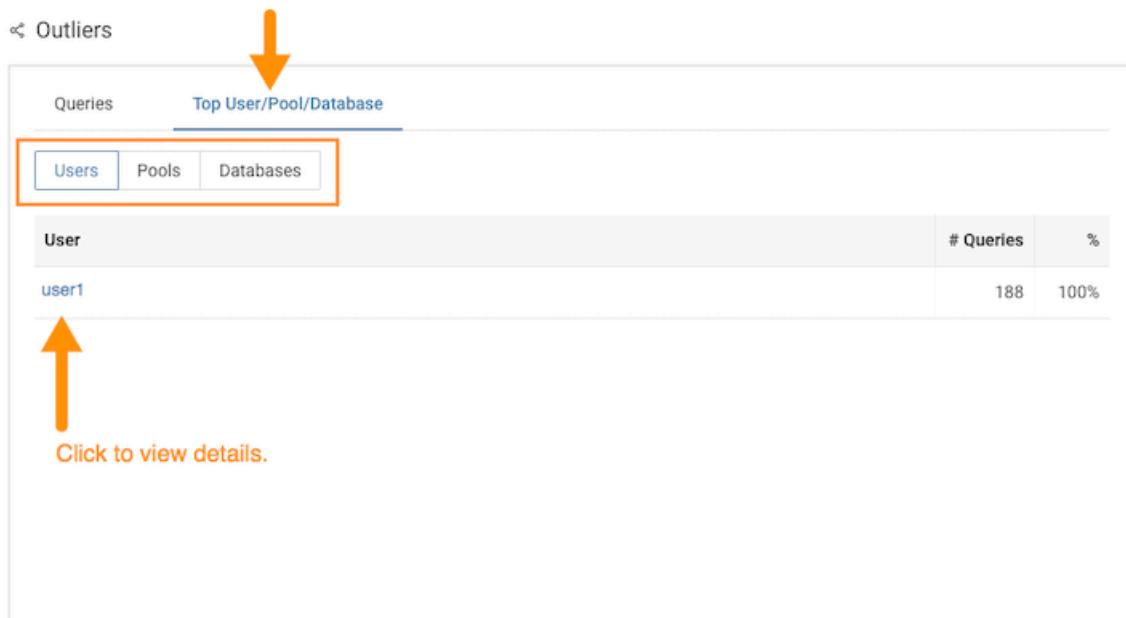
In this example, the maximum concurrency for this view is **2**. This indicates that for the queries flagged by this view, a maximum of only two queries access the same data at the same time during the specified time period. The graph, displays how the concurrency fluctuates over the date range specified for the workload view.



- In the Outliers section, you can display the **Slowest** queries and the **Most Complex** queries:



- You can also display the users who are executing the queries in your workload view and the pools and databases being used. To view further details about the specific queries being executed, click a user, pool, or the database name:



- You can also display the different statement types contained in the workload view, the active time of the queries, and you can further drill down to view more granular details on each query.

Troubleshooting with the Job Comparison Feature

Steps for comparing two different runs of the same job, which is especially useful when you notice unexpected changes. For example, when you have a job that consistently completes within a specific amount of time and then it starts taking longer, comparing two runs of the same job enables you to analyze the differences so that you can troubleshoot the cause.

About this task

Describes how to compare any two runs of a job using the Job Comparison tool.



Note: When a job is flagged as slow, there is a **Compare with Previous Run** link on the Job page that opens the Job Comparison tool and compares the current run of the job with its last run.

Procedure

1. Verify that you are logged in to the Cloudera Data Platform.
2. In a supported browser, log in to Workload XM.
3. From the **Your Enterprise Data Cloud** landing page, select the **Workload Manager** tile.
4. In the Search field of the Clusters page, enter the name of the cluster whose workloads you want to analyze.

5. From the navigation panel under Data Engineering, select **Jobs** and then from the time-range list in the Cluster Summary page, select a time period that meets your requirements.

