MongoDB Security Guide

Release 3.0.8

MongoDB, Inc.

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Contents

Maintaining a secure MongoDB deployment requires administrators to implement controls to ensure that users and applications have access to only the data that they require. MongoDB provides features that allow administrators to implement these controls and restrictions for any MongoDB deployment.

If you are already familiar with security and MongoDB security practices, consider the *Security Checklist* (page 3) for a collection of recommended actions to protect a MongoDB deployment.

CHAPTER 1

Security Checklist

This documents provides a list of security measures that you should implement to protect your MongoDB installation.

1.1 Enable Access Control and Enforce Authentication

Enable access control and specify the authentication mechanism. You can use the default MongoDB authentication mechanism or an existing external framework. Authentication requires that all clients and servers provide valid credentials before they can connect to the system. In clustered deployments, enable authentication for each MongoDB server.

See *Authentication* (page 7) and *Enable Client Access Control* (page 38).

1.2 Configure Role-Based Access Control

Create a user administrator **first**, then create additional users. Create a unique MongoDB user for each person and application that accesses the system.

Create roles that define the exact access a set of users needs. Follow a principle of least privilege. Then create users and assign them only the roles they need to perform their operations. A user can be a person or a client application.

See *Role-Based Access Control* (page 21) and *Manage User and Roles* (page 66), .

1.3 Encrypt Communication

Configure MongoDB to use TLS/SSL for all incoming and outgoing connections. Use TLS/SSL to encrypt communication between `mongod` and `mongos` components of a MongoDB client as well as between all applications and MongoDB.

See *Configure mongod and mongos for TLS/SSL* (page 75).

1.4 Limit Network Exposure

Ensure that MongoDB runs in a trusted network environment and limit the interfaces on which MongoDB instances listen for incoming connections. Allow only trusted clients to access the network interfaces and ports on which MongoDB instances are available.

See *Security Hardening* (page 33) and the `bindIp` setting.

1.5 Audit System Activity

Track access and changes to database configurations and data. MongoDB Enterprise[1] includes a system auditing facility that can record system events (e.g. user operations, connection events) on a MongoDB instance. These audit records permit forensic analysis and allow administrators to verify proper controls.

See *Auditing* (page 31) and *Configure Auditing* (page 93).

1.6 Encrypt and Protect Data

Encrypt MongoDB data on each host using file-system, device, or physical encryption. Protect MongoDB data using file-system permissions. MongoDB data includes data files, configuration files, auditing logs, and key files.

1.7 Run MongoDB with a Dedicated User

Run MongoDB processes with a dedicated operating system user account. Ensure that the account has permissions to access data but no unnecessary permissions.

See `https://docs.mongodb.org/manual/installation` for more information on running MongoDB.

1.8 Run MongoDB with Secure Configuration Options

MongoDB supports the execution of JavaScript code for certain server-side operations: `mapReduce`, `group`, and `$where`. If you do not use these operations, disable server-side scripting by using the *`--noscripting`* option on the command line.

Use only the MongoDB wire protocol on production deployments. Do **not** enable the following, all of which enable the web server interface: `enabled`, `net.http.JSONPEnabled`, and `net.http.RESTInterfaceEnabled`. Leave these *disabled*, unless required for backwards compatibility.

Keep input validation enabled. MongoDB enables input validation by default through the `wireObjectCheck` setting. This ensures that all documents stored by the `mongod` instance are valid *BSON*.

See *Security Hardening* (page 33) for more information on hardening MongoDB configuration.

1.9 Request a Security Technical Implementation Guide (where applicable)

The Security Technical Implementation Guide (STIG) contains security guidelines for deployments within the United States Department of Defense. MongoDB Inc. provides its STIG, upon request, for situations where it is required. Please request a copy[2] for more information.

[1] http://www.mongodb.com/products/mongodb-enterprise?jmp=docs
[2] http://www.mongodb.com/lp/contact/stig-requests

1.10 Consider Security Standards Compliance

For applications requiring HIPAA or PCI-DSS compliance, please refer to the MongoDB Security Reference Architecture[3] to learn more about how you can use the key security capabilities to build compliant application infrastructure.

[3] http://info.mongodb.com/rs/mongodb/images/MongoDB_Security_Architecture_WP.pdf

CHAPTER 2

Authentication

Authentication is the process of verifying the identity of a client. When access control, i.e. *authorization* (page 21), is enabled, MongoDB requires all clients to authenticate themselves in order to determine their access.

Although authentication and *authorization* (page 21) are closely connected, authentication is distinct from authorization. Authentication verifies the identity of a user; authorization determines the verified user's access to resources and operations.

2.1 Authentication Methods

To authenticate a *user* (page 8), MongoDB provides the `db.auth()` method.

For the `mongo` shell and the MongoDB tools, you can also authenticate a user by passing in the user authentication information from the command line.

2.2 Authentication Mechanisms

MongoDB supports a number of *authentication mechanisms* (page 10) that clients can use to verify their identity. These mechanisms allow MongoDB to integrate into your existing authentication system.

MongoDB supports multiple authentication mechanisms:

- *SCRAM-SHA-1* (page 10)
- *MongoDB Challenge and Response (MONGODB-CR)* (page 11)

  Changed in version 3.0: New challenge-response users created in 3.0 will use `SCRAM-SHA-1`. If using 2.6 user data, MongoDB 3.0 will continue to use the `MONGODB-CR`.
- *x.509 Certificate Authentication* (page 12).

In addition to supporting the aforementioned mechanisms, MongoDB Enterprise also supports the following mechanisms:

- *LDAP proxy authentication* (page 14), and
- *Kerberos authentication* (page 14).

2.3 Internal Authentication

In addition to verifying the identity of a client, MongoDB can require members of replica sets and sharded clusters to *authenticate their membership* (page 18) to their respective replica set or sharded cluster. See *Internal Authentication* (page 18) for more information.

2.4 Authentication on Sharded Clusters

In sharded clusters, clients generally authenticate directly to the `mongos` instances. However, some maintenance operations may require authenticating directly to a specific shard. For more information on authentication and sharded clusters, see *Sharded Cluster Users* (page 9).

2.4.1 Users

To authenticate a client in MongoDB, you must add a corresponding user to MongoDB.

User Management Interface

To add a user, MongoDB provides the `db.createUser()` method. When adding a user, you can assign *roles* (page 21) to the user in order to grant privileges.

Note: The first user created in the database should be a user administrator who has the privileges to manage other users. See *Enable Client Access Control* (page 38).

You can also update existing users, such as to change password and grant or revoke roles. For a full list of user management methods, see *user-management-methods*.

Authentication Database

When adding a user, you create the user in a specific database. This database is the authentication database for the user.

A user can have privileges across different databases; i.e. a user's privileges are not limited to the authentication database. By assigning to the user roles in other databases, a user created in one database can have permissions to act on other databases. For more information on roles, see *Role-Based Access Control* (page 21).

The user's name and authentication database serve as a unique identifier for that user. That is, if two users have the same name but are created in different databases, they are two separate users. If you intend to have a single user with permissions on multiple databases, create a single user with roles in the applicable databases instead of creating the user multiple times in different databases.

Authenticate a User

To authenticate a user, either

- Use the command line authentication options (e.g. `-u`, `-p`, `--authenticationDatabase`) when connecting to the `mongod` or `mongos` instance, or
- Connect first to the `mongod` or `mongos` instance, and then run the `authenticate` command or the `db.auth()` method against the authentication database.

To authenticate, the client must authenticate the user against the user's *authentication database*.

For instance, if using the `mongo` shell as a client, you can specify the authentication database for the user with the `--authenticationDatabase` option.

Centralized User Data

Changed in version 2.6.

MongoDB stores all user information, including `name` (page 115), `password` (page 115), and the `user's authentication database` (page 115), in the *system.users* (page 114) collection in the `admin` database.

Do not access this collection directly but instead use the *user management commands*.

Sharded Cluster Users

To create users for a sharded cluster, connect to the `mongos` instance and add the users. Clients then authenticate these users through the `mongos` instances.

Changed in version 2.6: MongoDB stores these sharded cluster user data in the `admin` database of the *config servers*. Previously, the credentials for authenticating to a database on a sharded cluster resided on the *primary shard* for that database.

Shard Local Users

However, some maintenance operations, such as `cleanupOrphaned`, `compact`, `rs.reconfig()`, require direct connections to specific shards in a sharded cluster. To perform these operations, you must connect directly to the shard and authenticate as a *shard local* administrative user.

To create a *shard local* administrative user, connect directly to the shard and create the user. MongoDB stores *shard local* users in the `admin` database of the shard itself.

These *shard local* users are completely independent from the users added to the sharded cluster via `mongos`. *Shard local* users are local to the shard and are inaccessible by `mongos`.

Direct connections to a shard should only be for shard-specific maintenance and configuration. In general, clients should connect to the sharded cluster through the `mongos`.

Localhost Exception

The localhost exception allows you to enable access control and then create the first user in the system. With the localhost exception, after you enable access control, connect to the localhost interface and create the first user in the `admin` database. The first user must have privileges to create other users, such as a user with the `userAdmin` (page 106) or `userAdminAnyDatabase` (page 110) role.

Changed in version 3.0: The localhost exception changed so that these connections *only* have access to create the first user on the `admin` database. In previous versions, connections that gained access using the localhost exception had unrestricted access to the MongoDB instance.

The localhost exception applies only when there are no users created in the MongoDB instance.

In the case of a sharded cluster, the localhost exception applies to each shard individually as well as to the cluster as a whole. Once you create a sharded cluster and add a user administrator through the `mongos` instance, you must still prevent unauthorized access to the individual shards. Follow one of the following steps for each shard in your cluster:

- Create an administrative user, or

- Disable the localhost exception at startup. To disable the localhost exception, set the `enableLocalhostAuthBypass` parameter to `0`.

2.4.2 Authentication Mechanisms

MongoDB supports the following authentication mechanisms:

- *SCRAM-SHA-1* (page 10)
- *MongoDB Challenge and Response (MONGODB-CR)* (page 11)

  Changed in version 3.0: New challenge-response users created in 3.0 will use `SCRAM-SHA-1`. If using 2.6 user data, MongoDB 3.0 will continue to use the `MONGODB-CR`.
- *x.509 Certificate Authentication* (page 12).

In addition, MongoDB Enterprise also provides supports for additional mechanisms. See *Enterprise Authentication Mechanisms* (page 14) for additional mechanisms available in MongoDB Enterprise.

Default Authentication Mechanism

Changed in version 3.0.

MongoDB uses the *SCRAM-SHA-1* (page 10) as the default challenge and response authentication mechanism. Previous versions used *MONGODB-CR* (page 11) as the default.

Specify Authentication Mechanism

To specify the authentication mechanism to use, set the `authenticationMechanisms` parameter for `mongod` and `mongos`.

Clients specify the authentication mechanism in the `db.auth()` method. For the `mongo` shell and the MongoDB tools, you can also specify the authentication mechanism from the command line.

SCRAM-SHA-1

New in version 3.0.

`SCRAM-SHA-1` is the default authentication mechanism for MongoDB. `SCRAM-SHA-1` is an IETF standard, RFC 5802[1], that defines best practice methods for implementation of challenge-response mechanisms for authenticating users with passwords.

`SCRAM-SHA-1` verifies the supplied user credentials against the user's `name` (page 115), `password` (page 115) and `authentication database` (page 115). The authentication database is the database where the user was created, and together with the user's name, serves to identify the user.

Note: A driver upgrade is **necessary** to use the `SCRAM-SHA-1` authentication mechanism if your current driver version does not support `SCRAM-SHA-1`. See *required driver versions* for details.

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[1] https://tools.ietf.org/html/rfc5802

SCRAM-SHA-1 Advantages MongoDB's implementation of SCRAM-SHA-1 represents an improvement in security over the previously-used MONGODB-CR, providing:

- A tunable work factor (iterationCount),
- Per-user random salts rather than server-wide salts,
- A cryptographically stronger hash function (SHA-1 rather than MD5), and
- Authentication of the server to the client as well as the client to the server.

SCRAM-SHA-1 and MongoDB-CR User Credentials SCRAM-SHA-1 is the default mechanism for MongoDB versions beginning with the 3.0 series. However, if you are upgrading a MongoDB 2.6 instances that already have users credentials, MongoDB will continue to use MONGODB-CR for challenge-response authentication until you upgrade the authentication schema.

Even when using the MONGODB-CR authentication mechanism, clients and drivers that support MongoDB 3.0 features (see *compatibility-driver-versions*) will use the SCRAM communication protocol. That is, MONGODB-CR authentication mechanism also implies *SCRAM-SHA-1* (page 10).

For details on upgrading the authentication schema model to SCRAM-SHA-1, see https://docs.mongodb.org/manual/release-notes/3.0-scram.

Warning: The procedure to upgrade to SCRAM-SHA-1 **discards** the MONGODB-CR credentials used by 2.6. As such, the procedure is **irreversible**, short of restoring from backups.
The procedure also disables MONGODB-CR as an authentication mechanism.

Additional Information

- Blog Post: Improved Password-Based Authentication in MongoDB 3.0: SCRAM Explained (Part 1)[2]
- Blog Post: Improved Password-Based Authentication in MongoDB 3.0: SCRAM Explained (Part 2)[3]

MONGODB-CR

MONGODB-CR is a challenge-response mechanism that authenticates users through passwords. MONGODB-CR verifies supplied user credentials against the user's name (page 115), password (page 115) and authentication database (page 115). The authentication database is the database where the user was created, and the user's database and the user's name together serve to identify the user.

MONGODB-CR and SCRAM-SHA-1 Changed in version 3.0.

MongoDB no longer defaults to MONGODB-CR and instead uses SCRAM-SHA-1 as the default authentication mechanism.

Even when using the MONGODB-CR authentication mechanism, clients and drivers that support MongoDB 3.0 features (see *compatibility-driver-versions*) will use the SCRAM communication protocol. That is, MONGODB-CR authentication mechanism also implies *SCRAM-SHA-1* (page 10).

[2] https://www.mongodb.com/blog/post/improved-password-based-authentication-mongodb-30-scram-explained-part-1?jmp=docs
[3] https://www.mongodb.com/blog/post/improved-password-based-authentication-mongodb-30-scram-explained-part-2?jmp=docs

x.509

New in version 2.6.

MongoDB supports x.509 certificate authentication for client authentication and internal authentication of the members of replica sets and sharded clusters.

x.509 certificate authentication requires a secure *TLS/SSL connection* (page 75).

Certificate Authority For production use, your MongoDB deployment should use valid certificates generated and signed by a single certificate authority. You or your organization can generate and maintain an independent certificate authority, or use certificates generated by a third-party SSL vendor. Obtaining and managing certificates is beyond the scope of this documentation.

Client x.509 Certificates To authenticate to servers, clients can use x.509 certificates instead of usernames and passwords.

Client Certificate Requirements The client certificate must have the following properties:

- A single Certificate Authority (CA) must issue the certificates for both the client and the server.
- Client certificates must contain the following fields:

```
keyUsage = digitalSignature
extendedKeyUsage = clientAuth
```

- Each unique MongoDB user must have a unique certificate.
- A client x.509 certificate's subject, which contains the Distinguished Name (`DN`), must **differ** from that of a *Member x.509 Certificate* (page 48). Specifically, the subjects must differ with regards to at least one of the following attributes: Organization (`O`), the Organizational Unit (`OU`) or the Domain Component (`DC`).

  Warning: If a client x.509 certificate's subject has the same `O`, `OU`, and `DC` combination as the *Member x.509 Certificate* (page 48), the client will be identified as a cluster member and granted full permission on the system.

MongoDB User and `$external` Database To authenticate with a client certificate, you must first add the value of the `subject` from the client certificate as a MongoDB user. Each unique x.509 client certificate corresponds to a single MongoDB user; i.e. you cannot use a single client certificate to authenticate more than one MongoDB user.

Add the user in the `$external` database; i.e. the *Authentication Database* (page 8) is the `$external` database

Authenticate To authenticate using x.509 client certificate, connect to MongogDB over TLS/SSL connection; i.e. include the `--ssl` and `--sslPEMKeyFile` command line options.

Then in the `$external` database, use `db.auth()` to authenticate the *user corresponding to the client certificate* (page 12).

For an example, see *Use x.509 Certificates to Authenticate Clients* (page 45)

Member x.509 Certificates For internal authentication, members of sharded clusters and replica sets can use x.509 certificates instead of keyfiles, which use *MONGODB-CR* (page 11) authentication mechanism.

Member Certificate Requirements The member certificate, used for internal authentication to verify membership to the sharded cluster or a replica set, must have the following properties:

- A single Certificate Authority (CA) must issue all the x.509 certificates for the members of a sharded cluster or a replica set.
- The Distinguished Name (`DN`), found in the member certificate's `subject`, must specify a non-empty value for *at least one* of the following attributes: Organization (`O`), the Organizational Unit (`OU`) or the Domain Component (`DC`).
- The Organization attributes (`O`'s), the Organizational Unit attributes (`OU`'s), and the Domain Components (`DC`'s) must match those from the certificates for the other cluster members. To match, the certificate must match all specifications of these attributes, or even the non-specification of these attributes. The order of the attributes does not matter.

  In the following example, the two `DN`'s contain matching specifications for `O`, `OU` as well as the non-specification of the `DC` attribute.

  ```
  CN=host1,OU=Dept1,O=MongoDB,ST=NY,C=US
  C=US, ST=CA, O=MongoDB, OU=Dept1, CN=host2
  ```

  However, the following two `DN`'s contain a mismatch for the `OU` attribute since one contains two `OU` specifications and the other, only one specification.

  ```
  CN=host1,OU=Dept1,OU=Sales,O=MongoDB
  CN=host2,OU=Dept1,O=MongoDB
  ```

- Either the Common Name (`CN`) or one of the Subject Alternative Name (`SAN`) entries must match the hostname of the server, used by the other members of the cluster.

