

Monitoring Apache Impala

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Impala Logs

You can review Impala log files on each host, when you have traced an issue back to a specific system. The Impala logs contain information about any errors Impala encountered, jobs Impala has completed, and settings Impala is configured with.

The logs store information about Impala startup options. This information appears once for each time Impala is started and may include:

- Machine name.
- Impala version number.
- Flags used to start Impala.
- CPU information.
- The number of available disks.

A new set of log files is produced each time the associated daemon is restarted. These log files have long names including a timestamp. The .INFO, .WARNING, and .ERROR files are physically represented as symbolic links to the latest applicable log files.

Review Impala log files on each host, when you have traced an issue back to a specific system:

- By using the web interface at `http://host-name:25000/logs` where host-name is your Cloudera cluster host name.

The web interface limits the amount of logging information displayed. To view every log entry, access the log files directly through the file system. Impala log files can often be several megabytes in size.

- By examining the contents of the log file

By default, the Impala logs are stored at `/var/log/impalad/`, `/var/log/catalogd/`, and `/var/log/statestore/`. The most comprehensive log, showing informational, warning, and error messages, is in the file name `impalad.INFO`.

For each of `impalad`, `statestore`, `catalogd`:

- Examine the .INFO files to see configuration settings for the processes.
- Examine the .WARNING files to see all kinds of problem information, including such things as suboptimal settings and also serious runtime errors.
- Examine the .ERROR and/or .FATAL files to see only the most serious errors, if the processes crash, or queries fail to complete. These messages are also in the .WARNING file.

Cloudera Manager collects front-end and back-end logs together into a single view and let you do a search across log data for all the managed nodes in `DiagnosticsLogs`.

Managing Logs

You must configure the Impala log settings to change the default log locations, to rotate logs, or to log verbose levels.

Procedure

1. To change log file locations:

- a) In Cloudera Manager, navigate to Impala serviceConfiguration.
- b) In the search field, type `log_dir`.
- c) Specify the new log directories for Impala Daemon, Catalog Server, or StateStore in the respective fields:
 - Impala Daemon Log Directory
 - Catalog Server Log Directory
 - StateStore Log Directory
- d) Click Save Changes and restart Impala.

2. To set up log rotation:

- a) In Cloudera Manager, navigate to Impala serviceConfiguration.
- b) In the search field, type `max_log_files`.
- c) Specify the values for Impala Daemon, Catalog Server, or StateStore in the respective fields:
 - Impala Daemon Maximum Log Files
 - Catalog Server Maximum Log Files
 - StateStore Maximum Log Files
- d) Click Save Changes and restart Impala.

The above configuration option specifies how many log files to keep at each severity level (INFO, WARNING, ERROR, and FATAL).

- A value of 0 preserves all log files, in which case you would set up manual log rotation using your Linux tool or technique of choice.
- A value of 1 preserves only the very latest log file.
- The default value is 10.

For some log levels, Impala logs are first temporarily buffered in memory and only written to disk periodically. The `--logbufsecs` setting controls the maximum time that log messages are buffered for. For example, with the default value of 5 seconds, there may be up to a 5 second delay before a logged message shows up in the log file.

It is not recommended that you set `--logbufsecs` to 0 as the setting makes the Impala daemon to spin in the thread that tries to delete old log files.

3. To specify how often the log information is written to disk:

- a) In Cloudera Manager, navigate to Impala serviceConfiguration.
- b) In the search field, type `logbuflevel`.
- c) Specify the values for Impala Daemon, Catalog Server, or StateStore in the respective fields:
 - Impala Daemon Log Buffer Level
 - Catalog Server Log Buffer Level
 - StateStore Log Buffer Level

The default is 0, meaning that the log is immediately flushed to disk when Impala outputs an important messages such as a warning or an error, but less important messages such as informational ones are buffered in memory rather than being flushed to disk immediately.

- d) Click Save Changes and restart Impala.

4. To set the logging verbose levels:

- a) In Cloudera Manager, navigate to Impala serviceConfiguration.
- b) In the search field, type GLOG_v.
- c) Specify the values for Impala Daemon, Catalog Server, or StateStore in the respective fields:
 - Impala Daemon Verbose Log Level
 - Catalog Server Verbose Log Level
 - StateStore Verbose Log Level
- d) Click Save Changes and restart Impala.