Type	Job	Status	Start Time	Duration	User	Health Issue	Execution ID
SP	Target Acc...	Failed	09/05/2018 3:04 AM PDT	18m 50s	wxm_demo		application_1530620270675_38990
SP	spark-etl	Succeeded	08/06/2018 9:46 AM PDT	51m 42s	wxm_demo		620270675_42024
SP	spark-etl	Succeeded	08/03/2018 8:37 AM PDT	51m 16s	wxm_demo		application_1530620270675_38990
SP	spark-etl	Succeeded	08/03/2018 1:33 AM PDT	51m 1s	wxm_demo		application_1530620270675_38990

6. View the list of jobs that have executed during the selected time period:

The following example reveals that though the `spark-etl` job runs often, the last three runs have taken significantly longer. Where, on August 2, the duration was 27 minutes, but on August 3, the duration almost doubled to 51 minutes. The Job Comparison tool will enable you to examine both runs to determine why the duration changed:

Type	Job	Status	Start Time	Duration	User	Health Issue	Execution ID
SP	Target Acc...	Failed	09/05/2018 3:04 AM PDT	18m 50s	wxm_demo	Failed to Finish	application_1527
SP	spark-etl	Succeeded	08/06/2018 9:46 AM PDT	51m 42s	wxm_demo	Shuffle Task Input Skew Abnormal Data Output Task Input Data Skew Abnormal Data Input Abnormal Duration	application_1530
SP	spark-etl	Succeeded	08/03/2018 8:37 AM PDT	51m 16s	wxm_demo	Shuffle Task Input Skew Abnormal Data Output Task Input Data Skew Abnormal Duration	application_1530
SP	spark-etl	Succeeded	08/03/2018 1:33 AM PDT	51m 1s	wxm_demo	Shuffle Task Input Skew Abnormal Data Output Task Input Data Skew Abnormal Duration	application_1530
SP	spark-etl	Succeeded	08/02/2018 7:05 AM PDT	27m 3s	wxm_demo	Task Input Data Skew Shuffle Task Input Skew	application_1530
SP	spark-etl	Succeeded	07/31/2018 7:35 AM PDT	38m 39s	wxm_demo	Task Input Data Skew Shuffle Task Input Skew	application_1530
SP	spark-etl	Succeeded	07/31/2018 6:02 AM PDT	38m 13s	wxm_demo	Task Input Data Skew Shuffle Task Input Skew	application_1530

7. Select one of the runs of the spark-eti job, and then in the Jobs detail page, click the **Trends** tab:

Cloudera Workload XM WXM-Demo

Jobs

spark-eti application_1530620270675_38692

Overview Health Checks Execution Details Baseline **Trends**

8/3/2018 1:33 AM 51m 1s wxm_demo root.wxm_demo

Job performance can be improved.

Baseline

- Abnormal Duration: Finished in 51m 1s, slower than the median duration 38m 13s.
- Abnormal Data Input: Processed 2.3 GiB of data, more than the median 1.3 GiB.
- Abnormal Data Output: Generated 4.6 GiB of data, more than the median 3.6 GiB.

Skew

- Task Input Data Skew: Some tasks processed an abnormal amount of data.
- Shuffle Task Input Skew: In shuffle phase, some tasks had an abnormal amount of data.

Resources

No resource issues found.

Up to 30 runs prior to the selected job are displayed. Notice that in the **Input** and **Output** columns there are different amounts of data processed by the job. For example, on August 2, the job processed 2.4 GB of data and outputted 1.8 GB. However, on August 3, the job processed 4.2 GB, almost twice as much data, and it outputted 4.6 GB. The Job Comparison tool will enable you to examine both runs to determine why the amount of data changed:

Cloudera Workload XM WXM-Demo

Jobs

spark-eti application_1530620270675_38692

Overview Health Checks Execution Details Baseline Trends

8/3/2018 1:33 AM 51m 1s wxm_demo root.wxm_demo

Duration

Data Input

Data Output

Compare

Start Time	Execution ID	Status	Duration	Input	Output	Health Issues
08/03/2018 1:33 AM	application_1530620270675_38692	Succeeded	51m 1s	4.2 GiB	4.6 GiB	Shuffle Task Input Skew Abnormal Data Output Task Input Data Skew Abnormal Duration
08/02/2018 7:05 AM	application_1530620270675_37976	Succeeded	27m 3s	2.4 GiB	1.8 GiB	Task Input Data Skew Shuffle Task Input Skew
07/31/2018 7:35 AM	application_1530620270675_35552	Succeeded	38m 39s	4.2 GiB	3.6 GiB	Task Input Data Skew Shuffle Task Input Skew
07/31/2018 6:02 AM	application_1530620270675_35463	Succeeded	38m 13s	4.2 GiB	3.6 GiB	Task Input Data Skew Shuffle Task Input Skew
05/24/2018 11:45 AM	application_1521297608030_101095	Failed	17m 3s	1.5 GiB	0 B	Shuffle Task Input Skew Failed to Finish
03/21/2018 8:23 AM	application_1521297608030_4085	Failed	1h 16m 2s	64.2 GiB	0 B	Shuffle Task Input Skew Failed to Finish
03/08/2018 4:49 AM	application_1520383227161_2794	Failed	15m 16s	17.9 GiB	0 B	Shuffle Task Input Skew Failed to Finish

8. To compare two job runs, select the check boxes adjacent to the job runs you require, in this case the runs for August 2 and August 3 are selected, and then click **Compare**.

The Job Comparison page opens displaying more details about each job. For this example's comparison, the tabs that will contain more information are the **Structure**, **Configurations**, and the **SQL Executions** tabs:

Job Comparison

Jobs

application_1530620270675_37976 (spark-etl)

application_1530620270675_38692 (spark-etl)

Performance

Duration

27m 3s	51m 1s
--------	--------

Data Input

2.4 GiB	4.2 GiB
---------	---------

Data Output

1.8 GiB	4.6 GiB
---------	---------

Details

Basic Structure Configurations SQL Executions Metrics

	application_1530620270675_37976	application_1530620270675_38692
Name	spark-etl	spark-etl
Type	Spark	Spark
Start Time	08/02/2018 7:05 AM	08/03/2018 1:33 AM
Status	Succeeded	Succeeded
Health Issues	Task Input Data Skew, Shuffle Task Input Skew	Shuffle Task Input Skew, Abnormal Data Output, Task Input Data Skew
Duration	27m 3s	51m 1s



Note: The **SQL Executions** tab is only available for Spark jobs.

9. The **Structure** tab page, displays the sub-jobs executed for both runs of the `spark-etl` job:

In this example, the job that took 27 minutes only executed 9 sub-jobs and the job that took 51 minutes, almost twice as much time, executed 16 sub-jobs, almost twice as many. Selecting any of the listed sub-jobs displays more details.

When the **Configurations** tab was examined, it revealed that the configurations between the two runs of this job were identical, so a configuration change probably did not cause this anomaly.

Details		
Basic	Structure	Configurations
application_1530620270675_37976		application_1530620270675_38692
07:05	⌚ SP spark-etl	27m 3s
07:06	+ ⌚ Job 0	36s 934ms
07:06	+ ⌚ Job 1	41s 353ms
07:06	+ ⌚ Job 2	49s 825ms
07:07	+ ⌚ Job 3	8s 757ms
07:07	+ ⌚ Job 4	8s 181ms
07:07	+ ⌚ Job 5	8s 101ms
07:07	+ ⌚ Job 6	42s 402ms
07:07	+ ⌚ Job 7	51s 113ms
07:07	+ ⌚ Job 8	24m 8s
07:32	+ ⌚ Job 9	1s 159ms
		⌚ SP spark-etl
01:33	+ ⌚ Job 0	51m 1s
01:34	+ ⌚ Job 1	36s 124ms
01:34	+ ⌚ Job 2	41s 394ms
01:34	+ ⌚ Job 3	53s 413ms
01:35	+ ⌚ Job 4	10s 903ms
01:35	+ ⌚ Job 5	8s 923ms
01:35	+ ⌚ Job 6	8s 875ms
01:35	+ ⌚ Job 7	48s 940ms
01:35	+ ⌚ Job 8	55s 78ms
01:36	+ ⌚ Job 9	25m 21s
02:01	+ ⌚ Job 10	224ms
02:01	+ ⌚ Job 11	275ms
02:01	+ ⌚ Job 12	214ms
02:01	+ ⌚ Job 13	206ms
02:01	+ ⌚ Job 14	981ms
02:01	+ ⌚ Job 15	267ms
02:01	+ ⌚ Job 16	22m 9s
		15s 827ms