  For example, the certificates for a cluster could have the following subjects:

  ```
  subject= CN=<myhostname1>,OU=Dept1,O=MongoDB,ST=NY,C=US
  subject= CN=<myhostname2>,OU=Dept1,O=MongoDB,ST=NY,C=US
  subject= CN=<myhostname3>,OU=Dept1,O=MongoDB,ST=NY,C=US
  ```

- *If* the certificate includes the Extended Key Usage (`extendedKeyUsage`) setting, the value must include `clientAuth` ("TLS Web Client Authentication").

  ```
  extendedKeyUsage = clientAuth
  ```

  You can also use a certificate that does not include the Extended Key Usage (EKU).

MongoDB Configuration To specify x.509 for internal authentication, in addition to the other SSL configurations appropriate for your deployment, for each member of the replica set or sharded cluster, include either:

- `security.clusterAuthMode` and `net.ssl.clusterFile` if using a `configuration file`, or
- `--clusterAuthMode` and `--sslClusterFile` command line options.

Member Certificate and `PEMKeyFile` To configure MongoDB for client certificate authentication, the `mongod` and `mongos` specify a `PEMKeyFile` to prove its identity to clients, either through `net.ssl.PEMKeyFile` setting in the configuration file or `--sslPEMKeyFile` command line option.

If no `clusterFile` certificate is specified for internal member authentication, MongoDB will attempt to use the `PEMKeyFile` certificate for member authentication. In order to use `PEMKeyFile` certificate for internal authentication as well as for client authentication, then the `PEMKeyFile` certificate must either:

- Omit `extendedKeyUsage` or

- Specify `extendedKeyUsage` values that include `clientAuth` in addition to `serverAuth`.

For an example of x.509 internal authentication, see *Use x.509 Certificate for Membership Authentication* (page 48).

2.4.3 Enterprise Authentication Mechanisms

In addition to the authentication mechanisms offered, MongoDB Enterprise provides integration with the following authentication mechanisms.

Kerberos Authentication

MongoDB Enterprise[4] supports authentication using a Kerberos service. Kerberos is an industry standard authentication protocol for large client/server systems.

To use MongoDB with Kerberos, you must have a properly configured Kerberos deployment, configured *Kerberos service principals* (page 15) for MongoDB, and added *Kerberos user principal* (page 15) to MongoDB.

For more information on Kerberos and MongoDB, see:

- *Kerberos Authentication* (page 14),
- *Configure MongoDB with Kerberos Authentication on Linux* (page 52) and
- *Configure MongoDB with Kerberos Authentication on Windows* (page 56).

LDAP Proxy Authority Authentication

MongoDB Enterprise (excluding Windows version)[5] supports proxy authentication through a Lightweight Directory Access Protocol (LDAP) service.

LDAP support for user authentication requires proper configuration of the `saslauthd` daemon process as well as the MongoDB server.

For more information on LDAP and MongoDB, see

- *LDAP Proxy Authority Authentication* (page 17),
- *Authenticate Using SASL and LDAP with OpenLDAP* (page 63) and
- *Authenticate Using SASL and LDAP with ActiveDirectory* (page 60).

Kerberos Authentication

New in version 2.4.

Overview MongoDB Enterprise provides support for Kerberos authentication of MongoDB clients to `mongod` and `mongos`. Kerberos is an industry standard authentication protocol for large client/server systems. Kerberos allows MongoDB and applications to take advantage of existing authentication infrastructure and processes.

Kerberos Components and MongoDB

[4] http://www.mongodb.com/products/mongodb-enterprise?jmp=docs
[5] http://www.mongodb.com/products/mongodb-enterprise?jmp=docs

Principals In a Kerberos-based system, every participant in the authenticated communication is known as a "principal", and every principal must have a unique name.

Principals belong to administrative units called *realms*. For each realm, the Kerberos Key Distribution Center (KDC) maintains a database of the realm's principal and the principals' associated "secret keys".

For a client-server authentication, the client requests from the KDC a "ticket" for access to a specific asset. KDC uses the client's secret and the server's secret to construct the ticket which allows the client and server to mutually authenticate each other, while keeping the secrets hidden.

For the configuration of MongoDB for Kerberos support, two kinds of principal names are of interest: *user principals* (page 15) and *service principals* (page 15).

User Principal To authenticate using Kerberos, you must add the Kerberos user principals to MongoDB to the `$external` database. User principal names have the form:

```
<username>@<KERBEROS REALM>
```

For every user you want to authenticate using Kerberos, you must create a corresponding user in MongoDB in the `$external` database.

For examples of adding a user to MongoDB as well as authenticating as that user, see *Configure MongoDB with Kerberos Authentication on Linux* (page 52) and *Configure MongoDB with Kerberos Authentication on Windows* (page 56).

See also:

Configure Users and Roles (page 66) for general information regarding creating and managing users in MongoDB.

Service Principal Every MongoDB `mongod` and `mongos` instance (or `mongod.exe` or `mongos.exe` on Windows) must have an associated service principal. Service principal names have the form:

```
<service>/<fully qualified domain name>@<KERBEROS REALM>
```

For MongoDB, the `<service>` defaults to `mongodb`. For example, if `m1.example.com` is a MongoDB server, and `example.com` maintains the `EXAMPLE.COM` Kerberos realm, then `m1` should have the service principal name `mongodb/m1.example.com@EXAMPLE.COM`.

To specify a different value for `<service>`, use `serviceName` during the start up of `mongod` or `mongos` (or `mongod.exe` or `mongos.exe`). `mongo` shell or other clients may also specify a different service principal name using `serviceName`.

Service principal names must be reachable over the network using the fully qualified domain name (FQDN) part of its service principal name.

By default, Kerberos attempts to identify hosts using the `/etc/krb5.conf` file before using DNS to resolve hosts.

On Windows, if running MongoDB as a service, see *Assign Service Principal Name to MongoDB Windows Service* (page 58).

Linux Keytab Files Linux systems can store Kerberos authentication keys for a *service principal* (page 15) in *keytab* files. Each Kerberized `mongod` and `mongos` instance running on Linux must have access to a keytab file containing keys for its *service principal* (page 15).

To keep keytab files secure, use file permissions that restrict access to only the user that runs the `mongod` or `mongos` process.

Tickets On Linux, MongoDB clients can use Kerberos's `kinit` program to initialize a credential cache for authenticating the user principal to servers.

Windows Active Directory Unlike on Linux systems, `mongod` and `mongos` instances running on Windows do not require access to keytab files. Instead, the `mongod` and `mongos` instances read their server credentials from a credential store specific to the operating system.

However, from the Windows Active Directory, you can export a keytab file for use on Linux systems. See Ktpass[6] for more information.

Authenticate With Kerberos To configure MongoDB for Kerberos support and authenticate, see *Configure MongoDB with Kerberos Authentication on Linux* (page 52) and *Configure MongoDB with Kerberos Authentication on Windows* (page 56).

Operational Considerations

The HTTP Console The MongoDB HTTP Console[7] interface does not support Kerberos authentication.

DNS Each host that runs a `mongod` or `mongos` instance must have both `A` and `PTR` DNS records to provide forward and reverse lookup.

Without `A` and `PTR` DNS records, the host cannot resolve the components of the Kerberos domain or the Key Distribution Center (KDC).

System Time Synchronization To successfully authenticate, the system time for each `mongod` and `mongos` instance must be within 5 minutes of the system time of the other hosts in the Kerberos infrastructure.

Kerberized MongoDB Environments

Driver Support The following MongoDB drivers support Kerberos authentication:

- C[8]
- C++[9]
- Java[10]
- C#[11]
- Node.js[12]
- PHP[13]
- Python[14]
- Ruby[15]

[6] http://technet.microsoft.com/en-us/library/cc753771.aspx
[7] https://docs.mongodb.org/ecosystem/tools/http-interfaces/#http-console
[8] https://api.mongodb.org/c/current/authentication.html#kerberos
[9] https://docs.mongodb.org/ecosystem/tutorial/authenticate-with-cpp-driver/
[10] https://docs.mongodb.org/ecosystem/tutorial/authenticate-with-java-driver/
[11] http://mongodb.github.io/mongo-csharp-driver/2.0/reference/driver/authentication/#gssapi-kerberos
[12] http://mongodb.github.io/node-mongodb-native/2.0/tutorials/enterprise_features/
[13] http://php.net/manual/en/mongoclient.construct.php
[14] http://api.mongodb.org/python/current/examples/authentication.html
[15] https://docs.mongodb.org/ecosystem/tutorial/ruby-driver-tutorial/#gssapi-kerberos-mechanism

Use with Additional MongoDB Authentication Mechanism Although MongoDB supports the use of Kerberos authentication with other authentication mechanisms, only add the other mechanisms as necessary. See the `Incorporate Additional Authentication Mechanisms` section in *Configure MongoDB with Kerberos Authentication on Linux* (page 52) and *Configure MongoDB with Kerberos Authentication on Windows* (page 56) for details.

Additional Resources

- MongoDB LDAP and Kerberos Authentication with Dell (Quest) Authentication Services[16]
- MongoDB with Red Hat Enterprise Linux Identity Management and Kerberos[17]

LDAP Proxy Authority Authentication

MongoDB Enterprise[18] supports proxy authentication through a Lightweight Directory Access Protocol (LDAP) service.

Considerations MongoDB Enterprise for Windows does **not** include LDAP support for authentication. However, MongoDB Enterprise for Linux supports using LDAP authentication with an ActiveDirectory server.

MongoDB does **not** support LDAP authentication in mixed sharded cluster deployments that contain both version 2.4 and version 2.6 shards. See `https://docs.mongodb.org/manual/release-notes/2.6-upgrade` for upgrade instructions.

Use secure encrypted or trusted connections between clients and the server, as well as between `saslauthd` and the LDAP server. The LDAP server uses the `SASL PLAIN` mechanism, sending and receiving data in **plain text**. You should use only a trusted channel such as a VPN, a connection encrypted with TLS/SSL, or a trusted wired network.

MongoDB Configuration To configure the MongoDB server to use LDAP authentication mechanism, use the following command line options:

- `--auth` to enable access control,
- `--authenticationMechanisms` set to `PLAIN`, and
- `--saslauthdPath` parameter set to the path to the Unix-domain Socket of the saslauthd instance.

Or, if using the `YAML configuration file`, use the following settings:

- `security.authorization` set to `enabled`,
- `setParameter.authenticationMechanisms` set to `PLAIN`, and
- `setParameter.saslauthdPath` set to the path to the Unix-domain Socket of the saslauthd instance.

LDAP User In order to authenticate a user with the LDAP authentication mechanism, add a corresponding *user* (page 8) to the `$external` database. You do not need to save the user's password in MongoDB.

The `$external` database is the *authentication database* (page 8) for the LDAP user. To authenticate the LDAP user, you must authenticate against the `$external` database. When authenticating, specify `PLAIN` for the authentication mechanism .

LDAP authentication requires that MongoDB forward the user's password in plan text. As such, you must specify `digestPassword` set to false during authentication.

[16] https://www.mongodb.com/blog/post/mongodb-ldap-and-kerberos-authentication-dell-quest-authentication-services?jmp=docs
[17] http://docs.mongodb.org/ecosystem/tutorial/manage-red-hat-enterprise-linux-identity-management?jmp=docs
[18] http://www.mongodb.com/products/mongodb-enterprise?jmp=docs

Additional Information For information on configuring MongoDB to use LDAP and authenticating users using LDAP, see:

- *Authenticate Using SASL and LDAP with OpenLDAP* (page 63) and
- *Authenticate Using SASL and LDAP with ActiveDirectory* (page 60).

2.4.4 Internal Authentication

You can authenticate members of *replica sets* and *sharded clusters*. For the internal authentication of the members, MongoDB can use either keyfiles or *x.509* (page 12) certificates.

Note: Enabling internal authentication also enables *client authorization* (page 21).

Keyfiles

Keyfiles use *SCRAM-SHA-1* (page 10) challenge and response authentication mechanism. The contents of the keyfiles serve as the shared password for the members. A key's length must be between 6 and 1024 characters and may only contain characters in the base64 set.

MongoDB strips whitespace characters (e.g. `x0d`, `x09`, and `x20`) for cross-platform convenience. As a result, the following operations produce identical keys:

```
echo -e "my secret key" > key1
echo -e "my secret key\n" > key2
echo -e "my    secret    key" > key3
echo -e "my\r\nsecret\r\nkey\r\n" > key4
```

On UNIX systems, the keyfile must not have group or world permissions. On Windows systems, keyfile permissions are not checked

The content of the keyfile must be the same on all `mongod` and `mongos` instances that connect to each other. You must store the keyfile on each member of the replica set or sharded clusters.

To specify the keyfile, use the `security.keyFile` setting or `--keyFile` command line option.

For an example of keyfile internal authentication, see *Enable Internal Authentication* (page 40).

x.509

Members of a replica set or sharded cluster can use x.509 certificates for internal authentication instead of using keyfiles. MongoDB supports x.509 certificate authentication for use with a secure TLS/SSL connection.

Member Certificate Requirements

The member certificate, used for internal authentication to verify membership to the sharded cluster or a replica set, must have the following properties:

- A single Certificate Authority (CA) must issue all the x.509 certificates for the members of a sharded cluster or a replica set.
- The Distinguished Name (`DN`), found in the member certificate's `subject`, must specify a non-empty value for *at least one* of the following attributes: Organization (`O`), the Organizational Unit (`OU`) or the Domain Component (`DC`).

- The Organization attributes (`O`'s), the Organizational Unit attributes (`OU`'s), and the Domain Components (`DC`'s) must match those from the certificates for the other cluster members. To match, the certificate must match all specifications of these attributes, or even the non-specification of these attributes. The order of the attributes does not matter.

  In the following example, the two `DN`'s contain matching specifications for `O`, `OU` as well as the non-specification of the `DC` attribute.

  ```
  CN=host1,OU=Dept1,O=MongoDB,ST=NY,C=US
  C=US, ST=CA, O=MongoDB, OU=Dept1, CN=host2
  ```

  However, the following two `DN`'s contain a mismatch for the `OU` attribute since one contains two `OU` specifications and the other, only one specification.

  ```
  CN=host1,OU=Dept1,OU=Sales,O=MongoDB
  CN=host2,OU=Dept1,O=MongoDB
  ```

- Either the Common Name (`CN`) or one of the Subject Alternative Name (`SAN`) entries must match the hostname of the server, used by the other members of the cluster.

  For example, the certificates for a cluster could have the following subjects:

  ```
  subject= CN=<myhostname1>,OU=Dept1,O=MongoDB,ST=NY,C=US
  subject= CN=<myhostname2>,OU=Dept1,O=MongoDB,ST=NY,C=US
  subject= CN=<myhostname3>,OU=Dept1,O=MongoDB,ST=NY,C=US
  ```

- *If* the certificate includes the Extended Key Usage (`extendedKeyUsage`) setting, the value must include `clientAuth` ("TLS Web Client Authentication").

  ```
  extendedKeyUsage = clientAuth
  ```

  You can also use a certificate that does not include the Extended Key Usage (EKU).

MongoDB Configuration

To specify x.509 for internal authentication, in addition to the other SSL configurations appropriate for your deployment, for each member of the replica set or sharded cluster, include either:

- `security.clusterAuthMode` and `net.ssl.clusterFile` if using a `configuration file`, or
- `--clusterAuthMode` and `--sslClusterFile` command line options.

Member Certificate and `PEMKeyFile`

To configure MongoDB for client certificate authentication, the `mongod` and `mongos` specify a `PEMKeyFile` to prove its identity to clients, either through `net.ssl.PEMKeyFile` setting in the configuration file or `--sslPEMKeyFile` command line option.

If no `clusterFile` certificate is specified for internal member authentication, MongoDB will attempt to use the `PEMKeyFile` certificate for member authentication. In order to use `PEMKeyFile` certificate for internal authentication as well as for client authentication, then the `PEMKeyFile` certificate must either:

- Omit `extendedKeyUsage` or
- Specify `extendedKeyUsage` values that include `clientAuth` in addition to `serverAuth`.

For an example of x.509 internal authentication, see *Use x.509 Certificate for Membership Authentication* (page 48).

To upgrade from keyfile internal authentication to x.509 internal authentication, see *Upgrade from Keyfile Authentication to x.509 Authentication* (page 50).

CHAPTER 3

Role-Based Access Control

MongoDB employs Role-Based Access Control (RBAC) to govern access to a MongoDB system. A user is granted one or more *roles* (page 21) that determine the user's access to database resources and operations. Outside of role assignments, the user has no access to the system.

3.1 Enable Access Control

MongoDB does not enable access control by default. You can enable authorization using the `--auth` or the `security.authorization` setting. Enabling *internal authentication* (page 18) also enables client authorization.

Once access control is enabled, users must *authenticate* (page 7) themselves.

3.2 Roles

A role grants privileges to perform the specified *actions* (page 118) on *resource* (page 116). Each privilege is either specified explicitly in the role or inherited from another role or both.

3.2.1 Privileges

A privilege consists of a specified resource and the actions permitted on the resource.

A *resource* (page 116) is either a database, collection, set of collections, or the cluster. If the resource is the cluster, the affiliated actions affect the state of the system rather than a specific database or collection. For information on the resource documents, see *Resource Document* (page 116).

An *action* (page 118) specifies the operation allowed on the resource. For available actions see *Privilege Actions* (page 118).

3.2.2 Inherited Privileges

A role can include one or more existing roles in its definition, in which case the role inherits all the privileges of the included roles.

A role can inherit privileges from other roles in its database. A role created on the `admin` database can inherit privileges from roles in any database.