As logging levels increase, the categories of information logged are cumulative. For example, GLOG_v=2 records everything GLOG_v=1 records, as well as additional information.

Increasing logging levels imposes performance overhead and increases log size. Cloudera recommends using GLOG_v=1 for most cases: this level has minimal performance impact but still captures useful troubleshooting information.

Additional information logged at each level of GLOG_v is as follows:

- 1: The default level. Logs information about each connection and query that is initiated to an impalad instance, including runtime profiles.
- 2: Everything from the previous level plus information for each RPC initiated. This level also records query execution progress information, including details on each file that is read.
- 3: Everything from the previous level plus logging of every row that is read. This level is only applicable for the most serious troubleshooting and tuning scenarios, because it can produce exceptionally large and detailed log files, potentially leading to its own set of performance and capacity problems.



Note: For performance reasons, Cloudera highly recommends not setting the most verbose logging level to 3.

Impala lineage

You can use the Atlas lineage graph to understand the source and impact of data and changes to data over time and across all your data.

Atlas collects metadata from Impala to represent the lineage among data assets. The Atlas lineage graph shows the input and output processes that the current entity participated in. Entities are included if they were inputs to processes that lead to the current entity or they are output from processes for which the current entity was an input. Impala processes follow this pattern.

Note that lineage is not updated between a table and views that the table is a part of when an Impala ALTER TABLE operation runs on the table.

Related Information

[Impala metadata collection](#)

Web User Interface for Debugging

You can use the Impala daemons (impalad, statestored, and catalogd) Web UI to display the diagnostic and status information. Each of these Impala daemons includes a built-in web server.

Impala Daemon Web UI

The Impala Daemon (impalad) Web UI includes information about configuration settings, running and completed queries, and associated performance and resource usage for queries. In particular, the Details link for each query displays alternative views of the query including a

graphical representation of the plan, and the output of the EXPLAIN, SUMMARY, and PROFILE statements from `impala-shell`. Each host that runs the `impalad` daemon has its own instance of the Web UI, with details about those queries for which that host served as the coordinator. The `impalad` Web UI is primarily used for diagnosing query problems that can be traced to a particular node.

StateStore Web UI

The StateStore (`statestored`) Web UI includes information about memory usage, configuration settings, and ongoing health checks performed by `statestored`. Because there is only a single instance of the `statestored` within any Impala cluster, you access the Web UI only on the particular host that serves as the Impala StateStore.

Catalog Server Web UI

The Catalog Server (`catalogd`) Web UI includes information about the databases, tables, and other objects managed by Impala, in addition to the resource usage and configuration settings of the `catalogd`. Because there is only a single instance of the `catalogd` within any Impala cluster, you access the Web UI only on the particular host that serves as the Impala Catalog Server.

Debug Web UI for Impala Daemon

You can use the Impala Daemon (`impalad`) Web UI to view information about configuration settings, running and completed queries, and associated performance and resource usage for queries.

To debug and troubleshoot an `impalad` using a web-based interface, open the URL `http://impala#server#hostname:25000/` in a browser. (For secure clusters, use the prefix `https://` instead of `http://`.)

Because each Impala node produces its own set of debug information, you should choose a specific node that you want to investigate an issue on.

Main Page

The main `impalad` Web UI page at `/` lists the following information about the `impalad`:

- The version of the `impalad` daemon
- The Version section also contains other information, such as when Impala was built and what build flags were used.
- Process start time
- Hardware information
- OS information
- Process information
- CGroup information

Admission Controller Page

The Admission Controller `impalad` debug Web UI is at `/admission` page under the main `impalad` Web UI.

Use the `/admission` page to troubleshoot queued queries and the admission control.

The admission page provides the following information about each resource pool to which queries have been submitted at least once:

- Time since the `statestored` received the last update
- A warning if this `impalad` is considered disconnected from the `statestored` and thus the information on this page could be stale.
- Pool configuration
- Queued queries submitted to this coordinator, in the order of submission
- Running queries submitted to this coordinator

- Pool stats
 - Average of time in queue: An exponential moving average which represents the average time in queue over the last 10 to 12 queries. If a query is admitted immediately, the wait time of 0 is used in calculating this average wait time.
- Histogram of the distribution of peak memory used by queries admitted to the pool

Use the histogram to figure out settings for the minimum and maximum query MEM_LIMIT ranges for this pool.