10. When the **SQL Executions** tab was selected, it revealed that twice as many Spark queries executed for the job that took the longest duration:

Job Comparison																																					
Jobs																																					
application_1530620270675_37976 (spark-etl)																																					
application_1530620270675_38692 (spark-etl)																																					
Performance																																					
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Basic	Structure	Configurations																																			
application_1530620270675_37976		application_1530620270675_38692																																			
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Results

The analysis from the Job Comparison tells us that either the Spark SQL code was changed by the Job Developer or that the data which the code ran against triggered more of the Spark queries in the job. The Workload XM Job Comparison tool helped narrow the number of causes that produced this anomaly. In this example, the change in job duration appears to be expected so no further troubleshooting is required.

Identifying File Size Storage Issues

Data stored in small files or partitions may create performance issues. The File size reporting feature helps you identify data that is stored inefficiently in small files or partitions.

A table's data maybe stored in a large number of files, perhaps millions of files. For example, the first time you run an Impala query, Impala also loads the metadata for each file, which can cause processing delays. In addition, every time you change a query, refresh the metadata, or add a new file or partition, Impala reloads the metadata. This puts pressure on the NameNode, which stores each file's metadata. For more information about the problems caused by small files and what you can do to fix those problems, see [Handling Small Files on Hadoop with Hive and Impala](#) on the Cloudera Engineering Blog.

The Workload XM file size reporting enables you to identify tables that have a large number of files or partitions. For example, if a query runs slowly or your Impala cluster crashed, you can view the table's metadata that the query is using to determine if a large number of files or partitions is causing the problem.



Important: At this time the Workload XM File Size Report feature is only supported on CDH Workload clusters, version 6.3 to version 7.0, with Cloudera Navigator enabled. CDP Workload clusters are not supported.



Note: Before you can view file size metadata in Workload XM, you must enable file size reporting in Cloudera Manager. Once enabled, the file size metadata is saved in HDFS. Telemetry Publisher gets the metadata from HDFS and sends it to Workload XM.

Displaying File Size Metadata

Steps for displaying a table's File Size report and the metadata about the table's file's size distribution.

About this task

Describes how to open a table's File Size report and the metadata of a file.



Important: At this time the Workload XM File Size Report feature is only supported on CDH Workload clusters, version 6.3 to version 7.0, with Cloudera Navigator enabled. CDP Workload clusters are not supported.

Procedure

1. Verify that you are logged in to the Cloudera Data Platform.
2. In a supported browser, log in to Workload XM.
3. From the **Your Enterprise Data Cloud** landing page, select the **Workload Manager** tile.
4. In the Search field of the Clusters page, enter the name of the cluster whose workloads you want to analyze.
5. From the navigation panel under Data Warehouse, select **File Size Report**.

6. In the **File Size Report** page, either search for a specific table, or locate the table by sorting the tables by the number of files, the number of partitions, or the table size.

For example, the File Size Reports shows that the Animantarx table has 7 million files and 913 partitions.

Table	Files	Median File Size	File Size Distribution	Partitions	Table Size	Database
Animantarx	7M	36.7 KiB		913	229.6 GiB	Carnotaurus
Bonapartenykus	3.1M	1 MiB		397.3K	3.3 TiB	Bruhathkayosaurus
Balaaur	1.7M	469 KiB		1K	1.7 TiB	Chasmosaurus
Alwalkeria	595.3K	2.5 MiB		1.7K	1.4 TiB	Cetiosaurus
Atlasaurus	401.8K	1.2 KiB		4	477.6 MiB	Chilantaisaurus
Angolatitan	358.9K	168 KiB		7.1K	455.9 GiB	Cerasinops
Anatosaurus	346.9K	1.9 KiB		5.1K	27.3 GiB	Byronosaurus

7. To display details about the table's file size distribution, select a table name.

For example, the following table's details window shows that the Aerosteon table uses 42 data files that range from 10 to 24.5 GiB and the graph displays the Q1 and Q3 file size distribution.