3.2.3 View Role's Privileges

You can view the privileges for a role by issuing the `rolesInfo` command with the `showPrivileges` and `showBuiltinRoles` fields both set to `true`.

3.3 Users and Roles

You can assign roles to users during the user creation. You can also update existing users to grant or revoke roles. For a full list of user management methods, see *user-management-methods*

A user assigned a role receives all the privileges of that role. A user can have multiple roles. By assigning to the user roles in various databases, a user created in one database can have permissions to act on other databases.

Note: The first user created in the database should be a user administrator who has the privileges to manage other users. See *Enable Client Access Control* (page 38).

3.4 Built-In Roles and User-Defined Roles

MongoDB provides *built-in roles* (page 22) that provide set of privileges commonly needed in a database system.

If these built-in-roles cannot provide the desired set of privileges, MongoDB provides methods to create and modify *user-defined roles* (page 24).

3.4.1 Built-In Roles

MongoDB provides built-in roles that provide the different levels of access commonly needed in a database system. Built-in *database user roles* (page 104) and *database administration roles* (page 105) roles exist in *each* database. The `admin` database contains additional roles.

This page provides a brief description of the built-in roles. For the specific privileges granted by each role, see the *Built-In Roles* (page 104) reference page.

Database User Roles

Every database includes the following roles:

Role	Short Description
`read` (page 104)	Provides the ability to read data on all *non*-system collections and on the following system collections: `system.indexes`, `system.js`, and `system.namespaces` collections. For the specific privileges granted by the role, see `read` (page 104).
`readWrite` (page 104)	Provides all the privileges of the `read` (page 104) role and the ability to modify data on all *non*-system collections and the `system.js` collection. For the specific privileges granted by the role, see `readWrite` (page 104).

Database Administration Roles

Every database includes the following database administration roles:

Role	Short Description
dbAdmin (page 105)	Provides the ability to perform administrative tasks such as schema-related tasks, indexing, gathering statistics. This role does not grant privileges for user and role management. For the specific privileges granted by the role, see dbAdmin (page 105).
dbOwner (page 106)	Provides the ability to perform any administrative action on the database. This role combines the privileges granted by the readWrite (page 104), dbAdmin (page 105) and userAdmin (page 106) roles.
userAdmin (page 106)	Provides the ability to create and modify roles and users on the current database. Since the userAdmin (page 106) role allows users to grant any privilege to any user, including themselves, the role also indirectly provides *superuser* (page 111) access to either the database or, if scoped to the admin database, the cluster. For the specific privileges granted by the role, see userAdmin (page 106).

Cluster Administration Roles

The admin database includes the following roles for administering the whole system rather than a specific database. These roles include but are not limited to *replica set* and *sharded cluster* administrative functions.

Role	Short Description
clusterAdmin (page 106)	Provides the greatest cluster-management access. This role combines the privileges granted by the clusterManager (page 107), clusterMonitor (page 108), and hostManager (page 108) roles. Additionally, the role provides the dropDatabase (page 121) action.
clusterManager (page 107)	Provides management and monitoring actions on the cluster. A user with this role can access the config and local databases, which are used in sharding and replication, respectively. For the specific privileges granted by the role, see clusterManager (page 107).
clusterMonitor (page 108)	Provides read-only access to monitoring tools, such as the MongoDB Cloud Manager[1] and Ops Manager[2] monitoring agent. For the specific privileges granted by the role, see clusterMonitor (page 108).
hostManager (page 108)	Provides the ability to monitor and manage servers. For the specific privileges granted by the role, see hostManager (page 108).

Backup and Restoration Roles

The admin database includes the following roles for backing up and restoring data:

Role	Short Description
backup (page 109)	Provides privileges needed to back up data except for the system.profile collection. This role provides sufficient privileges to use the MongoDB Cloud Manager[3] backup agent, Ops Manager[4] backup agent, or to use mongodump. For the specific privileges granted by the role, see backup (page 109).
restore (page 110)	Provides privileges needed to restore data with mongorestore without the *--oplogReplay* option. For the specific privileges granted by the role, see restore (page 110).

All-Database Roles

The admin database provides the following roles that apply to all databases in a mongod instance and are roughly equivalent to their single-database equivalents:

[1] https://cloud.mongodb.com/?jmp=docs
[2] https://docs.opsmanager.mongodb.com/current/
[3] https://cloud.mongodb.com/?jmp=docs
[4] https://docs.opsmanager.mongodb.com/current/

Role	Short Description
readAnyDatabase (page 110)	Provides the same read-only permissions as read (page 104), except it applies to *all* databases in the cluster. The role also provides the listDatabases (page 122) action on the cluster as a whole. For the specific privileges granted by the role, see readAnyDatabase (page 110).
readWriteAnyDatabase (page 110)	Provides the same read and write permissions as readWrite (page 104), except it applies to *all* databases in the cluster. The role also provides the listDatabases (page 122) action on the cluster as a whole. For the specific privileges granted by the role, see readWriteAnyDatabase (page 110).
userAdminAnyDatabase (page 110)	Provides the same access to user administration operations as userAdmin (page 106), except it applies to *all* databases in the cluster. Since the userAdminAnyDatabase (page 110) role allows users to grant any privilege to any user, including themselves, the role also indirectly provides *superuser* (page 111) access. For the specific privileges granted by the role, see userAdminAnyDatabase (page 110).
dbAdminAnyDatabase (page 111)	Provides the same access to database administration operations as dbAdmin (page 105), except it applies to *all* databases in the cluster. The role also provides the listDatabases (page 122) action on the cluster as a whole. For the specific privileges granted by the role, see dbAdminAnyDatabase (page 111).

Superuser Roles

The following role provides full privileges on all resources:

Role	Short Description
root (page 111)	Provides access to the operations and all the resources of the readWriteAnyDatabase (page 110), dbAdminAnyDatabase (page 111), userAdminAnyDatabase (page 110) and clusterAdmin (page 106) roles *combined*. For the specific privileges granted by the role, see root (page 111).

Internal Role

Role	Short Description
__system (page 112)	Provides privileges to take any action against any object in the database. **Do not** assign this role to user objects representing applications or human administrators, other than in exceptional circumstances. For more information, see root (page 111).

3.4.2 User-Defined Roles

New in version 2.6.

MongoDB provides a number of *built-in roles* (page 104). However, if these roles cannot describe the desired set of privileges, you can create new roles.

Role Management Interface

To add a role, MongoDB provides the db.createRole() method. MongoDB also provides methods to update existing user-defined roles. For a full list of role management methods, see *role-management-methods*.

Scope

When adding a role, you create the role in a specific database. MongoDB uses the combination of the database and the role name to uniquely define a role.

Except for roles created in the `admin` database, a role can only include privileges that apply to its database and can only inherit from other roles in its database.

A role created in the `admin` database can include privileges that apply to the `admin` database, other databases or to the *cluster* (page 117) resource, and can inherit from roles in other databases as well as the `admin` database.

Centralized Role Data

MongoDB stores all role information in the *system.roles* (page 112) collection in the `admin` database

Do not access this collection directly but instead use the *role management commands* to view and edit custom roles.

3.4.3 Collection-Level Access Control

Collection-level access control allows administrators to grant users privileges that are scoped to specific collections.

Administrators can implement collection-level access control through *user-defined roles* (page 24). By creating a role with *privileges* (page 21) that are scoped to a specific collection in a particular database, administrators can provision users with roles that grant privileges on a collection level.

Privileges and Scope

A privilege consists of *actions* (page 118) and the *resources* (page 116) upon which the actions are permissible; i.e. the resources define the scope of the actions for that privilege.

By specifying both the database and the collection in the *resource document* (page 116) for a privilege, administrator can limit the privilege actions just to a specific collection in a specific database. Each privilege action in a role can be scoped to a different collection.

For example, a user defined role can contain the following privileges:

```
privileges: [
  { resource: { db: "products", collection: "inventory" }, actions: [ "find", "update", "insert" ] },
  { resource: { db: "products", collection: "orders" },  actions: [ "find" ] }
]
```

The first privilege scopes its actions to the `inventory` collection of the `products` database. The second privilege scopes its actions to the `orders` collection of the `products` database.

Additional Information

For more information on user-defined roles and MongoDB authorization model, see *Role-Based Access Control* (page 21). For a tutorial on creating user-defined roles, see *Manage User and Roles* (page 66).

CHAPTER 4

Encryption

4.1 Transport Encryption

You can use TLS/SSL (Transport Layer Security/Secure Sockets Layer) to encrypt all of MongoDB's network traffic. TLS/SSL ensures that MongoDB network traffic is only readable by the intended client.

See *Transport Encryption* (page 27) for more information.

4.2 Encryption at Rest

There are two broad classes of approaches to encrypting data at rest with MongoDB: Application Level Encryption and Storage Encryption. You can use these solutions together or independently.

See *Encryption At Rest* (page 28) for more information.

4.2.1 Transport Encryption

TLS/SSL

MongoDB supports TLS/SSL (Transport Layer Security/Secure Sockets Layer) to encrypt all of MongoDB's network traffic. TLS/SSL ensures that MongoDB network traffic is only readable by the intended client.

MongoDB TLS/SSL implementation uses OpenSSL libraries. MongoDB's SSL encryption only allows use of strong SSL ciphers with a minimum of 128-bit key length for all connections.

Certificates

Before you can use SSL, you must have a `.pem` file containing a public key certificate and its associated private key.

MongoDB can use any valid SSL certificate issued by a certificate authority or a self-signed certificate. If you use a self-signed certificate, although the communications channel will be encrypted, there will be *no* validation of server identity. Although such a situation will prevent eavesdropping on the connection, it leaves you vulnerable to a man-in-the-middle attack. Using a certificate signed by a trusted certificate authority will permit MongoDB drivers to verify the server's identity.

For example, see *TLS/SSL Configuration for Clients* (page 80).

Identity Verification

In addition to encrypting connections, SSL allows for authentication using certificates, both for *client authentication* (page 7) and for *internal authentication* (page 18) of members of replica sets and sharded clusters.

For more inforamtion, see:

- *Configure mongod and mongos for TLS/SSL* (page 75)
- *TLS/SSL Configuration for Clients* (page 80)
- *Use x.509 Certificates to Authenticate Clients* (page 45)
- *Use x.509 Certificate for Membership Authentication* (page 48)

FIPS Mode

Enterprise Feature

Available in MongoDB Enterprise only.

The Federal Information Processing Standard (FIPS) is a U.S. government computer security standard used to certify software modules and libraries that encrypt and decrypt data securely. You can configure MongoDB to run with a FIPS 140-2 certified library for OpenSSL. Configure FIPS to run by default or as needed from the command line.

For an example, see *Configure MongoDB for FIPS* (page 84).

4.2.2 Encryption At Rest

Application Level Encryption

Application Level Encryption provides encryption on a per-field or per-document basis within the application layer. To encrypt document or field level data, write custom encryption and decryption routines or use a commercial solution such as the Vormetric Data Security Platform[1].

Storage Encryption

Storage Encryption encrypts all MongoDB data on the storage or operating system to ensure that only authorized processes can access protected data. A number of third-party libraries can integrate with the operating system to provide transparent disk-level encryption. For example:

- **Linux Unified Key Setup (LUKS)** LUKS is available for most Linux distributions. For configuration explanation, see the LUKS documentation from Red Hat[2].
- **IBM Guardium Data Encryption** IBM Guardium Data Encryption[3] provides support for disk-level encryption for Linux and Windows operating systems.
- **Vormetric Data Security Platform** The Vormetric Data Security Platform[4] provides disk and file-level encryption in addition to application level encryption.
- **Bitlocker Drive Encryption** Bitlocker Drive Encryption[5] is a feature available on Windows Server 2008 and 2012 that provides disk encryption.

[1] http://www.vormetric.com/sites/default/files/sb-MongoDB-Letter-2014-0611.pdf
[2] https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_Linux/7/html/Security_Guide/sec-Encryption.html
[3] http://www-03.ibm.com/software/products/en/infosphere-guardium-data-encryption
[4] http://www.vormetric.com/sites/default/files/sb-MongoDB-Letter-2014-0611.pdf
[5] http://technet.microsoft.com/en-us/library/hh831713.aspx

Properly configured disk encryption, when used alongside good security policies that protect relevant accounts, passwords, and encryption keys, can help ensure compliance with standards, including HIPAA, PCI-DSS, and FERPA.

CHAPTER 5

Auditing

New in version 2.6.

MongoDB Enterprise includes an auditing capability for `mongod` and `mongos` instances. The auditing facility allows administrators and users to track system activity for deployments with multiple users and applications.

5.1 Enable and Configure Audit Output

The auditing facility can write audit events to the console, the *syslog*, a JSON file, or a BSON file. To enable auditing for MongoDB Enterprise, see *Configure Auditing* (page 93).

For information on the audit log messages, see *System Event Audit Messages* (page 123).

5.2 Audit Events and Filter

Once enabled, the auditing system can record the following operations:

- schema (DDL),
- replica set and sharded cluster,
- authentication and authorization, and
- CRUD operations (requires `auditAuthorizationSuccess` set to `true`).

For details on audited actions, see *Audit Event Actions, Details, and Results* (page 124).

With the auditing system, you can *set up filters* (page 95) to restrict the events captured. To set up filters, see *Configure Audit Filters* (page 95).

5.3 Audit Guarantee

The auditing system writes every audit event [1] to an in-memory buffer of audit events. MongoDB writes this buffer to disk periodically. For events collected from any single connection, the events have a total order: if MongoDB writes one event to disk, the system guarantees that it has written all prior events for that connection to disk.

If an audit event entry corresponds to an operation that affects the durable state of the database, such as a modification to data, MongoDB will always write the audit event to disk *before* writing to the *journal* for that entry.

[1] Audit configuration can include a *filter* (page 95) to limit events to audit.

That is, before adding an operation to the journal, MongoDB writes all audit events on the connection that triggered the operation, up to and including the entry for the operation.

These auditing guarantees require that MongoDB run with `journaling` enabled.

Warning: MongoDB may lose events **if** the server terminates before it commits the events to the audit log. The client may receive confirmation of the event before MongoDB commits to the audit log. For example, while auditing an aggregation operation, the server might crash after returning the result but before the audit log flushes.

CHAPTER 6

Security Hardening

To reduce the risk exposure of the entire MongoDB system, ensure that only trusted hosts have access to MongoDB.

6.1 MongoDB Configuration Hardening

For MongoDB, ensure that HTTP status interface and the REST API API are disabled in production to prevent potential data exposure to attackers.

For more information, see *MongoDB Configuration Hardening* (page 33).

6.2 Network Hardening

To restrict exposure to MongoDB, configure firewalls to control access to MongoDB systems. Use of VPNs can also provide a secure tunnel.

For more information, see *Hardening Network Infrastructure* (page 34).

6.2.1 MongoDB Configuration Hardening

HTTP Status Interface

Warning: Ensure that the HTTP status interface, the REST API, and the JSON API are all disabled in production environments to prevent potential data exposure and vulnerability to attackers.

Changed in version 2.6: The `mongod` and `mongos` instances run with the HTTP interface *disabled* by default. See `net.http.enabled` setting.

The HTTP status interface provides a web-based interface that includes a variety of operational data, logs, and status reports regarding the `mongod` or `mongos` instance. The HTTP status interface is *disabled* by default and is not recommended for production use.

The `net.http.enabled` setting enables HTTP status interface. When enabled without the `net.http.RESTInterfaceEnabled` setting, the HTTP interface is entirely read-only and limited in scope.

The HTTP interface uses the port that is `1000` greater than the primary `mongod` port. By default, the HTTP interface port is `28017`, but is indirectly set using the `net.port` option which allows you to configure the primary `mongod` port.

The HTTP status interface does not include support for authentication other than MONGODB-CR.

While MongoDB Enterprise does support Kerberos authentication, Kerberos is not supported in HTTP status interface in any version of MongoDB.

Changed in version 3.0: Neither the HTTP status interface nor the REST API support the *SCRAM-SHA-1* (page 10) challenge-response user authentication mechanism introduced in version 3.0.

Warning: If you enable the interface, you should only allow trusted clients to access this port. See *Firewalls* (page 34).

REST API

Warning: Ensure that the HTTP status interface, the REST API, and the JSON API are all disabled in production environments to prevent potential data exposure and vulnerability to attackers.

The REST API to MongoDB provides additional information and write access on top of the HTTP status interface. While the REST API does not provide any support for insert, update, or remove operations, it does provide administrative access, and its accessibility represents a vulnerability in a secure environment.

The REST interface is *disabled* by default and is not recommended for production use.

The net.http.RESTInterfaceEnabled setting for mongod enables a fully interactive administrative *REST* interface, which is *disabled* by default. Enabling the REST API enables the HTTP interface, even if the HTTP interface option is disabled, and makes the HTTP interface fully interactive.

The REST API does not include support for authentication other than MONGODB-CR.

Warning: If you enable the interface, you should only allow trusted clients to access this port. See *Firewalls* (page 34).

Changed in version 3.0: Neither the HTTP status interface nor the REST API support the *SCRAM-SHA-1* (page 10) challenge-response user authentication mechanism introduced in version 3.0.

bind_ip

The net.bindIp setting (or the --bind_ip command line option) for mongod and mongos instances limits the network interfaces on which MongoDB programs will listen for incoming connections.

Warning: Make sure that your mongod and mongos instances are only accessible on trusted networks. If your system has more than one network interface, bind MongoDB programs to the private or internal network interface.

See also:

Firewalls (page 34), *configuration-security*

6.2.2 Hardening Network Infrastructure

Firewalls

Firewalls allow administrators to filter and control access to a system by providing granular control over network communications. For administrators of MongoDB, the following capabilities are important: limiting incoming traffic

on a specific port to specific systems and limiting incoming traffic from untrusted hosts.