The histogram displays data for all queries admitted to the pool, including the queries that finished, got canceled, or encountered an error.

Click on the pool name to only display information relevant to that pool. You can then refresh the debug page to see only the information for that specific pool.

Click Reset informational stats for all pools to reset the stats that keep track of historical data, such as Totals stats, Time in queue (exponential moving average), and the histogram.

The above information is also available as a JSON object from the following HTTP endpoint:

```
http://impala-server-hostname:port/admission?json
```

Known Backends Page

The Known backends page of the impalad debug Web UI is at /backends under the main impalad Web UI.

This page lists the following info for each of the impalad nodes in the cluster. Because each impalad daemon knows about every other impalad daemon through the StateStore, this information should be the same regardless of which node you select.

- Address of the node: Host name and port
- KRPC address: The KRPC address of the impalad. Use this address when you issue the SHUT DOWN command for this impalad.
- Whether acting as a coordinator
- Whether acting as an executor
- Quiescing status: Specify whether the graceful shutdown process has been initiated on this impalad.
- Memory limit for admission: The amount of memory that can be admitted to this backend by the admission controller.
- Memory reserved: The amount of memory reserved by queries that are active, either currently executing or finished but not yet closed, on this backend.

The memory reserved for a query that is currently executing is its memory limit, if set. Otherwise, if the query has no limit or if the query finished executing, the current consumption is used.

- Memory of the queries admitted to this coordinator: The memory submitted to this particular host by the queries admitted by this coordinator.

Catalog Page

The Catalog page of the impalad debug Web UI is at /catalog under the main impalad Web UI.

This page displays a list of databases and associated tables recognized by this instance of impalad. You can use this page to locate which database a table is in, check the exact spelling of a database or table name, look for identical table names in multiple databases. The primary debugging use case would be to check if an impalad instance has knowledge of a particular table that someone expects to be in a particular database.

Hadoop Configuration

The Hadoop Configuration page of the impalad debug Web UI is at /hadoop-varz under the main impalad Web UI.

This page displays the Hadoop common configurations that Impala is running with.

JMX

The JMX page of the impalad debug Web UI is at /jmx under the main impalad Web UI.

This page displays monitoring information about various JVM subsystems, such as memory pools, thread management, runtime. etc.

Java Log Level

The Change log level page of the impalad debug Web UI is at /log_level under the main impalad Web UI.

This page displays the current Java and backend log levels, and it allows you to change the log levels dynamically without having to restart the impalad.

Logs Page

The INFO logs page of the impalad debug Web UI is at /logs under the main impalad Web UI.

This page shows the last portion of the impalad.INFO log file, including the info, warning, and error logs for the impalad. You can see the details of the most recent operations, whether the operations succeeded or encountered errors. This page provides one central place for the log files and saves you from looking around the filesystem for the log files, which could be in different locations on clusters that use cluster management software.

Memz Page

The Memory Usage page of the impalad debug Web UI is at /memz under the main impalad Web UI.

This page displays the summary and detailed information about memory usage by the impalad.

Metrics Page

The Metrics page of the impalad debug Web UI is at /metrics under the main impalad Web UI.

This page displays the current set of metrics, counters and flags representing various aspects of impalad internal operations.

Queries Page

The Queries page of the impalad debug Web UI is at /queries under the main impalad Web UI.

This page lists:

- Currently running queries
- Queries that have completed their execution, but have not been closed yet
- Completed queries whose details still reside in memory

The queries are listed in reverse chronological order, with the most recent at the top. You can control the amount of memory devoted to completed queries by specifying the `-#-#query_log_size` startup option for impalad.

This page provides:

- How many SQL statements are failing (State value of EXCEPTION)
- How large the result sets are (# rows fetched)
- How long each statement took (Start Time and End Time)

Click the Details link for a query to display the detailed performance characteristics of that query, such as the profile output.