Table	Files	Median File Size	File Size Distribution	Partitions	Table Size	Database
Atlascopcosaurus	42	41.1 KiB		0	1.7 MiB	Chilantaisaurus
Agustinia	42	10.8 MiB		0	168.3 KiB	Chialingosaurus
Apatosaurus	42	1.2 MiB		0	24.1 MiB	Cerasinops
Bistahieversor	42	338.9 KiB		0	9.8 MiB	Camelotia
Amurosaurus	42	367.3 KiB		0	28.9 MiB	Brachylophosaurus
Acrotholus	42	789 B		0	2 GiB	Chungkingosaurus
Aorun	42	11.9 GiB		0	12.4 MiB	Carnotaurus
Aerosteon	42	11.9 GiB		0	572.5 GiB	Bruhathkayosaurus
Anatosaurus	42	1.2 MiB		0	48.7 MiB	Chasmosaurus
Afrovenator	42	338.9 KiB		0	14.5 MiB	Byronosaurus
Barosaurus	42	367.3 KiB		0	14.9 MiB	Carcharodontosaurus
Aucasaurus	42	789 B		0	32.9 KiB	Brachytrachelopan

Displaying the Metadata of a Table

Steps for displaying a table's metadata that could be causing a query to run slowly.

About this task

Describes how to display the metadata of table used in your query, such as the table's file size distribution that could be causing your query statement to run slowly.

Procedure

- Verify that you are logged in to the Cloudera Data Platform.

2. In a supported browser, log in to Workload XM.
3. From the **Your Enterprise Data Cloud** landing page, select the **Workload Manager** tile.
4. In the Search field of the Clusters page, enter the name of the cluster whose workloads you want to analyze.
5. From the navigation panel under Data Warehouse, select **Summary**.
6. In the Queries page, select the query of interest and then select the **HDFS Tables Scanned** tab.

For example, the **Duration** column shows that the query took over six hours to run and the **HDFS Tables Scanned** section displays the metadata for the tables that were scanned.



Note: This is not the number of files accessed, but the total number of files that were in the table the last time a HDFS snapshot was taken before the query was run.

The screenshot shows the Cloudera Workload XM interface. On the left, there's a sidebar with sections for Data Warehouse (Summary, Workloads, File Size Report), Data Engineering (Summary, Jobs), and Feedback. The main area is titled 'Queries' and shows a specific query ID: 1c4d1a6ca67e94f4:7977bd4d00000000. Below the query ID, there are tabs for 'Summary', 'Trend', 'Succeeded', '04/24/2019 2:05 AM CDT', 'stegosaurus', 'DML', 'root.default', and 'Profile'. Under the 'Summary' tab, it shows metrics: Joins (2), Duration (6h 34m 3s), Rows Produced (571), Aggregate CPU Usage (41h 29m 23s), Aggregate Memory Usage (30.6 TiB × s), and Peak Memory Usage (1.5 GiB). Below these metrics, there are tabs for 'Basic', 'Operators', 'Hosts', and 'HDFS Tables Scanned'. The 'HDFS Tables Scanned' tab is selected. A note below it states: 'The table metadata below is taken from the last HDFS snapshot before the query was run.' A table is shown with columns: Table, Files, Median File Size, File Size Distribution, Partitions, Table Size, and Database. One row is present: Aragosaurus, 739, 39.5 KiB, 0, 78.8 MiB, and Brachytrachelopan.

Table	Files	Median File Size	File Size Distribution	Partitions	Table Size	Database
Aragosaurus	739	39.5 KiB		0	78.8 MiB	Brachytrachelopan

7. To display the file size distribution details for a table, click the Table name .