On Linux systems, the `iptables` interface provides access to the underlying `netfilter` firewall. On Windows systems, `netsh` command line interface provides access to the underlying Windows Firewall. For additional information about firewall configuration, see:

- *Configure Linux iptables Firewall for MongoDB* (page 85) and
- *Configure Windows netsh Firewall for MongoDB* (page 89).

For best results and to minimize overall exposure, ensure that *only* traffic from trusted sources can reach `mongod` and `mongos` instances and that the `mongod` and `mongos` instances can only connect to trusted outputs.

See also:

For MongoDB deployments on Amazon's web services, see the Amazon EC2[1] page, which addresses Amazon's Security Groups and other EC2-specific security features.

Virtual Private Networks

Virtual private networks, or VPNs, make it possible to link two networks over an encrypted and limited-access trusted network. Typically, MongoDB users who use VPNs use TLS/SSL rather than IPSEC VPNs for performance issues.

Depending on configuration and implementation, VPNs provide for certificate validation and a choice of encryption protocols, which requires a rigorous level of authentication and identification of all clients. Furthermore, because VPNs provide a secure tunnel, by using a VPN connection to control access to your MongoDB instance, you can prevent tampering and "man-in-the-middle" attacks.

[1] https://docs.mongodb.org/ecosystem/platforms/amazon-ec2

CHAPTER 7

Security Tutorials

The following tutorials provide instructions for enabling and using the security features available in MongoDB.

Before enabling role based access control, you should first consider the users of the system. Once the users have been identified, determine the roles required by the users. Roles may inherit from other roles to provide a hierarchy.

Enable Access Control **(page 37)** Tutorials for enabling access control.

Authentication Mechanisms **(page 45)** Tutorials for specifying various authentication mechanisms supported by MongoDB.

Configure Users and Roles **(page 66)** Tutorials for managing users and roles.

Network **(page 75)** Tutorials for securing your network via TLS/SSL and firewall configuration.

Auditing **(page 93)** Tutorials for configuring auditing.

Miscellaneous **(page 98)** Tutorial illustrating field-level redaction or instructions for reporting a security vulnerability to MongoDB.

7.1 Enable Access Control

The tutorials in this section enable access control. Once access control is enabled, users must *authenticate* (page 7) themselves. The following tutorials use the *default authentication mechanism* (page 10) .

Important: Before enabling role based access control, you should first consider the users of the system. Once the users have been identified, determine the roles required by the users. Roles may inherit from other roles to provide a hierarchy.

A user should have only the minimal set of privileges required to ensure a system of *least privilege*.

Each application and user of a MongoDB system should map to a distinct user in MongoDB; i.e. do not create a group user that is shared among multiple individuals. This *access isolation* facilitates access revocation and ongoing user maintenance.

Enable Client Access Control **(page 38)** Describes the process for enabling client access control for MongoDB deployments.

Enable Internal Authentication **(page 40)** Describes the process for enabling internal authentication members of replica sets and sharded clusters. Enabling internal authentication implicitly enables client access control.

7.1.1 Enable Client Access Control

Overview

Enabling access control requires authentication of every user. Once authenticated, users only have the privileges as defined in the roles granted to the users.

To enable access control, use either the command line option `--auth` or `security.authorization` configuration file setting.

Note: The tutorial enables access control and uses the *default authentication mechanism* (page 10). To specify a different authentication mechanism, see *Authentication Mechanisms* (page 45).

You can also enable client access control by *enabling internal authentication* (page 40) of replica sets or sharded clusters. For instructions on enabling internal authentication, see *Enable Internal Authentication* (page 40).

Considerations

With access control enabled, ensure you have a user with `userAdmin` (page 106) or `userAdminAnyDatabase` (page 110) role in the `admin` database.

You can create users before enabling access control or you can create users after enabling access control. If you enable access control before creating any user, MongoDB provides a *localhost exception* (page 9) which allows you to create a user administrator in the `admin` database. Once created, authenticate as the user administrator to create additional users as needed.

Procedures

Add Users Before Enabling Access Control

The following procedure first adds a user administrator to a MongoDB instance running without access control and then enables access control.

Step 1: Start MongoDB without access control. For example, the following starts a standalone `mongod` instance without access control.

```
mongod --port 27017 --dbpath /data/db1
```

For details on starting a `mongod` or `mongos`, see `https://docs.mongodb.org/manual/tutorial/manage-mongodb-pr` or `https://docs.mongodb.org/manual/tutorial/deploy-shard-cluster`.

Step 2: Connect to the instance. For example, connect a `mongo` shell to the instance.

```
mongo --port 27017
```

Specify additional command line options as appropriate to connect the `mongo` shell to your deployment, such as `--host`.

Step 3: Create the user administrator. Add a user with the `userAdminAnyDatabase` (page 110) role. For example, the following creates the user `myUserAdmin` on the `admin` database:

```
use admin
db.createUser(
  {
    user: "myUserAdmin",
    pwd: "abc123",
    roles: [ { role: "userAdminAnyDatabase", db: "admin" } ]
  }
)
```

Step 4: Re-start the MongoDB instance with access control. Re-start the `mongod` instance with the `--auth` command line option or, if using a configuration file, the `security.authorization` setting.

```
mongod --auth --port 27017 --dbpath /data/db1
```

Step 5: Authenticate as the user administrator. Either connect a new `mongo` shell to the MongoDB instance with the `-u <username>`, `-p <password>`, and the `--authenticationDatabase <database>`:

```
mongo --port 27017 -u "myUserAdmin" -p "abc123" --authenticationDatabase "admin"
```

The `mongo` shell executes a number of commands at start up. As a result, when you log in as the user administrator, you may see authentication errors from one or more commands. You may ignore these errors, which are expected, because the `userAdminAnyDatabase` (page 110) role does not have permissions to run some of the start up commands.

Or, in the `mongo` shell connected without authentication, switch to the authentication database, and use `db.auth()` method to authenticate:

```
use admin
db.auth("myUserAdmin", "abc123" )
```

Step 5: Create additional users as needed for your deployment. If you need to disable access control for any reason, restart the MongoDB instance without the `--auth` command line option, or if using a configuration file, the `security.authorization` setting.

Add Users After Enabling Access Control

The following procedure first enables access control, and then uses *localhost exception* (page 9) to add a user administrator.

Step 1: Start the MongoDB instance with access control. Start the `mongod` instance with the `--auth` command line option or, if using a configuration file, the `security.authorization` setting.

```
mongod --auth --port 27017 --dbpath /data/db1
```

Step 2: Connect to the MongoDB instance via the localhost exception. To add the first user using *Localhost Exception* (page 9), connect a `mongo` shell to the `mongod` instance. Run the `mongo` shell from the same host as the `mongod` instance.

Step 3: Create the system user administrator. Add the user with the `userAdminAnyDatabase` (page 110) role, and only that role.

The following example creates the user `myUserAdmin` user on the `admin` database:

```
use admin
db.createUser(
  {
    user: "myUserAdmin",
    pwd: "abc123",
    roles: [ { role: "userAdminAnyDatabase", db: "admin" } ]
  }
)
```

After you create the user administrator, the *localhost exception* (page 9) is no longer available.

Step 4: Authenticate as the user administrator. Either connect a new `mongo` shell to the MongoDB instance with the `-u <username>`, `-p <password>`, and the `--authenticationDatabase <database>`:

```
mongo --port 27017 -u "myUserAdmin" -p "abc123" --authenticationDatabase "admin"
```

The `mongo` shell executes a number of commands at start up. As a result, when you log in as the user administrator, you may see authentication errors from one or more commands. You may ignore these errors, which are expected, because the `userAdminAnyDatabase` (page 110) role does not have permissions to run some of the start up commands.

Or, in the `mongo` shell connected without authentication, switch to the authentication database, and use `db.auth()` method to authenticate:

```
use admin
db.auth("myUserAdmin", "abc123" )
```

Step 5: Create additional users as needed for your deployment.

Additional Information

See also *Manage User and Roles* (page 66).

7.1.2 Enable Internal Authentication

Overview

When authentication is enabled on a replica set or a sharded cluster, members of the replica set or the sharded clusters must provide credentials to authenticate.

To enable authentication on a replica set or a sharded cluster, you must enable authentication individually for each member. For a sharded cluster, this means enabling authentication on each `mongos` and each `mongod`, including the config servers and each member of a shard's replica set.

The following tutorial uses a *keyfile* (page 18) to enable internal authentication. You can also use x.509 certificate for internal authentication. For details on using x.509, see *Use x.509 Certificate for Membership Authentication* (page 48).

Considerations

Access Control

Enabling internal authentication enables *access control* (page 21). The following tutorial assumes *no* users have been created in the system before enabling internal authentication, and uses *Localhost Exception* (page 9) to add a user administrator after access control has been enabled.

If you prefer, you can create the users before enabling internal authentication.

Sharded Cluster

It is not possible to convert an existing sharded cluster that does not enforce access control to require authentication without taking all components of the cluster offline for a short period of time.

For sharded clusters, the *Localhost Exception* (page 9) will apply to the individual shards unless you either create an administrative user or disable the localhost exception on each shard.

Procedures

Update Existing Deployment

Step 1: Create a keyfile. Create the *keyfile* (page 18) your deployment will use to authenticate to members to each other. You can generate a keyfile using any method you choose. Ensure that the password stored in the keyfile is both long and contains a high amount of randomness.

For example, the following operation uses `openssl` command to generate pseudo-random data to use for a keyfile:

```
openssl rand -base64 741 > /srv/mongodb/mongodb-keyfile
chmod 600 mongodb-keyfile
```

Step 2: Enable authentication for each member of the sharded cluster or replica set. For *each* `mongod` in the replica set or for *each* `mongos` and `mongod` in the sharded cluster, including all config servers and shards, specify the keyfile using either a configuration file or a command line option.

In a configuration file, set the `security.keyFile` option to the keyfile's path and then start the component, as in the following example:

```
security:
  keyFile: /srv/mongodb/keyfile
```

Include any other settings as appropriate for your deployment.

Or, when starting the component, specify the `--keyFile` option. For example, for a `mongod`

```
mongod --keyfile /srv/mongodb/mongodb-keyfile --dbpath <path to data>
```

Include any other options as appropriate for your deployment.

Enabling internal authentication enables *access control* (page 21).

Step 3: Connect to the MongoDB instance via the localhost exception. To add the first user using *Localhost Exception* (page 9):

- For a replica set, connect a `mongo` shell to the primary. Run the `mongo` shell from the same host as the primary.

- For a sharded cluster, connect a `mongo` shell to the `mongos`. Run the `mongo` shell from same host as the `mongos`.

Step 4: Add first user. Add a user with the `userAdminAnyDatabase` (page 110) role. For example, the following creates the user `myUserAdmin` on the `admin` database:

```
use admin
db.createUser(
  {
    user: "myUserAdmin",
    pwd: "abc123",
    roles: [ { role: "userAdminAnyDatabase", db: "admin" } ]
  }
)
```

After you create the user administrator, for a replica set, the *localhost exception* (page 9) is no longer available.

For sharded clusters, you must still prevent unauthorized access to the individual shards. Follow one of the following steps for each shard in your cluster:

- Create an administrative user, or
- Disable the *Localhost Exception* (page 9) at startup. To disable the localhost exception, set the `enableLocalhostAuthBypass` to 0.

Step 5: Authenticate as the user administrator. Either connect a new `mongo` shell to the MongoDB instance with the `-u <username>`, `-p <password>`, and the `--authenticationDatabase <database>`:

```
mongo --port 27017 -u "myUserAdmin" -p "abc123" --authenticationDatabase "admin"
```

The `mongo` shell executes a number of commands at start up. As a result, when you log in as the user administrator, you may see authentication errors from one or more commands. You may ignore these errors, which are expected, because the `userAdminAnyDatabase` (page 110) role does not have permissions to run some of the start up commands.

Or, in the `mongo` shell connected without authentication, switch to the authentication database, and use `db.auth()` method to authenticate:

```
use admin
db.auth("myUserAdmin", "abc123" )
```

Step 6: Create additional users as needed for your deployment.

Deploy New Replica Set with Access Control

Step 1: Start one member of the replica set. This `mongod` should *not* enable `auth`.

Step 2: Create administrative users. The following operations will create two users: a user administrator that will be able to create and modify users (`myUserAdmin`), and a `root` (page 111) user (`siteRootAdmin`) that you will use to complete the remainder of the tutorial:

```
use admin
db.createUser( {
    user: "myUserAdmin",
    pwd: "<password>",
```

```
    roles: [ { role: "userAdminAnyDatabase", db: "admin" } ]
  });
db.createUser( {
    user: "siteRootAdmin",
    pwd: "<password>",
    roles: [ { role: "root", db: "admin" } ]
  });
```

Step 3: Stop the `mongod` instance.

Step 4: Create the key file to be used by each member of the replica set. Create the key file your deployment will use to authenticate servers to each other.

To generate pseudo-random data to use for a `keyfile`, issue the following `openssl` command:

```
openssl rand -base64 741 > mongodb-keyfile
chmod 600 mongodb-keyfile
```

You may generate a key file using any method you choose. Always ensure that the password stored in the key file is both long and contains a high amount of entropy. Using `openssl` in this manner helps generate such a key.

Step 5: Copy the key file to each member of the replica set. Copy the `mongodb-keyfile` to all hosts where components of a MongoDB deployment run. Set the permissions of these files to `600` so that only the *owner* of the file can read or write this file to prevent other users on the system from accessing the shared secret.

Step 6: Start each member of the replica set with the appropriate options. For each member, start a `mongod` and specify the key file and the name of the replica set. Also specify other parameters as needed for your deployment. For replication-specific parameters, see *cli-mongod-replica-set* required by your deployment.

If your application connects to more than one replica set, each set should have a distinct name. Some drivers group replica set connections by replica set name.

The following example specifies parameters through the *`--keyFile`* and *`--replSet`* command-line options:

```
mongod --keyFile /mysecretdirectory/mongodb-keyfile --replSet "rs0"
```

The following example specifies parameters through a configuration file:

```
mongod --config $HOME/.mongodb/config
```

In production deployments, you can configure a *init script* to manage this process. Init scripts are beyond the scope of this document.

Step 7: Connect to the member of the replica set where you created the administrative users. Connect to the replica set member you started and authenticate as the `siteRootAdmin` user. From the `mongo` shell, use the following operation to authenticate:

```
use admin
db.auth("siteRootAdmin", "<password>");
```

Step 8: Initiate the replica set. Use `rs.initiate()` on the replica set member:

```
rs.initiate()
```

MongoDB initiates a set that consists of the current member and that uses the default replica set configuration.

Step 9: Verify the initial replica set configuration. Use `rs.conf()` to display the `replica set configuration object`:

```
rs.conf()
```

The replica set configuration object resembles the following:

```
{
   "_id" : "rs0",
   "version" : 1,
   "members" : [
      {
         "_id" : 1,
         "host" : "mongodb0.example.net:27017"
      }
   ]
}
```

Step 10: Add the remaining members to the replica set. Add the remaining members with the `rs.add()` method.

The following example adds two members:

```
rs.add("mongodb1.example.net")
rs.add("mongodb2.example.net")
```

When complete, you have a fully functional replica set. The new replica set will elect a *primary*.

Step 11: Check the status of the replica set. Use the `rs.status()` operation:

```
rs.status()
```

Step 12: Create additional users to address operational requirements. You can use *built-in roles* (page 104) to create common types of database users, such as the `dbOwner` (page 106) role to create a database administrator, the `readWrite` (page 104) role to create a user who can update data, or the `read` (page 104) role to create user who can search data but no more. You also can define *custom roles* (page 24).

For example, the following creates a database administrator for the `products` database:

```
use products
db.createUser(
  {
    user: "productsDBAdmin",
    pwd: "password",
    roles:
    [
      {
        role: "dbOwner",
        db: "products"
      }
    ]
```

```
    }
)
```

For an overview of roles and privileges, see *Role-Based Access Control* (page 21). For more information on adding users, see *Manage User and Roles* (page 66).

x.509 Internal Authentication

For details on using x.509 for internal authentication, see *Use x.509 Certificate for Membership Authentication* (page 48).

To upgrade from keyfile internal authentication to x.509 internal authentication, see *Upgrade from Keyfile Authentication to x.509 Authentication* (page 50).

7.2 Authentication Mechanisms

The following tutorials provide information on configuring MongoDB to use authentication mechanisms other than the *default authentication mechanism* (page 10). For tutorials on using *default authentication mechanism* (page 10), see *Enable Access Control* (page 37).

Use x.509 Certificates to Authenticate Clients **(page 45)** Use x.509 for client authentication.

Use x.509 Certificate for Membership Authentication **(page 48)** Use x.509 for internal member authentication for replica sets and sharded clusters.

Upgrade from Keyfile Authentication to x.509 Authentication **(page 50)** Upgrade from keyfile internal authentication to x.509 internal authentication.

Configure MongoDB with Kerberos Authentication on Linux **(page 52)** For MongoDB Enterprise Linux, describes the process to enable Kerberos-based authentication for MongoDB deployments.

Configure MongoDB with Kerberos Authentication on Windows **(page 56)** For MongoDB Enterprise for Windows, describes the process to enable Kerberos-based authentication for MongoDB deployments.

Troubleshoot Kerberos Authentication **(page 58)** Steps to troubleshoot Kerberos-based authentication for MongoDB deployments.

Authenticate Using SASL and LDAP with ActiveDirectory **(page 60)** Describes the process for authentication using SASL/LDAP with ActiveDirectory.

Authenticate Using SASL and LDAP with OpenLDAP **(page 63)** Describes the process for authentication using SASL/LDAP with OpenLDAP.

7.2.1 Use x.509 Certificates to Authenticate Clients

New in version 2.6.