On the query detail page, in the Profile tab, you have options to export the query profile output to the Thrift, text, or Json format.

The Queries page also includes the Query Locations section that lists the number of running queries with fragments on this host.

RPC Services Page

The RPC durations page of the impalad debug Web UI is at /rpcz under the main impalad Web UI.

This page displays information, such as the duration, about the RPC communications of this impalad with other Impala daemons.

Sessions Page

The Sessions page of the impalad debug Web UI is at /session under the main impalad Web UI.

This page displays information about the sessions currently connected to this impalad instance. For example, sessions could include connections from the impala-shell command, JDBC or ODBC applications, or the Impala Query UI in the Hue web interface.

Threadz Page

The Threads page of the impalad debug Web UI is at /threadz under the main impalad Web UI.

This page displays information about the threads used by this instance of impalad, and it shows which categories they are grouped into. Making use of this information requires substantial knowledge about Impala internals.

Varz Page

The Varz page of the impalad debug Web UI is at /varz under the main impalad Web UI.

This page shows the configuration settings in effect when this instance of impalad communicates with other Hadoop components such as HDFS and YARN. These settings are collected from a set of configuration files.

The bottom of this page also lists all the command-line settings in effect for this instance of impalad.

Prometheus Metrics Page

At /metrics_prometheus, under the main impalad Web UI, the metrics are generated in Prometheus exposition format that Prometheus can consume for event monitoring and alerting.

The /metrics_prometheus is not shown in the Web UI list of pages.

Debug Web UI for StateStore

You can use the StateStore (statestored) Web UI to view information about memory usage, configuration settings, and ongoing health checks performed by statestored.

To debug and troubleshoot the statestored daemon using a web-based interface, open the URL `http://impala#server#hostname:25010/` in a browser. (For secure clusters, use the prefix `https://` instead of `http://`.)

Main Page

The main statestored Web UI page at / lists the following information about the statestored:

- The version of the statestored daemon
- Process start time
- Hardware information
- OS information
- Process information
- CGroup information

Logs Page

The INFO logs page of the debug Web UI is at /logs under the main statestored Web UI.

This page shows the last portion of the statestored.INFO log file, including the info, warning, and error logs for the statestored. You can refer here to see the details of the most recent operations, whether the operations succeeded or encountered errors. This page provides one central place for the log files and saves you from looking around the filesystem for the log files, which could be in different locations on clusters that use cluster management software.

Memz Page

The Memory Usage page of the debug Web UI is at /memz under the main statestored Web UI.

This page displays summary and detailed information about memory usage by the statestored. You can see the memory limit in effect for the node, and how much of that memory Impala is currently using.

Metrics Page

The Metrics page of the debug Web UI is at /metrics under the main statestored Web UI.

This page displays the current set of metrics: counters and flags representing various aspects of statestored internal operation.

RPC Services Page

The RPC durations page of the statestored debug Web UI is at /rpcz under the main statestored Web UI.

This page displays information, such as the durations, about the RPC communications of this statestored with other Impala daemons.

Subscribers Page

The Subscribers page of the debug Web UI is at /subscribers under the main statestored Web UI.

This page displays information about the other Impala daemons that have registered with the statestored to receive and send updates.

Threadz Page

The Threads page of the debug Web UI is at /threadz under the main statestored Web UI.

This page displays information about the threads used by this instance of statestored, and shows which categories they are grouped into. Making use of this information requires substantial knowledge about Impala internals.

Topics Page

The Topics page of the debug Web UI is at /topics under the main statestored Web UI.

This page displays information about the topics to which the other Impala daemons have registered to receive updates.

Varz Page

The Varz page of the debug Web UI is at /varz under the main statestored Web UI.

This page shows the configuration settings in effect when this instance of statestored communicates with other Hadoop components such as HDFS and YARN. These settings are collected from a set of configuration files.

The bottom of this page also lists all the command-line settings in effect for this instance of statestored.

Prometheus Metrics Page

At `/metrics_prometheus`, under the main statestored Web UI, the metrics are generated in Prometheus exposition format that Prometheus can consume for event monitoring and alerting.

The `/metrics_prometheus` is not shown in the Web UI list of pages.