MongoDB supports x.509 certificate authentication for use with a secure *TLS/SSL connection* (page 75). The x.509 client authentication allows *clients to authenticate to servers with certificates* (page 46) rather than with a username and password.

To use x.509 authentication for the internal authentication of replica set/sharded cluster members, see *Use x.509 Certificate for Membership Authentication* (page 48).

Prerequisites

Important: A full description of TLS/SSL, PKI (Public Key Infrastructure) certificates, in particular x.509 certificates, and Certificate Authority is beyond the scope of this document. This tutorial assumes prior knowledge of TLS/SSL as well as access to valid x.509 certificates.

Certificate Authority

For production use, your MongoDB deployment should use valid certificates generated and signed by a single certificate authority. You or your organization can generate and maintain an independent certificate authority, or use certificates generated by a third-party SSL vendor. Obtaining and managing certificates is beyond the scope of this documentation.

Client x.509 Certificate

The client certificate must have the following properties:

- A single Certificate Authority (CA) must issue the certificates for both the client and the server.
- Client certificates must contain the following fields:

```
keyUsage = digitalSignature
extendedKeyUsage = clientAuth
```

- Each unique MongoDB user must have a unique certificate.
- A client x.509 certificate's subject, which contains the Distinguished Name (`DN`), must **differ** from that of a *Member x.509 Certificate* (page 48). Specifically, the subjects must differ with regards to at least one of the following attributes: Organization (`O`), the Organizational Unit (`OU`) or the Domain Component (`DC`).

  Warning: If a client x.509 certificate's subject has the same `O`, `OU`, and `DC` combination as the *Member x.509 Certificate* (page 48), the client will be identified as a cluster member and granted full permission on the system.

Procedures

Configure MongoDB Server

Use Command-line Options You can configure the MongoDB server from the command line, e.g.:

```
mongod --clusterAuthMode x509 --sslMode requireSSL --sslPEMKeyFile <path to SSL certificate and key f
```

Warning: If the *`--sslCAFile`* option and its target file are not specified, x.509 client and member authentication will not function. `mongod`, and `mongos` in sharded systems, will not be able to verify the certificates of processes connecting to it against the trusted certificate authority (CA) that issued them, breaking the certificate chain.
As of version 2.6.4, `mongod` will not start with x.509 authentication enabled if the CA file is not specified.

Use Configuration File You may also specify these options in the `configuration file`.

Starting in MongoDB 2.6, you can specify the configuration for MongoDB in `YAML format`, e.g.:

```
security:
   clusterAuthMode: x509
net:
   ssl:
      mode: requireSSL
      PEMKeyFile: <path to TLS/SSL certificate and key PEM file>
      CAFile: <path to root CA PEM file>
```

For backwards compatibility, you can also specify the configuration using the older configuration file format[1], e.g.:

```
clusterAuthMode = x509
sslMode = requireSSL
sslPEMKeyFile = <path to TLS/SSL certificate and key PEM file>
sslCAFile = <path to the root CA PEM file>
```

Include any additional options, TLS/SSL or otherwise, that are required for your specific configuration.

Add x.509 Certificate `subject` as a User

To authenticate with a client certificate, you must first add the value of the `subject` from the client certificate as a MongoDB user. Each unique x.509 client certificate corresponds to a single MongoDB user; i.e. you cannot use a single client certificate to authenticate more than one MongoDB user.

1. You can retrieve the `subject` from the client certificate with the following command:

   ```
   openssl x509 -in <pathToClient PEM> -inform PEM -subject -nameopt RFC2253
   ```

   The command returns the `subject` string as well as certificate:

   ```
   subject= CN=myName,OU=myOrgUnit,O=myOrg,L=myLocality,ST=myState,C=myCountry
   -----BEGIN CERTIFICATE-----
   # ...
   -----END CERTIFICATE-----
   ```

2. Add the value of the `subject`, omitting the spaces, from the certificate as a user.

   For example, in the `mongo` shell, to add the user with both the `readWrite` role in the `test` database and the `userAdminAnyDatabase` role which is defined only in the `admin` database:

   ```
   db.getSiblingDB("$external").runCommand(
     {
       createUser: "CN=myName,OU=myOrgUnit,O=myOrg,L=myLocality,ST=myState,C=myCountry",
       roles: [
                { role: 'readWrite', db: 'test' },
                { role: 'userAdminAnyDatabase', db: 'admin' }
              ],
       writeConcern: { w: "majority" , wtimeout: 5000 }
     }
   )
   ```

   In the above example, to add the user with the `readWrite` role in the `test` database, the role specification document specified `'test'` in the `db` field. To add `userAdminAnyDatabase` role for the user, the above example specified `'admin'` in the `db` field.

[1] https://docs.mongodb.org/v2.4/reference/configuration-options

Note: Some roles are defined only in the `admin` database, including: `clusterAdmin`, `readAnyDatabase`, `readWriteAnyDatabase`, `dbAdminAnyDatabase`, and `userAdminAnyDatabase`. To add a user with these roles, specify `'admin'` in the `db`.

See *Manage User and Roles* (page 66) for details on adding a user with roles.

Authenticate with a x.509 Certificate

To authenticate with a client certificate, you must first add a MongoDB user that corresponds to the client certificate. See *Add x.509 Certificate subject as a User* (page 47).

To authenticate, use the `db.auth()` method in the `$external` database, specifying `"MONGODB-X509"` for the `mechanism` field, and the *user that corresponds to the client certificate* (page 47) for the `user` field.

For example, if using the `mongo` shell,

1. Connect `mongo` shell to the `mongod` set up for SSL:

   ```
   mongo --ssl --sslPEMKeyFile <path to CA signed client PEM file> --sslCAFile <path to root CA PEM
   ```

2. To perform the authentication, use the `db.auth()` method in the `$external` database. For the `mechanism` field, specify `"MONGODB-X509"`, and for the `user` field, specify the user, or the `subject`, that corresponds to the client certificate.

   ```
   db.getSiblingDB("$external").auth(
     {
       mechanism: "MONGODB-X509",
       user: "CN=myName,OU=myOrgUnit,O=myOrg,L=myLocality,ST=myState,C=myCountry"
     }
   )
   ```

7.2.2 Use x.509 Certificate for Membership Authentication

New in version 2.6.

MongoDB supports x.509 certificate authentication for use with a secure *TLS/SSL connection* (page 75). Sharded cluster members and replica set members can use x.509 certificates to verify their membership to the cluster or the replica set instead of using *keyfiles* (page 18). The membership authentication is an internal process.

For client authentication with x.509, see *Use x.509 Certificates to Authenticate Clients* (page 45).

Important: A full description of TLS/SSL, PKI (Public Key Infrastructure) certificates, in particular x.509 certificates, and Certificate Authority is beyond the scope of this document. This tutorial assumes prior knowledge of TLS/SSL as well as access to valid x.509 certificates.

Member x.509 Certificate

Certificate Requirements

The member certificate, used for internal authentication to verify membership to the sharded cluster or a replica set, must have the following properties:

- A single Certificate Authority (CA) must issue all the x.509 certificates for the members of a sharded cluster or a replica set.

- The Distinguished Name (DN), found in the member certificate's subject, must specify a non-empty value for *at least one* of the following attributes: Organization (O), the Organizational Unit (OU) or the Domain Component (DC).
- The Organization attributes (O's), the Organizational Unit attributes (OU's), and the Domain Components (DC's) must match those from the certificates for the other cluster members. To match, the certificate must match all specifications of these attributes, or even the non-specification of these attributes. The order of the attributes does not matter.

  In the following example, the two DN's contain matching specifications for O, OU as well as the non-specification of the DC attribute.

  ```
  CN=host1,OU=Dept1,O=MongoDB,ST=NY,C=US
  C=US, ST=CA, O=MongoDB, OU=Dept1, CN=host2
  ```

  However, the following two DN's contain a mismatch for the OU attribute since one contains two OU specifications and the other, only one specification.

  ```
  CN=host1,OU=Dept1,OU=Sales,O=MongoDB
  CN=host2,OU=Dept1,O=MongoDB
  ```

- Either the Common Name (CN) or one of the Subject Alternative Name (SAN) entries must match the hostname of the server, used by the other members of the cluster.

  For example, the certificates for a cluster could have the following subjects:

  ```
  subject= CN=<myhostname1>,OU=Dept1,O=MongoDB,ST=NY,C=US
  subject= CN=<myhostname2>,OU=Dept1,O=MongoDB,ST=NY,C=US
  subject= CN=<myhostname3>,OU=Dept1,O=MongoDB,ST=NY,C=US
  ```

- *If* the certificate includes the Extended Key Usage (extendedKeyUsage) setting, the value must include clientAuth ("TLS Web Client Authentication").

  ```
  extendedKeyUsage = clientAuth
  ```

  You can also use a certificate that does not include the Extended Key Usage (EKU).

Member Certificate and PEMKeyFile

To configure MongoDB for client certificate authentication, the mongod and mongos specify a PEMKeyFile to prove its identity to clients, either through net.ssl.PEMKeyFile setting in the configuration file or --sslPEMKeyFile command line option.

If no clusterFile certificate is specified for internal member authentication, MongoDB will attempt to use the PEMKeyFile certificate for member authentication. In order to use PEMKeyFile certificate for internal authentication as well as for client authentication, then the PEMKeyFile certificate must either:

- Omit extendedKeyUsage or
- Specify extendedKeyUsage values that include clientAuth in addition to serverAuth.

Configure Replica Set/Sharded Cluster

Use Command-line Options

To specify the x.509 certificate for internal cluster member authentication, append the additional TLS/SSL options *--clusterAuthMode* and *--sslClusterFile*, as in the following example for a member of a replica set:

```
mongod --replSet <name> --sslMode requireSSL --clusterAuthMode x509 --sslClusterFile <path to members
```

Include any additional options, TLS/SSL or otherwise, that are required for your specific configuration. For instance, if the membership key is encrypted, set the *--sslClusterPassword* to the passphrase to decrypt the key or have MongoDB prompt for the passphrase. See *SSL Certificate Passphrase* (page 79) for details.

Warning: If the *--sslCAFile* option and its target file are not specified, x.509 client and member authentication will not function. `mongod`, and `mongos` in sharded systems, will not be able to verify the certificates of processes connecting to it against the trusted certificate authority (CA) that issued them, breaking the certificate chain.
As of version 2.6.4, `mongod` will not start with x.509 authentication enabled if the CA file is not specified.

Use Configuration File

You can specify the configuration for MongoDB in a `YAML formatted` configuration file, as in the following example:

```
security:
   clusterAuthMode: x509
net:
   ssl:
      mode: requireSSL
      PEMKeyFile: <path to TLS/SSL certificate and key PEM file>
      CAFile: <path to root CA PEM file>
      clusterFile: <path to x.509 membership certificate and key PEM file>
```

See `security.clusterAuthMode`, `net.ssl.mode`, `net.ssl.PEMKeyFile`, `net.ssl.CAFile`, and `net.ssl.clusterFile` for more information on the settings.

Additional Information

To upgrade from keyfile internal authentication to x.509 internal authentication, see *Upgrade from Keyfile Authentication to x.509 Authentication* (page 50).

7.2.3 Upgrade from Keyfile Authentication to x.509 Authentication

To upgrade clusters that are currently using *keyfile authentication* (page 18) to x.509 authentication, use the following rolling upgrade processes.

Clusters Currently Using TLS/SSL

For clusters using TLS/SSL and keyfile authentication, to upgrade to x.509 cluster authentication, use the following rolling upgrade process:

1. For each node of a cluster, start the node with the option *--clusterAuthMode* set to `sendKeyFile` and the option *--sslClusterFile* set to the appropriate path of the node's certificate. Include other *TLS/SSL options* (page 75) as well as any other options that are required for your specific configuration. For example:

   ```
   mongod --replSet <name> --sslMode requireSSL --clusterAuthMode sendKeyFile --sslClusterFile <pat
   ```

With this setting, each node continues to use its keyfile to authenticate itself as a member. However, each node can now accept either a keyfile or an x.509 certificate from other members to authenticate those members. Upgrade all nodes of the cluster to this setting.

2. Then, for each node of a cluster, connect to the node and use the `setParameter` command to update the `clusterAuthMode` to `sendX509`. [2] For example,

```
db.getSiblingDB('admin').runCommand( { setParameter: 1, clusterAuthMode: "sendX509" } )
```

With this setting, each node uses its x.509 certificate, specified with the *--sslClusterFile* option in the previous step, to authenticate itself as a member. However, each node continues to accept either a keyfile or an x.509 certificate from other members to authenticate those members. Upgrade all nodes of the cluster to this setting.

3. Optional but recommended. Finally, for each node of the cluster, connect to the node and use the `setParameter` command to update the `clusterAuthMode` to `x509` to only use the x.509 certificate for authentication. [1] For example:

```
db.getSiblingDB('admin').runCommand( { setParameter: 1, clusterAuthMode: "x509" } )
```

4. After the upgrade of all nodes, edit the `configuration file` with the appropriate x.509 settings to ensure that upon subsequent restarts, the cluster uses x.509 authentication.

See *--clusterAuthMode* for the various modes and their descriptions.

Clusters Currently Not Using TLS/SSL

For clusters using keyfile authentication but not TLS/SSL, to upgrade to x.509 authentication, use the following rolling upgrade process:

1. For each node of a cluster, start the node with the option *--sslMode* set to `allowSSL`, the option *--clusterAuthMode* set to `sendKeyFile` and the option *--sslClusterFile* set to the appropriate path of the node's certificate. Include other *TLS/SSL options* (page 75) as well as any other options that are required for your specific configuration. For example:

```
mongod --replSet <name> --sslMode allowSSL --clusterAuthMode sendKeyFile --sslClusterFile <path
```

The *--sslMode allowSSL* setting allows the node to accept both TLS/SSL and non-TLS/non-SSL incoming connections. Its outgoing connections do not use TLS/SSL.

The *--clusterAuthMode sendKeyFile* setting allows each node continues to use its keyfile to authenticate itself as a member. However, each node can now accept either a keyfile or an x.509 certificate from other members to authenticate those members.

Upgrade all nodes of the cluster to these settings.

2. Then, for each node of a cluster, connect to the node and use the `setParameter` command to update the `sslMode` to `preferSSL` and the `clusterAuthMode` to `sendX509`. [1] For example:

```
db.getSiblingDB('admin').runCommand( { setParameter: 1, sslMode: "preferSSL", clusterAuthMode: "
```

With the `sslMode` set to `preferSSL`, the node accepts both TLS/SSL and non-TLS/non-SSL incoming connections, and its outgoing connections use TLS/SSL.

With the `clusterAuthMode` set to `sendX509`, each node uses its x.509 certificate, specified with the *--sslClusterFile* option in the previous step, to authenticate itself as a member. However, each node continues to accept either a keyfile or an x.509 certificate from other members to authenticate those members.

[2] As an alternative to using the `setParameter` command, you can also restart the nodes with the appropriate TLS/SSL and x509 options and values.

Upgrade all nodes of the cluster to these settings.

3. Optional but recommended. Finally, for each node of the cluster, connect to the node and use the `setParameter` command to update the `sslMode` to `requireSSL` and the `clusterAuthMode` to `x509`. [1] For example:

   ```
   db.getSiblingDB('admin').runCommand( { setParameter: 1, sslMode: "requireSSL", clusterAuthMode:
   ```

   With the `sslMode` set to `requireSSL`, the node only uses TLS/SSLs connections.

   With the `clusterAuthMode` set to `x509`, the node only uses the x.509 certificate for authentication.

4. After the upgrade of all nodes, edit the `configuration file` with the appropriate TLS/SSL and x.509 settings to ensure that upon subsequent restarts, the cluster uses x.509 authentication.

See *`--clusterAuthMode`* for the various modes and their descriptions.

7.2.4 Configure MongoDB with Kerberos Authentication on Linux

New in version 2.4.

Overview

MongoDB Enterprise supports authentication using a *Kerberos service* (page 14). Kerberos is an industry standard authentication protocol for large client/server system.

Prerequisites

Setting up and configuring a Kerberos deployment is beyond the scope of this document. This tutorial assumes you have configured a *Kerberos service principal* (page 15) for each `mongod` and `mongos` instance in your MongoDB deployment, and you have a valid *keytab file* (page 15) for for each `mongod` and `mongos` instance.

To verify MongoDB Enterprise binaries:

```
mongod --version
```

In the output from this command, look for the string `modules: subscription` or `modules: enterprise` to confirm your system has MongoDB Enterprise.

Procedure

The following procedure outlines the steps to add a Kerberos user principal to MongoDB, configure a standalone `mongod` instance for Kerberos support, and connect using the `mongo` shell and authenticate the user principal.

Step 1: Start `mongod` without Kerberos.

For the initial addition of Kerberos users, start `mongod` without Kerberos support.

If a Kerberos user is already in MongoDB and has the *privileges required to create a user*, you can start `mongod` with Kerberos support.

Step 2: Connect to mongod.

Connect via the mongo shell to the mongod instance. If mongod has *--auth* enabled, ensure you connect with the *privileges required to create a user*.

Step 3: Add Kerberos Principal(s) to MongoDB.

Add a Kerberos principal, <username>@<KERBEROS REALM> or <username>/<instance>@<KERBEROS REALM>, to MongoDB in the $external database. Specify the Kerberos realm in all uppercase. The $external database allows mongod to consult an external source (e.g. Kerberos) to authenticate. To specify the user's privileges, assign *roles* (page 21) to the user.

The following example adds the Kerberos principal application/reporting@EXAMPLE.NET with read-only access to the records database:

```
use $external
db.createUser(
   {
     user: "application/reporting@EXAMPLE.NET",
     roles: [ { role: "read", db: "records" } ]
   }
)
```

Add additional principals as needed. For every user you want to authenticate using Kerberos, you must create a corresponding user in MongoDB. For more information about creating and managing users, see https://docs.mongodb.org/manual/reference/command/nav-user-management.