Debug Web UI for Catalog Server

You can use the Catalog Server (`catalogd`) Web UI to view information about the databases, tables, and other objects managed by Impala, in addition to the resource usage and configuration settings of the `catalogd`.

The main page of the debug Web UI is at `http://impala#server#hostname:25020/` (non-secure cluster) or `https://impala#server#hostname:25020/` (secure cluster).

Main Page

The main `catalogd` Web UI page at `/` lists the following information about the `catalogd`:

- The version of the `catalogd` daemon
- Process start time
- Hardware information
- OS information
- Process information
- CGroup information

Catalog Page

The Catalog page of the debug Web UI is at `/catalog` under the main `catalogd` Web UI.

This page displays a list of databases and associated tables recognized by this instance of `catalogd`. You can use this page to locate which database a table is in, check the exact spelling of a database or table name, look for identical table names in multiple databases. The catalog information is represented as the underlying Thrift data structures.

JMX

The JMX page of the `catalogd` debug Web UI is at `/jmx` under the main `catalogd` Web UI.

This page displays monitoring information about various JVM subsystems, such as memory pools, thread management, runtime. etc.

Java Log Level

The Change log level page of the `catalogd` debug Web UI is at `/log_level` under the main `catalogd` Web UI.

The page displays the current Java and backend log levels and allows you to change the log levels dynamically without having to restart the `catalogd`.

Logs Page

The INFO logs page of the debug Web UI is at `/logs` under the main `catalogd` Web UI.

This page shows the last portion of the `catalogd.INFO` log file, including the info, warning, and error logs for the `catalogd` daemon. You can refer here to see the details of the most recent operations, whether the operations succeeded or encountered errors. This page provides one central place for the log files and saves you from looking around the filesystem for the log files, which could be in different locations on clusters that use cluster management software.

Memz Page

The Memory Usage page of the debug Web UI is at `/memz` under the main `catalogd` Web UI.

This page displays summary and detailed information about memory usage by the `catalogd`. You can see the memory limit in effect for the node, and how much of that memory Impala is currently using.

Metrics Page

The Metrics page of the debug Web UI is at /metrics under the main catalogd Web UI.

This page displays the current set of metrics: counters and flags representing various aspects of catalogd internal operation.

RPC Services Page

The RPC durations page of the catalogd debug Web UI is at /rpcz under the main catalogd Web UI.

This page displays information, such as the durations, about the RPC communications of this catalogd with other Impala daemons.

Threadz Page

The Threads page of the debug Web UI is at /threadz under the main catalogd Web UI.

This page displays information about the threads used by this instance of catalogd, and shows which categories they are grouped into. Making use of this information requires substantial knowledge about Impala internals.

Varz Page

The Varz page of the debug Web UI is at /varz under the main catalogd Web UI.

This page shows the configuration settings in effect when this instance of catalogd communicates with other Hadoop components such as HDFS and YARN. These settings are collected from a set of configuration files.

The bottom of this page also lists all the command-line settings in effect for this instance of catalogd.

Prometheus Metrics Page

At /metrics_prometheus, under the main catalogd Web UI, the metrics are generated in Prometheus exposition format that Prometheus can consume for event monitoring and alerting.

The /metrics_prometheus is not shown in the Web UI list of pages.

Configuring Impala Web UI

As an administrator, you can diagnose issues with each daemon on a particular host, or perform other administrative actions such as cancelling a running query from the built-in web server's UI. The built-in web server is included within each of the Impala-related daemons. By default, these web servers are enabled. You can turn them off in a high-security configuration where it is not appropriate for users to have access to this kind of monitoring information through a web interface.

Enabling and Disabling Access to Impala Web Servers

By default, these web servers are enabled. You might turn them off in a high-security configuration where it is not appropriate for users to have access to this kind of monitoring information through a web interface.

To enable or disable Impala Web Servers for Web UI in Cloudera Manager:

- Impala Daemon
 1. Navigate to ClustersImpala ServiceConfiguration.
 2. Select ScopeImpala Daemon .
 3. Select CategoryPorts and Addresses.
 4. Select or clear Enable Impala Daemon Web Server.
 5. Click Save Changes, and restart the Impala service.