Step 4: Start mongod with Kerberos support.

To start mongod with Kerberos support, set the environmental variable KRB5_KTNAME to the path of the keytab file and the mongod parameter authenticationMechanisms to GSSAPI in the following form:

```
env KRB5_KTNAME=<path to keytab file> \
mongod \
--setParameter authenticationMechanisms=GSSAPI
<additional mongod options>
```

For example, the following starts a standalone mongod instance with Kerberos support:

```
env KRB5_KTNAME=/opt/mongodb/mongod.keytab \
/opt/mongodb/bin/mongod --auth \
--setParameter authenticationMechanisms=GSSAPI \
--dbpath /opt/mongodb/data
```

The path to your mongod as well as your *keytab file* (page 15) may differ. Modify or include additional mongod options as required for your configuration. The *keytab file* (page 15) must be only accessible to the owner of the mongod process.

With the official .deb or .rpm packages, you can set the KRB5_KTNAME in a environment settings file. See *KRB5_KTNAME* (page 54) for details.

Step 5: Connect mongo shell to mongod and authenticate.

Connect the mongo shell client as the Kerberos principal application/reporting@EXAMPLE.NET. Before connecting, you must have used Kerberos's kinit program to get credentials for

application/reporting@EXAMPLE.NET.

You can connect and authenticate from the command line.

```
mongo --authenticationMechanism=GSSAPI --authenticationDatabase='$external' \
--username application/reporting@EXAMPLE.NET
```

Or, alternatively, you can first connect `mongo` to the `mongod`, and then from the `mongo` shell, use the `db.auth()` method to authenticate in the `$external` database.

```
use $external
db.auth( { mechanism: "GSSAPI", user: "application/reporting@EXAMPLE.NET" } )
```

Additional Considerations

KRB5_KTNAME

If you installed MongoDB Enterprise using one of the official `.deb` or `.rpm` packages, and you use the included init/upstart scripts to control the `mongod` instance, you can set the `KR5_KTNAME` variable in the default environment settings file instead of setting the variable each time.

For `.rpm` packages, the default environment settings file is `/etc/sysconfig/mongod`.

For `.deb` packages, the file is `/etc/default/mongodb`.

Set the `KRB5_KTNAME` value in a line that resembles the following:

```
export KRB5_KTNAME="<path to keytab>"
```

Configure `mongos` for Kerberos

To start `mongos` with Kerberos support, set the environmental variable `KRB5_KTNAME` to the path of its *keytab file* (page 15) and the `mongos` parameter `authenticationMechanisms` to `GSSAPI` in the following form:

```
env KRB5_KTNAME=<path to keytab file> \
mongos \
--setParameter authenticationMechanisms=GSSAPI \
<additional mongos options>
```

For example, the following starts a `mongos` instance with Kerberos support:

```
env KRB5_KTNAME=/opt/mongodb/mongos.keytab \
mongos \
--setParameter authenticationMechanisms=GSSAPI \
--configdb shard0.example.net, shard1.example.net,shard2.example.net \
--keyFile /opt/mongodb/mongos.keyfile
```

The path to your `mongos` as well as your *keytab file* (page 15) may differ. The *keytab file* (page 15) must be only accessible to the owner of the `mongos` process.

Modify or include any additional `mongos` options as required for your configuration. For example, instead of using *`--keyFile`* for internal authentication of sharded cluster members, you can use *x.509 member authentication* (page 48) instead.

Use a Config File

To configure `mongod` or `mongos` for Kerberos support using a `configuration file`, specify the `authenticationMechanisms` setting in the configuration file:

If using the `YAML configuration file format`:

```
setParameter:
   authenticationMechanisms: GSSAPI
```

Or, if using the older `.ini` configuration file format:

```
setParameter=authenticationMechanisms=GSSAPI
```

Modify or include any additional `mongod` options as required for your configuration. For example, if `/opt/mongodb/mongod.conf` contains the following configuration settings for a standalone `mongod`:

```
security:
   authorization: enabled
setParameter:
   authenticationMechanisms: GSSAPI
storage:
   dbPath: /opt/mongodb/data
```

Or, if using the older configuration file format[3]:

```
auth = true
setParameter=authenticationMechanisms=GSSAPI
dbpath=/opt/mongodb/data
```

To start `mongod` with Kerberos support, use the following form:

```
env KRB5_KTNAME=/opt/mongodb/mongod.keytab \
/opt/mongodb/bin/mongod --config /opt/mongodb/mongod.conf
```

The path to your `mongod`, *keytab file* (page 15), and configuration file may differ. The *keytab file* (page 15) must be only accessible to the owner of the `mongod` process.

Troubleshoot Kerberos Setup for MongoDB

If you encounter problems when starting `mongod` or `mongos` with Kerberos authentication, see *Troubleshoot Kerberos Authentication* (page 58).

Incorporate Additional Authentication Mechanisms

Kerberos authentication (*GSSAPI* (page 14) (Kerberos)) can work alongside MongoDB's challenge/response authentication mechanisms (*SCRAM-SHA-1* (page 10) and *MONGODB-CR* (page 11)), MongoDB's authentication mechanism for LDAP (*PLAIN* (page 14) (LDAP SASL)), and MongoDB's authentication mechanism for x.509 (*MONGODB-X509* (page 12)). Specify the mechanisms as follows:

```
--setParameter authenticationMechanisms=GSSAPI,SCRAM-SHA-1
```

Only add the other mechanisms if in use. This parameter setting does not affect MongoDB's internal authentication of cluster members.

[3] https://docs.mongodb.org/v2.4/reference/configuration-options

Additional Resources

- MongoDB LDAP and Kerberos Authentication with Dell (Quest) Authentication Services[4]
- MongoDB with Red Hat Enterprise Linux Identity Management and Kerberos[5]

7.2.5 Configure MongoDB with Kerberos Authentication on Windows

New in version 2.6.

Overview

MongoDB Enterprise supports authentication using a *Kerberos service* (page 14). Kerberos is an industry standard authentication protocol for large client/server system. Kerberos allows MongoDB and applications to take advantage of existing authentication infrastructure and processes.

Prerequisites

Setting up and configuring a Kerberos deployment is beyond the scope of this document. This tutorial assumes have configured a *Kerberos service principal* (page 15) for each `mongod.exe` and `mongos.exe` instance.

Procedures

Step 1: Start `mongod.exe` without Kerberos.

For the initial addition of Kerberos users, start `mongod.exe` without Kerberos support.

If a Kerberos user is already in MongoDB and has the *privileges required to create a user*, you can start `mongod.exe` with Kerberos support.

Step 2: Connect to `mongod`.

Connect via the `mongo.exe` shell to the `mongod.exe` instance. If `mongod.exe` has `--auth` enabled, ensure you connect with the *privileges required to create a user*.

Step 3: Add Kerberos Principal(s) to MongoDB.

Add a Kerberos principal, `<username>@<KERBEROS REALM>`, to MongoDB in the `$external` database. Specify the Kerberos realm in **ALL UPPERCASE**. The `$external` database allows `mongod.exe` to consult an external source (e.g. Kerberos) to authenticate. To specify the user's privileges, assign *roles* (page 21) to the user.

The following example adds the Kerberos principal `reportingapp@EXAMPLE.NET` with read-only access to the `records` database:

```
use $external
db.createUser(
   {
     user: "reportingapp@EXAMPLE.NET",
```

[4] https://www.mongodb.com/blog/post/mongodb-ldap-and-kerberos-authentication-dell-quest-authentication-services?jmp=docs
[5] http://docs.mongodb.org/ecosystem/tutorial/manage-red-hat-enterprise-linux-identity-management?jmp=docs

```
    roles: [ { role: "read", db: "records" } ]
  }
)
```

Add additional principals as needed. For every user you want to authenticate using Kerberos, you must create a corresponding user in MongoDB. For more information about creating and managing users, see `https://docs.mongodb.org/manual/reference/command/nav-user-management`.

Step 4: Start `mongod.exe` with Kerberos support.

You must start `mongod.exe` as the *service principal account* (page 58).

To start `mongod.exe` with Kerberos support, set the `mongod.exe` parameter `authenticationMechanisms` to `GSSAPI`:

```
mongod.exe --setParameter authenticationMechanisms=GSSAPI <additional mongod.exe options>
```

For example, the following starts a standalone `mongod.exe` instance with Kerberos support:

```
mongod.exe --auth --setParameter authenticationMechanisms=GSSAPI
```

Modify or include additional `mongod.exe` options as required for your configuration.

Step 5: Connect `mongo.exe` shell to `mongod.exe` and authenticate.

Connect the `mongo.exe` shell client as the Kerberos principal `application@EXAMPLE.NET`.

You can connect and authenticate from the command line.

```
mongo.exe --authenticationMechanism=GSSAPI --authenticationDatabase='$external' \
--username reportingapp@EXAMPLE.NET
```

Or, alternatively, you can first connect `mongo.exe` to the `mongod.exe`, and then from the `mongo.exe` shell, use the `db.auth()` method to authenticate in the `$external` database.

```
use $external
db.auth( { mechanism: "GSSAPI", user: "reportingapp@EXAMPLE.NET" } )
```

Additional Considerations

Configure `mongos.exe` for Kerberos

To start `mongos.exe` with Kerberos support, set the `mongos.exe` parameter `authenticationMechanisms` to `GSSAPI`. You must start `mongos.exe` as the *service principal account* (page 58).:

```
mongos.exe --setParameter authenticationMechanisms=GSSAPI <additional mongos options>
```

For example, the following starts a `mongos` instance with Kerberos support:

```
mongos.exe --setParameter authenticationMechanisms=GSSAPI --configdb shard0.example.net, shard1.examp
```

Modify or include any additional `mongos.exe` options as required for your configuration. For example, instead of using *`--keyFile`* for internal authentication of sharded cluster members, you can use *x.509 member authentication* (page 48) instead.

Assign Service Principal Name to MongoDB Windows Service

Use `setspn.exe` to assign the service principal name (SPN) to the account running the `mongod.exe` and the `mongos.exe` service:

```
setspn.exe -A <service>/<fully qualified domain name> <service account name>
```

For example, if `mongod.exe` runs as a service named `mongodb` on `testserver.mongodb.com` with the service account name `mongodtest`, assign the SPN as follows:

```
setspn.exe -A mongodb/testserver.mongodb.com mongodtest
```

Incorporate Additional Authentication Mechanisms

Kerberos authentication (*GSSAPI* (page 14) (Kerberos)) can work alongside MongoDB's challenge/response authentication mechanisms (*SCRAM-SHA-1* (page 10) and *MONGODB-CR* (page 11)), MongoDB's authentication mechanism for LDAP (*PLAIN* (page 14) (LDAP SASL)), and MongoDB's authentication mechanism for x.509 (*MONGODB-X509* (page 12)). Specify the mechanisms as follows:

```
--setParameter authenticationMechanisms=GSSAPI,SCRAM-SHA-1
```

Only add the other mechanisms if in use. This parameter setting does not affect MongoDB's internal authentication of cluster members.

7.2.6 Troubleshoot Kerberos Authentication

New in version 2.4.

Kerberos Configuration Checklist

If you have difficulty starting `mongod` or `mongos` with *Kerberos* (page 14), ensure that:

- The `mongod` and the `mongos` binaries are from MongoDB Enterprise.

  To verify MongoDB Enterprise binaries:

  ```
  mongod --version
  ```

  In the output from this command, look for the string `modules: subscription` or `modules: enterprise` to confirm your system has MongoDB Enterprise.

- You are not using the HTTP Console[6]. MongoDB Enterprise does not support Kerberos authentication over the HTTP Console interface.

- On Linux, either the service principal name (SPN) in the *keytab file* (page 15) matches the SPN for the `mongod` or `mongos` instance, or the `mongod` or the `mongos` instance use the `--setParameter saslHostName=<host name>` to match the name in the keytab file.

- The canonical system hostname of the system that runs the `mongod` or `mongos` instance is a resolvable, fully qualified domain for this host. You can test the system hostname resolution with the `hostname -f` command at the system prompt.

- Each host that runs a `mongod` or `mongos` instance has both the `A` and `PTR` DNS records to provide forward and reverse lookup. The records allow the host to resolve the components of the Kerberos infrastructure.

[6] https://docs.mongodb.org/ecosystem/tools/http-interface/#http-console

- Both the Kerberos Key Distribution Center (KDC) and the system running `mongod` instance or `mongos` must be able to resolve each other using DNS. By default, Kerberos attempts to resolve hosts using the content of the `/etc/kerb5.conf` before using DNS to resolve hosts.
- The time synchronization of the systems running `mongod` or the `mongos` instances and the Kerberos infrastructure are within the maximum time skew (default is 5 minutes) of each other. Time differences greater than the maximum time skew will prevent successful authentication.

Debug with More Verbose Logs on Linux

If you still encounter problems with Kerberos on Linux, you can start both `mongod` and `mongo` (or another client) with the environment variable `KRB5_TRACE` set to different files to produce more verbose logging of the Kerberos process to help further troubleshooting. For example, the following starts a standalone `mongod` with `KRB5_TRACE` set:

```
env KRB5_KTNAME=/opt/mongodb/mongod.keytab \
    KRB5_TRACE=/opt/mongodb/log/mongodb-kerberos.log \
    /opt/mongodb/bin/mongod --dbpath /opt/mongodb/data \
    --fork --logpath /opt/mongodb/log/mongod.log \
    --auth --setParameter authenticationMechanisms=GSSAPI
```

Common Error Messages

In some situations, MongoDB will return error messages from the GSSAPI interface if there is a problem with the Kerberos service. Some common error messages are:

`GSSAPI error in client while negotiating security context.` This error occurs on the client and reflects insufficient credentials or a malicious attempt to authenticate.

If you receive this error, ensure that you are using the correct credentials and the correct fully qualified domain name when connecting to the host.

`GSSAPI error acquiring credentials.` This error occurs during the start of the `mongod` or `mongos` and reflects improper configuration of the system hostname or a missing or incorrectly configured keytab file.

If you encounter this problem, consider the items in the *Kerberos Configuration Checklist* (page 58), in particular, whether the SPN in the *keytab file* (page 15) matches the SPN for the `mongod` or `mongos` instance.

To determine whether the SPNs match:

1. Examine the keytab file, with the following command:

   ```
   klist -k <keytab>
   ```

   Replace `<keytab>` with the path to your keytab file.

2. Check the configured hostname for your system, with the following command:

   ```
   hostname -f
   ```

   Ensure that this name matches the name in the keytab file, or start `mongod` or `mongos` with the `--setParameter saslHostName=<hostname>`.

See also:

- *Kerberos Authentication* (page 14)
- *Configure MongoDB with Kerberos Authentication on Linux* (page 52)
- *Configure MongoDB with Kerberos Authentication on Windows* (page 56)

7.2.7 Authenticate Using SASL and LDAP with ActiveDirectory

MongoDB Enterprise provides support for proxy authentication of users. This allows administrators to configure a MongoDB cluster to authenticate users by proxying authentication requests to a specified Lightweight Directory Access Protocol (LDAP) service.

Considerations

MongoDB Enterprise for Windows does **not** include LDAP support for authentication. However, MongoDB Enterprise for Linux supports using LDAP authentication with an ActiveDirectory server.

MongoDB does **not** support LDAP authentication in mixed sharded cluster deployments that contain both version 2.4 and version 2.6 shards. See `https://docs.mongodb.org/manual/release-notes/2.6-upgrade` for upgrade instructions.

Use secure encrypted or trusted connections between clients and the server, as well as between `saslauthd` and the LDAP server. The LDAP server uses the `SASL PLAIN` mechanism, sending and receiving data in **plain text**. You should use only a trusted channel such as a VPN, a connection encrypted with TLS/SSL, or a trusted wired network.

Configure `saslauthd`

LDAP support for user authentication requires proper configuration of the `saslauthd` daemon process as well as the MongoDB server.

Step 1: Specify the mechanism.

On systems that configure `saslauthd` with the `/etc/sysconfig/saslauthd` file, such as Red Hat Enterprise Linux, Fedora, CentOS, and Amazon Linux AMI, set the mechanism `MECH` to `ldap`:

```
MECH=ldap
```

On systems that configure `saslauthd` with the `/etc/default/saslauthd` file, such as Ubuntu, set the `MECHANISMS` option to `ldap`:

```
MECHANISMS="ldap"
```

Step 2: Adjust caching behavior.

On certain Linux distributions, `saslauthd` starts with the caching of authentication credentials *enabled*. Until restarted or until the cache expires, `saslauthd` will not contact the LDAP server to re-authenticate users in its authentication cache. This allows `saslauthd` to successfully authenticate users in its cache, even in the LDAP server is down or if the cached users' credentials are revoked.

To set the expiration time (in seconds) for the authentication cache, see the -t option[7] of `saslauthd`.

Step 3: Configure LDAP Options with ActiveDirectory.

If the `saslauthd.conf` file does not exist, create it. The `saslauthd.conf` file usually resides in the `/etc` folder. If specifying a different file path, see the -O option[8] of `saslauthd`.

[7] http://www.linuxcommand.org/man_pages/saslauthd8.html
[8] http://www.linuxcommand.org/man_pages/saslauthd8.html

To use with ActiveDirectory, start `saslauthd` with the following configuration options set in the `saslauthd.conf` file:

```
ldap_servers: <ldap uri>
ldap_use_sasl: yes
ldap_mech: DIGEST-MD5
ldap_auth_method: fastbind
```

For the `<ldap uri>`, specify the uri of the ldap server. For example, `ldap_servers: ldaps://ad.example.net`.

For more information on `saslauthd` configuration, see http://www.openldap.org/doc/admin24/guide.html#Configuringsaslauthd.

Step 4: Test the `saslauthd` configuration.

Use `testsaslauthd` utility to test the `saslauthd` configuration. For example:

```
testsaslauthd -u testuser -p testpassword -f /var/run/saslauthd/mux
```

Note: `/var/run/saslauthd` directory must have permissions set to `755` for MongoDB to successfully authenticate.

Configure MongoDB

Step 1: Add user to MongoDB for authentication.

Add the user to the `$external` database in MongoDB. To specify the user's privileges, assign *roles* (page 21) to the user.

For example, the following adds a user with read-only access to the `records` database.

```
db.getSiblingDB("$external").createUser(
    {
      user : <username>,
      roles: [ { role: "read", db: "records" } ]
    }
)
```

Add additional principals as needed. For more information about creating and managing users, see `https://docs.mongodb.org/manual/reference/command/nav-user-management`.

Step 2: Configure MongoDB server.

To configure the MongoDB server to use the `saslauthd` instance for proxy authentication, start the `mongod` with the following options:

- `--auth`,
- `authenticationMechanisms` parameter set to `PLAIN`, and
- `saslauthdPath` parameter set to the path to the Unix-domain Socket of the `saslauthd` instance.

Configure the MongoDB server using either the command line option `--setParameter` or the `configuration file`. Specify additional configurations as appropriate for your configuration.

If you use the `authorization` option to enforce authentication, you will need privileges to create a user.

Use specific `saslauthd` socket path. For socket path of `/<some>/<path>/saslauthd`, set the `saslauthdPath` to `/<some>/<path>/saslauthd/mux`, as in the following command line example:

```
mongod --auth --setParameter saslauthdPath=/<some>/<path>/saslauthd/mux --setParameter authentication
```

Or if using a `YAML format configuration file`, specify the following settings in the file:

```
security:
   authorization: enabled

setParameter:
   saslauthdPath: /<some>/<path>/saslauthd/mux
   authenticationMechanisms: PLAIN
```

Or, if using the older configuration file format[9]:

```
auth=true
setParameter=saslauthdPath=/<some>/<path>/saslauthd/mux
setParameter=authenticationMechanisms=PLAIN
```

Use default Unix-domain socket path. To use the default Unix-domain socket path, set the `saslauthdPath` to the empty string `""`, as in the following command line example:

```
mongod --auth --setParameter saslauthdPath="" --setParameter authenticationMechanisms=PLAIN
```

Or if using a `YAML format configuration file`, specify the following settings in the file:

```
security:
   authorization: enabled

setParameter:
   saslauthdPath: ""
   authenticationMechanisms: PLAIN
```

Or, if using the older configuration file format[10]:

```
auth=true
setParameter=saslauthdPath=""
setParameter=authenticationMechanisms=PLAIN
```

Step 3: Authenticate the user in the `mongo` shell.

To perform the authentication in the `mongo` shell, use the `db.auth()` method in the `$external` database.

Specify the value `"PLAIN"` in the `mechanism` field, the user and password in the `user` and `pwd` fields respectively, and the value `false` in the `digestPassword` field. You **must** specify `false` for `digestPassword` since the server must receive an undigested password to forward on to `saslauthd`, as in the following example:

```
db.getSiblingDB("$external").auth(
   {
     mechanism: "PLAIN",
     user: <username>,
     pwd:  <cleartext password>,
     digestPassword: false
   }
)
```

[9] https://docs.mongodb.org/v2.4/reference/configuration-options
[10] https://docs.mongodb.org/v2.4/reference/configuration-options

The server forwards the password in plain text. In general, use only on a trusted channel (VPN, TLS/SSL, trusted wired network). See Considerations.

7.2.8 Authenticate Using SASL and LDAP with OpenLDAP

MongoDB Enterprise provides support for proxy authentication of users. This allows administrators to configure a MongoDB cluster to authenticate users by proxying authentication requests to a specified Lightweight Directory Access Protocol (LDAP) service.

Considerations

MongoDB Enterprise for Windows does **not** include LDAP support for authentication. However, MongoDB Enterprise for Linux supports using LDAP authentication with an ActiveDirectory server.

MongoDB does **not** support LDAP authentication in mixed sharded cluster deployments that contain both version 2.4 and version 2.6 shards. See `https://docs.mongodb.org/manual/release-notes/2.6-upgrade` for upgrade instructions.

Use secure encrypted or trusted connections between clients and the server, as well as between `saslauthd` and the LDAP server. The LDAP server uses the `SASL PLAIN` mechanism, sending and receiving data in **plain text**. You should use only a trusted channel such as a VPN, a connection encrypted with TLS/SSL, or a trusted wired network.

Configure `saslauthd`

LDAP support for user authentication requires proper configuration of the `saslauthd` daemon process as well as the MongoDB server.

Step 1: Specify the mechanism.

On systems that configure `saslauthd` with the `/etc/sysconfig/saslauthd` file, such as Red Hat Enterprise Linux, Fedora, CentOS, and Amazon Linux AMI, set the mechanism `MECH` to `ldap`:

```
MECH=ldap
```

On systems that configure `saslauthd` with the `/etc/default/saslauthd` file, such as Ubuntu, set the `MECHANISMS` option to `ldap`:

```
MECHANISMS="ldap"
```

Step 2: Adjust caching behavior.

On certain Linux distributions, `saslauthd` starts with the caching of authentication credentials *enabled*. Until restarted or until the cache expires, `saslauthd` will not contact the LDAP server to re-authenticate users in its authentication cache. This allows `saslauthd` to successfully authenticate users in its cache, even in the LDAP server is down or if the cached users' credentials are revoked.

To set the expiration time (in seconds) for the authentication cache, see the -t option[11] of `saslauthd`.

[11] http://www.linuxcommand.org/man_pages/saslauthd8.html

Step 3: Configure LDAP Options with OpenLDAP.

If the `saslauthd.conf` file does not exist, create it. The `saslauthd.conf` file usually resides in the `/etc` folder. If specifying a different file path, see the -O option[12] of `saslauthd`.

To connect to an OpenLDAP server, update the `saslauthd.conf` file with the following configuration options:

```
ldap_servers: <ldap uri>
ldap_search_base: <search base>
ldap_filter: <filter>
```

The `ldap_servers` specifies the uri of the LDAP server used for authentication. In general, for OpenLDAP installed on the local machine, you can specify the value `ldap://localhost:389` or if using LDAP over TLS/SSL, you can specify the value `ldaps://localhost:636`.

The `ldap_search_base` specifies distinguished name to which the search is relative. The search includes the base or objects below.

The `ldap_filter` specifies the search filter.

The values for these configuration options should correspond to the values specific for your test. For example, to filter on email, specify `ldap_filter: (mail=%n)` instead.

OpenLDAP Example A sample `saslauthd.conf` file for OpenLDAP includes the following content:

```
ldap_servers: ldaps://ad.example.net
ldap_search_base: ou=Users,dc=example,dc=com
ldap_filter: (uid=%u)
```

To use this sample OpenLDAP configuration, create users with a `uid` attribute (login name) and place under the `Users` organizational unit (`ou`) under the domain components (`dc`) `example` and `com`.

For more information on `saslauthd` configuration, see http://www.openldap.org/doc/admin24/guide.html#Configuringsaslauthd.

Step 4: Test the `saslauthd` configuration.

Use `testsaslauthd` utility to test the `saslauthd` configuration. For example:

```
testsaslauthd -u testuser -p testpassword -f /var/run/saslauthd/mux
```

Note: `/var/run/saslauthd` directory must have permissions set to `755` for MongoDB to successfully authenticate.

Configure MongoDB

Step 1: Add user to MongoDB for authentication.

Add the user to the `$external` database in MongoDB. To specify the user's privileges, assign *roles* (page 21) to the user.

For example, the following adds a user with read-only access to the `records` database.

[12] http://www.linuxcommand.org/man_pages/saslauthd8.html

```
db.getSiblingDB("$external").createUser(
    {
      user : <username>,
      roles: [ { role: "read", db: "records" } ]
    }
)
```

Add additional principals as needed. For more information about creating and managing users, see https://docs.mongodb.org/manual/reference/command/nav-user-management.

Step 2: Configure MongoDB server.

To configure the MongoDB server to use the saslauthd instance for proxy authentication, start the mongod with the following options:

- *--auth*,
- authenticationMechanisms parameter set to PLAIN, and
- saslauthdPath parameter set to the path to the Unix-domain Socket of the saslauthd instance.

Configure the MongoDB server using either the command line option --setParameter or the configuration file. Specify additional configurations as appropriate for your configuration.

If you use the authorization option to enforce authentication, you will need privileges to create a user.

Use specific saslauthd socket path. For socket path of /<some>/<path>/saslauthd, set the saslauthdPath to /<some>/<path>/saslauthd/mux, as in the following command line example:

```
mongod --auth --setParameter saslauthdPath=/<some>/<path>/saslauthd/mux --setParameter authentication
```

Or if using a YAML format configuration file, specify the following settings in the file:

```
security:
   authorization: enabled

setParameter:
   saslauthdPath: /<some>/<path>/saslauthd/mux
   authenticationMechanisms: PLAIN
```

Or, if using the older configuration file format[13]:

```
auth=true
setParameter=saslauthdPath=/<some>/<path>/saslauthd/mux
setParameter=authenticationMechanisms=PLAIN
```

Use default Unix-domain socket path. To use the default Unix-domain socket path, set the saslauthdPath to the empty string "", as in the following command line example:

```
mongod --auth --setParameter saslauthdPath="" --setParameter authenticationMechanisms=PLAIN
```

Or if using a YAML format configuration file, specify the following settings in the file:

[13] https://docs.mongodb.org/v2.4/reference/configuration-options

```
security:
   authorization: enabled

setParameter:
   saslauthdPath: ""
   authenticationMechanisms: PLAIN
```

Or, if using the older configuration file format[14]:

```
auth=true
setParameter=saslauthdPath=""
setParameter=authenticationMechanisms=PLAIN
```

Step 3: Authenticate the user in the `mongo` shell.

To perform the authentication in the `mongo` shell, use the `db.auth()` method in the `$external` database.

Specify the value `"PLAIN"` in the `mechanism` field, the user and password in the `user` and `pwd` fields respectively, and the value `false` in the `digestPassword` field. You **must** specify `false` for `digestPassword` since the server must receive an undigested password to forward on to `saslauthd`, as in the following example:

```
db.getSiblingDB("$external").auth(
   {
     mechanism: "PLAIN",
     user: <username>,
     pwd:  <cleartext password>,
     digestPassword: false
   }
)
```

The server forwards the password in plain text. In general, use only on a trusted channel (VPN, TLS/SSL, trusted wired network). See Considerations.

7.3 Configure Users and Roles

The following tutorials provide instructions on creating and managing users and roles.

Manage User and Roles **(page 66)** Manage users by creating new users, creating new roles, and modifying existing users.

Change Your Password and Custom Data **(page 73)** Create role with sufficient privileges to allow users to change their own passwords and modify the optional *custom data* associated with their user credential.

7.3.1 Manage User and Roles

Overview

Changed in version 2.6: MongoDB 2.6 introduces a new *authorization model* (page 21).

MongoDB employs Role-Based Access Control (RBAC) to determine access for users. A user is granted one or more *roles* (page 21) that determine the user's access or privileges to MongoDB *resources* (page 116) and the *actions* (page 118) that user can perform. A user should have only the minimal set of privileges required to ensure a system of *least privilege*.

[14] https://docs.mongodb.org/v2.4/reference/configuration-options

Each application and user of a MongoDB system should map to a distinct application or user. This *access isolation* facilitates access revocation and ongoing user maintenance.

This tutorial provides examples for user and role management under the MongoDB's authorization model.

Prerequisites

Important: If you have *enabled access control* (page 38) for your deployment, you must authenticate as a user with the required privileges specified in each section. A user administrator with the `userAdminAnyDatabase` (page 110) role, or `userAdmin` (page 106) role in the specific databases, provides the required privileges to perform the operations listed in this tutorial. See *Enable Client Access Control* (page 38) for details on adding user administrator as the first user.

Add a User

To create a user, specify the user name, password, and *roles* (page 21). For users that authenticate using external mechanisms [15], you do not need to provide the password when creating users.

When assigning roles, select the roles that have the exact required *privileges* (page 21). If the correct roles does not exist, you can *create new roles* (page 68).

Prerequisites

- To create a new user in a database, you must have `createUser` (page 119) *action* (page 118) on that *database resource* (page 116).
- To grant roles to a user, you must have the `grantRole` (page 119) *action* (page 118) on the role's database.

Built-in roles `userAdmin` (page 106) and `userAdminAnyDatabase` (page 110) provide `createUser` (page 119) and `grantRole` (page 119) actions on their respective *resources* (page 116).

Procedure

Step 1: Connect to MongoDB with the appropriate privileges. Connect to `mongod` or `mongos` as a user with the privileges specified in the prerequisite section.

The following procedure uses the `myUserAdmin` created in *Enable Client Access Control* (page 38).

```
mongo --port 27017 -u myUserAdmin -p abc123 --authenticationDatabase admin
```

Step 2: Create the new user. Create the user in the database to which the user will belong. Pass a well formed user document to the `db.createUser()` method.

The following operation creates a user in the `reporting` database with the specified name, password, and roles.

```
use reporting
db.createUser(
    {
      user: "reportsUser",
      pwd: "12345678",
      roles: [
```

[15] See *x.509* (page 12), *Kerberos Authentication* (page 14), and *LDAP Proxy Authority Authentication* (page 14)

```
          { role: "read", db: "reporting" },
          { role: "read", db: "products" },
          { role: "read", db: "sales" },
          { role: "readWrite", db: "accounts" }
        ]
    }
)
```

To authenticate the `reportsUser`, you must authenticate the user in the `reporting` database; i.e. specify *`--authenticationDatabase reporting`*.

You can create a user without assigning roles, choosing instead to assign the roles later. To do so, create the user with an empty `roles` (page 115) array.

Create a User-Defined Role

Roles grant users access to MongoDB resources. MongoDB provides a number of *built-in roles* (page 104) that administrators can use to control access to a MongoDB system. However, if these roles cannot describe the desired set of privileges, you can create new roles in a particular database.

Except for roles created in the `admin` database, a role can only include privileges that apply to its database and can only inherit from other roles in its database.

A role created in the `admin` database can include privileges that apply to the `admin` database, other databases or to the *cluster* (page 117) resource, and can inherit from roles in other databases as well as the `admin` database.

To create a new role, use the `db.createRole()` method, specifying the privileges in the `privileges` array and the inherited roles in the `roles` array.

MongoDB uses the combination of the database name and the role name to uniquely define a role. Each role is scoped to the database in which you create the role, but MongoDB stores all role information in the `admin.system.roles` collection in the `admin` database.

Prerequisites

To create a role in a database, you must have:

- the `createRole` (page 119) *action* (page 118) on that *database resource* (page 116).
- the `grantRole` (page 119) *action* (page 118) on that database to specify privileges for the new role as well as to specify roles to inherit from.

Built-in roles `userAdmin` (page 106) and `userAdminAnyDatabase` (page 110) provide `createRole` (page 119) and `grantRole` (page 119) actions on their respective *resources* (page 116).

Create a Role to Manage Current Operations

The following example creates a role named `manageOpRole` which provides only the privileges to run both `db.currentOp()` and `db.killOp()`. [16]

[16] The built-in role `clusterMonitor` (page 108) also provides the privilege to run `db.currentOp()` along with other privileges, and the built-in role `hostManager` (page 108) provides the privilege to run `db.killOp()` along with other privileges.

Step 1: Connect to MongoDB with the appropriate privileges. Connect to `mongod` or `mongos` with the privileges specified in the *Prerequisites* (page 68) section.

The following procedure uses the `myUserAdmin` created in *Enable Client Access Control* (page 38).

```
mongo --port 27017 -u myUserAdmin -p abc123 --authenticationDatabase admin
```

The `myUserAdmin` has privileges to create roles in the `admin` as well as other databases.

Step 2: Create a new role to manage current operations. `manageOpRole` has privileges that act on multiple databases as well as the *cluster resource* (page 117). As such, you must create the role in the `admin` database.

```
use admin
db.createRole(
   {
     role: "manageOpRole",
     privileges: [
       { resource: { cluster: true }, actions: [ "killop", "inprog" ] },
       { resource: { db: "", collection: "" }, actions: [ "killCursors" ] }
     ],
     roles: []
   }
)
```

The new role grants permissions to kill any operations.

Warning: Terminate running operations with extreme caution. Only use `db.killOp()` to terminate operations initiated by clients and *do not* terminate internal database operations.

Create a Role to Run `mongostat`

The following example creates a role named `mongostatRole` that provides only the privileges to run `mongostat`.[17]

Step 1: Connect to MongoDB with the appropriate privileges. Connect to `mongod` or `mongos` with the privileges specified in the *Prerequisites* (page 68) section.

The following procedure uses the `myUserAdmin` created in *Enable Client Access Control* (page 38).

```
mongo --port 27017 -u myUserAdmin -p abc123 --authenticationDatabase admin
```

The `myUserAdmin` has privileges to create roles in the `admin` as well as other databases.

Step 2: Create a new role to manage current operations. `mongostatRole` has privileges that act on the *cluster resource* (page 117). As such, you must create the role in the `admin` database.

```
use admin
db.createRole(
   {
     role: "mongostatRole",
     privileges: [
       { resource: { cluster: true }, actions: [ "serverStatus" ] }
     ],
```

[17] The built-in role `clusterMonitor` (page 108) also provides the privilege to run `mongostat` along with other privileges.

```
      roles: []
    }
)
```

Modify Access for Existing User

Prerequisites

- You must have the `grantRole` (page 119) *action* (page 118) on a database to grant a role on that database.
- You must have the `revokeRole` (page 119) *action* (page 118) on a database to revoke a role on that database.
- To view a role's information, you must be either explicitly granted the role or must have the `viewRole` (page 119) *action* (page 118) on the role's database.