- Impala StateStore
 1. Navigate to ClustersImpala ServiceConfiguration.
 2. Select ScopeImpala StateStore.
 3. Select CategoryMain.
 4. Select or clear Enable StateStore Web Server.
 5. Click Save Changes, and restart the Impala service.
- Impala Catalog Server
 1. Navigate to ClustersImpala ServiceConfiguration.
 2. Select ScopeImpala Catalog Server.
 3. Select CategoryMain.
 4. Check or clear Enable Catalog Server Web Server.
 5. Click Save Changes, and restart the Impala service.

Configuring Secure Access for Impala Web Servers

Cloudera Manager supports two methods of authentication for secure access to the Impala Catalog Server, Impala Daemon, and StateStore web servers: password-based authentication and SPNEGO authentication.

Authentication for the three types of daemons can be configured independently.

Configuring Password Authentication

1. Navigate to ClustersImpala ServiceConfiguration.
2. Search for "password" using the Search box in the Configuration tab. This should display the password-related properties (Username and Password properties) for the Impala Daemon, StateStore, and Catalog Server. If there are multiple role groups configured for Impala Daemon instances, the search should display all of them.
3. Enter a username and password into these fields.
4. Click Save Changes, and restart the Impala service.

Now when you access the Web UI for the Impala Daemon, StateStore, or Catalog Server, you are asked to log in before access is granted.

Enabling Kerberos HTTP SPNEGO Authentication for Web UI

To provide security through Kerberos, Impala Web UIs support SPNEGO. SPNEGO is a protocol for securing HTTP requests with Kerberos by passing negotiation tokens through HTTP headers.

To enable authorization using SPNEGO in Cloudera Manager:

1. Navigate to ClustersImpala ServiceConfiguration.
2. Select ScopeImpala 1 (Service-Wid).
3. Select the Enable Kerberos Authentication for HTTP Web-Consoles field.

This setting is effective only Kerberos is enabled for the HDFS service.

4. Click Save Changes, and restart the Impala service.

Configuring TLS/SSL for Web UI

1. Create or obtain an TLS/SSL certificate.
2. Place the certificate, in .pem format, on the hosts where the Impala Catalog Server and StateStore are running, and on each host where an Impala Daemon is running. It can be placed in any location (path) you choose. If all the Impala Daemons are members of the same role group, then the .pem file must have the same path on every host.
3. Navigate to ClustersImpala ServiceConfiguration.
4. Search for "certificate" using the Search box in the Configuration tab. This should display the certificate file location properties for the Impala Catalog Server, Impala Daemon, and StateStore. If there are multiple role groups configured for Impala Daemon instances, the search should display all of them.

5. In the property fields, enter the full path name to the certificate file, the private key file path, and the password for the private key file..
6. Click Save Changes, and restart the Impala service.



Important: If Cloudera Manager cannot find the .pem file on the host for a specific role instance, that role will fail to start.

When you access the Web UI for the Impala Catalog Server, Impala Daemon, and StateStore, https will be used.

Opening Impala Web UIs

Procedure

1. Navigate to ClustersImpala ServiceConfiguration.
2. Open the appropriate Web UI:Select Web UIImpala Catalog Web UI.
 - To open StateStore Web UI, select Web UIImpala StateStore Web UI.
 - To open Catalog Server Web UI, select Web UIImpala Catalog Web UI.
 - To open Impala Daemon Web UI:
 - a. Click the Instances tab.
 - b. Click an Impala Daemon instance.
 - c. Click Impala Daemon Web UI.

Debug Web UI for Query Timeline

For a detailed report on how a query was executed and to understand the detailed performance characteristics of a query, you can use the built-in web server's UI and look at the Gantt chart.

The Gantt chart is an alternative to the profile command and is a graphical display in the WebUI that renders timing information and dependencies. This chart allows you to determine where queries are spending time instead of looking for timing information in the profile. Once you identify which fragments or operators are consuming the most time you may need to look at the summary profile or full profile to drill down further.

In subsequent releases, the timeline will be enhanced to display additional details so that looking at the profiles will not be necessary.

Here is the screenshot of the Gantt chart that shows the Query timeline of a TPC_DS query.