Procedure

Step 1: Connect to MongoDB with the appropriate privileges. Connect to `mongod` or `mongos` as a user with the privileges specified in the prerequisite section.

The following procedure uses the `myUserAdmin` created in *Enable Client Access Control* (page 38).

```
mongo --port 27017 -u myUserAdmin -p abc123 --authenticationDatabase admin
```

Step 2: Identify the user's roles and privileges. To display the roles and privileges of the user to be modified, use the `db.getUser()` and `db.getRole()` methods.

For example, to view roles for `reportsUser` created in *Add a User* (page 67), issue:

```
use reporting
db.getUser("reportsUser")
```

To display the privileges granted to the user by the `readWrite` role on the `"accounts"` database, issue:

```
use accounts
db.getRole( "readWrite", { showPrivileges: true } )
```

Step 3: Identify the privileges to grant or revoke. If the user requires additional privileges, grant to the user the role, or roles, with the required set of privileges. If such a role does not exist, *create a new role* (page 68) with the appropriate set of privileges.

To revoke a subset of privileges provided by an existing role: revoke the original role and grant a role that contains only the required privileges. You may need to *create a new role* (page 68) if a role does not exist.

Step 4: Modify the user's access.

Revoke a Role Revoke a role with the `db.revokeRolesFromUser()` method. The following example operation removes the `readWrite` (page 104) role on the `accounts` database from the `reportsUser`:

```
use reporting
db.revokeRolesFromUser(
    "reportsUser",
    [
```

```
      { role: "readWrite", db: "accounts" }
    ]
)
```

Grant a Role Grant a role using the `db.grantRolesToUser()` method. For example, the following operation grants the `reportsUser` user the `read` (page 104) role on the `accounts` database:

```
use reporting
db.grantRolesToUser(
    "reportsUser",
    [
      { role: "read", db: "accounts" }
    ]
)
```

For sharded clusters, the changes to the user are instant on the `mongos` on which the command runs. However, for other `mongos` instances in the cluster, the user cache may wait up to 10 minutes to refresh. See `userCacheInvalidationIntervalSecs`.

Modify Password for Existing User

Prerequisites

To modify the password of another user on a database, you must have the `changeAnyPassword` *action* (page 118) on that database.

Procedure

Step 1: Connect to MongoDB with the appropriate privileges. Connect to the `mongod` or `mongos` with the privileges specified in the *Prerequisites* (page 71) section.

The following procedure uses the `myUserAdmin` created in *Enable Client Access Control* (page 38).

```
mongo --port 27017 -u myUserAdmin -p abc123 --authenticationDatabase admin
```

Step 2: Change the password. Pass the user's username and the new password to the `db.changeUserPassword()` method.

The following operation changes the `reporting` user's password to `SOh3TbYhxuLiW8ypJPxmt1oOfL`:

```
db.changeUserPassword("reporting", "SOh3TbYhxuLiW8ypJPxmt1oOfL")
```

See also:

Change Your Password and Custom Data (page 73)

View a User's Role

Prerequisites

To view another user's information, you must have the `viewUser` (page 119) *action* (page 118) on the other user's database.

Users can view their own information.

Procedure

Step 1: Connect to MongoDB with the appropriate privileges. Connect to `mongod` or `mongos` as a user with the privileges specified in the prerequisite section.

The following procedure uses the `myUserAdmin` created in *Enable Client Access Control* (page 38).

```
mongo --port 27017 -u myUserAdmin -p abc123 --authenticationDatabase admin
```

Step 2: Identify the user's roles. Use the `usersInfo` command or `db.getUser()` method to display user information.

For example, to view roles for `reportsUser` created in *Add a User* (page 67), issue:

```
use reporting
db.getUser("reportsUser")
```

In the returned document, the `roles` (page 115) field displays all roles for `reportsUser`:

```
...
"roles" : [
   { "role" : "readWrite", "db" : "accounts" },
   { "role" : "read", "db" : "reporting" },
   { "role" : "read", "db" : "products" },
   { "role" : "read", "db" : "sales" }
]
```

View Role's Privileges

Prerequisites

To view a role's information, you must be either explicitly granted the role or must have the `viewRole` (page 119) *action* (page 118) on the role's database.

Procedure

Step 1: Connect to MongoDB with the appropriate privileges. Connect to `mongod` or `mongos` as a user with the privileges specified in the prerequisite section.

The following procedure uses the `myUserAdmin` created in *Enable Client Access Control* (page 38).

```
mongo --port 27017 -u myUserAdmin -p abc123 --authenticationDatabase admin
```

Step 2: Identify the privileges granted by a role. For a given role, use the `db.getRole()` method, or the `rolesInfo` command, with the `showPrivileges` option:

For example, to view the privileges granted by `read` role on the `products` database, use the following operation, issue:

```
use products
db.getRole( "read", { showPrivileges: true } )
```

In the returned document, the `privileges` and `inheritedPrivileges` arrays. The `privileges` lists the privileges directly specified by the role and excludes those privileges inherited from other roles. The `inheritedPrivileges` lists all privileges granted by this role, both directly specified and inherited. If the role does not inherit from other roles, the two fields are the same.

```
...
"privileges" : [
  {
    "resource": { "db" : "products", "collection" : "" },
    "actions": [ "collStats","dbHash","dbStats","find","killCursors","planCacheRead" ]
  },
  {
    "resource" : { "db" : "products", "collection" : "system.js" },
    "actions": [ "collStats","dbHash","dbStats","find","killCursors","planCacheRead" ]
  }
],
"inheritedPrivileges" : [
  {
    "resource": { "db" : "products", "collection" : "" },
    "actions": [ "collStats","dbHash","dbStats","find","killCursors","planCacheRead" ]
  },
  {
    "resource" : { "db" : "products", "collection" : "system.js" },
    "actions": [ "collStats","dbHash","dbStats","find","killCursors","planCacheRead" ]
  }
]
```

7.3.2 Change Your Password and Custom Data

Changed in version 2.6.

Overview

Users with appropriate privileges can change their own passwords and custom data. `Custom data` (page 115) stores optional user information.

Considerations

To generate a strong password for use in this procedure, you can use the `openssl` utility's `rand` command. For example, issue `openssl rand` with the following options to create a base64-encoded string of 48 pseudo-random bytes:

```
openssl rand -base64 48
```

Prerequisites

To modify your own password and custom data, you must have privileges that grant `changeOwnPassword` (page 118) and `changeOwnCustomData` (page 118) *actions* (page 118) respectively on the user's database.

Step 1: Connect as a user with privileges to manage users and roles.

Connect to the `mongod` or `mongos` with privileges to manage users and roles, such as a user with `userAdminAnyDatabase` (page 110) role. The following procedure uses the `myUserAdmin` created in *Enable*

Client Access Control (page 38).

```
mongo --port 27017 -u myUserAdmin -p abc123 --authenticationDatabase admin
```

Step 2: Create a role with appropriate privileges.

In the `admin` database, `create` a new role with `changeOwnPassword` (page 118) and `changeOwnCustomData` (page 118).

```
use admin
db.createRole(
   { role: "changeOwnPasswordCustomDataRole",
     privileges: [
        {
          resource: { db: "", collection: ""},
          actions: [ "changeOwnPassword", "changeOwnCustomData" ]
        }
     ],
     roles: []
   }
)
```

Step 3: Add a user with this role.

In the `test` database, `create` a new user with the created `"changeOwnPasswordCustomDataRole"` role. For example, the following operation creates a user with both the built-in role `readWrite` (page 104) and the user-created `"changeOwnPasswordCustomDataRole"`.

```
use test
db.createUser(
   {
     user:"user123",
     pwd:"12345678",
     roles:[ "readWrite", { role:"changeOwnPasswordCustomDataRole", db:"admin" } ]
   }
)
```

To grant an existing user the new role, use `db.grantRolesToUser()`.

Procedure

Step 1: Connect with the appropriate privileges.

Connect to the `mongod` or `mongos` as a user with appropriate privileges.

For example, the following operation connects to MongoDB as `user123` created in the *Prerequisites* (page 73) section.

```
mongo --port 27017 -u user123 -p 12345678 --authenticationDatabase test
```

To check that you have the privileges specified in the *Prerequisites* (page 73) section as well as to see user information, use the `usersInfo` command with the `showPrivileges` option.

Step 2: Change your password and custom data.

Use the `db.updateUser()` method to update the password and custom data.

For example, the following operation changes thw user's password to `KNlZmiaNUp0B` and custom data to `{ title: "Senior Manager" }`:

```
use test
db.updateUser(
   "user123",
   {
      pwd: "KNlZmiaNUp0B",
      customData: { title: "Senior Manager" }
   }
)
```

7.4 Network

The following tutorials provide information on handling network security for MongoDB.

Configure mongod and mongos for TLS/SSL **(page 75)** Configure MongoDB to support TLS/SSL.

TLS/SSL Configuration for Clients **(page 80)** Configure clients to connect to MongoDB instances that use TLS/SSL.

Upgrade a Cluster to Use TLS/SSL **(page 83)** Rolling upgrade process to use TLS/SSL.

Configure MongoDB for FIPS **(page 84)** Configure for Federal Information Processing Standard (FIPS).

Configure Linux iptables Firewall for MongoDB **(page 85)** Basic firewall configuration patterns and examples for `iptables` on Linux systems.

Configure Windows netsh Firewall for MongoDB **(page 89)** Basic firewall configuration patterns and examples for `netsh` on Windows systems.

7.4.1 Configure `mongod` and `mongos` for TLS/SSL

Overview

This document helps you to configure MongoDB to support TLS/SSL. MongoDB clients can use TLS/SSL to encrypt connections to `mongod` and `mongos` instances. MongoDB TLS/SSL implementation uses OpenSSL libraries.

Note: Although TLS is the successor to SSL, this page uses the more familiar term SSL to refer to TLS/SSL.

These instructions assume that you have already installed a build of MongoDB that includes SSL support and that your client driver supports SSL. For instructions on upgrading a cluster currently not using SSL to using SSL, see *Upgrade a Cluster to Use TLS/SSL* (page 83).

Changed in version 2.6: MongoDB's SSL encryption only allows use of strong SSL ciphers with a minimum of 128-bit key length for all connections.

Prerequisites

Important: A full description of TLS/SSL, PKI (Public Key Infrastructure) certificates, and Certificate Authority is beyond the scope of this document. This page assumes prior knowledge of TLS/SSL as well as access to valid certificates.

MongoDB Support

New in version 3.0: Most MongoDB distributions now include support for SSL.

Certain distributions of MongoDB[18] do **not** contain support for SSL. To use SSL, be sure to choose a package that supports SSL. All MongoDB Enterprise[19] supported platforms include SSL support.

Client Support

See *TLS/SSL Configuration for Clients* (page 80) to learn about SSL support for Python, Java, Ruby, and other clients.

Certificate Authorities

For production use, your MongoDB deployment should use valid certificates generated and signed by a single certificate authority. You or your organization can generate and maintain an independent certificate authority, or use certificates generated by a third-party SSL vendor. Obtaining and managing certificates is beyond the scope of this documentation.

`.pem` File

Before you can use SSL, you must have a `.pem` file containing a public key certificate and its associated private key.

MongoDB can use any valid SSL certificate issued by a certificate authority, or a self-signed certificate. If you use a self-signed certificate, although the communications channel will be encrypted, there will be *no* validation of server identity. Although such a situation will prevent eavesdropping on the connection, it leaves you vulnerable to a man-in-the-middle attack. Using a certificate signed by a trusted certificate authority will permit MongoDB drivers to verify the server's identity.

In general, avoid using self-signed certificates unless the network is trusted.

Additionally, with regards to *authentication among replica set/sharded cluster members* (page 18), in order to minimize exposure of the private key and allow hostname validation, it is advisable to use different certificates on different servers.

For *testing* purposes, you can generate a self-signed certificate and private key on a Unix system with a command that resembles the following:

```
cd /etc/ssl/
openssl req -newkey rsa:2048 -new -x509 -days 365 -nodes -out mongodb-cert.crt -keyout mongodb-cert.k
```

This operation generates a new, self-signed certificate with no passphrase that is valid for 365 days. Once you have the certificate, concatenate the certificate and private key to a `.pem` file, as in the following example:

```
cat mongodb-cert.key mongodb-cert.crt > mongodb.pem
```

See also:

Use x.509 Certificates to Authenticate Clients (page 45)

[18] http://www.mongodb.org/downloads?jmp=docs
[19] http://www.mongodb.com/products/mongodb-enterprise?jmp=docs

Procedures

Set Up mongod and mongos with SSL Certificate and Key

To use SSL in your MongoDB deployment, include the following run-time options with `mongod` and `mongos`:

- `net.ssl.mode` set to `requireSSL`. This setting restricts each server to use only SSL encrypted connections. You can also specify either the value `allowSSL` or `preferSSL` to set up the use of mixed SSL modes on a port. See `net.ssl.mode` for details.
- `PEMKeyfile` with the `.pem` file that contains the SSL certificate and key.

Consider the following syntax for `mongod`:

```
mongod --sslMode requireSSL --sslPEMKeyFile <pem>
```

For example, given an SSL certificate located at `/etc/ssl/mongodb.pem`, configure `mongod` to use SSL encryption for all connections with the following command:

```
mongod --sslMode requireSSL --sslPEMKeyFile /etc/ssl/mongodb.pem
```

Note:

- Specify `<pem>` with the full path name to the certificate.
- If the private key portion of the `<pem>` is encrypted, specify the passphrase. See *SSL Certificate Passphrase* (page 79).

You may also specify these options in the `configuration file`, as in the following examples:

If using the `YAML configuration file format`:

```
net:
   ssl:
      mode: requireSSL
      PEMKeyFile: /etc/ssl/mongodb.pem
```

Or, if using the older older configuration file format[20]:

```
sslMode = requireSSL
sslPEMKeyFile = /etc/ssl/mongodb.pem
```

To connect, to `mongod` and `mongos` instances using SSL, the `mongo` shell and MongoDB tools must include the `--ssl` option. See *TLS/SSL Configuration for Clients* (page 80) for more information on connecting to `mongod` and `mongos` running with SSL.

See also:

Upgrade a Cluster to Use TLS/SSL (page 83)

Set Up mongod and mongos with Certificate Validation

To set up `mongod` or `mongos` for SSL encryption using an SSL certificate signed by a certificate authority, include the following run-time options during startup:

- `net.ssl.mode` set to `requireSSL`. This setting restricts each server to use only SSL encrypted connections. You can also specify either the value `allowSSL` or `preferSSL` to set up the use of mixed SSL modes on a port. See `net.ssl.mode` for details.

[20] https://docs.mongodb.org/v2.4/reference/configuration-options

- `PEMKeyfile` with the name of the `.pem` file that contains the signed SSL certificate and key.
- `CAFile` with the name of the `.pem` file that contains the root certificate chain from the Certificate Authority.

Consider the following syntax for `mongod`:

```
mongod --sslMode requireSSL --sslPEMKeyFile <pem> --sslCAFile <ca>
```

For example, given a signed SSL certificate located at `/etc/ssl/mongodb.pem` and the certificate authority file at `/etc/ssl/ca.pem`, you can configure `mongod` for SSL encryption as follows:

```
mongod --sslMode requireSSL --sslPEMKeyFile /etc/ssl/mongodb.pem --sslCAFile /etc/ssl/ca.pem
```

Note:

- Specify the `<pem>` file and the `<ca>` file with either the full path name or the relative path name.
- If the `<pem>` is encrypted, specify the passphrase. See *SSL Certificate Passphrase* (page 79).

You may also specify these options in the `configuration file`, as in the following examples:

If using the `YAML configuration file format`:

```
net:
   ssl:
      mode: requireSSL
      PEMKeyFile: /etc/ssl/mongodb.pem
      CAFile: /etc/ssl/ca.pem
```

Or, if using the older older configuration file format[21]:

```
sslMode = requireSSL
sslPEMKeyFile = /etc/ssl/mongodb.pem
sslCAFile = /etc/ssl/ca.pem
```

To connect, to `mongod` and `mongos` instances using SSL, the `mongo` tools must include the both the *`--ssl`* and *`--sslPEMKeyFile`* option. See *TLS/SSL Configuration for Clients* (page 80) for more information on connecting to `mongod` and `mongos` running with SSL.

See also:

Upgrade a Cluster to Use TLS/SSL (page 83)

Block Revoked Certificates for Clients To prevent clients with revoked certificates from connecting, include the `sslCRLFile` to specify a `.pem` file that contains revoked certificates.

For example, the following `mongod` with SSL configuration includes the `sslCRLFile` setting:

```
mongod --sslMode requireSSL --sslCRLFile /etc/ssl/ca-crl.pem --sslPEMKeyFile /etc/ssl/mongodb.pem --s
```

Clients with revoked certificates in the `/etc/ssl/ca-crl.pem` will not be able to connect to this `mongod` instance.

Validate Only if a Client Presents a Certificate In most cases it is important to ensure that clients present valid certificates. However, if you have clients that cannot present a client certificate, or are transitioning to using a certificate authority you may only want to validate certificates from clients that present a certificate.

If you want to bypass validation for clients that don't present certificates, include the `allowConnectionsWithoutCertificates` run-time option with `mongod` and `mongos`. If the client

[21] https://docs.mongodb.org/v2.4/reference/configuration-options

does not present a certificate, no validation occurs. These connections, though not validated, are still encrypted using SSL.

For example, consider the following `mongod` with an SSL configuration that includes the `allowConnectionsWithoutCertificates` setting:

```
mongod --sslMode requireSSL --sslAllowConnectionsWithoutCertificates --sslPEMKeyFile /etc/ssl/mongodb
```

Then, clients can connect either with the option *`--ssl`* and **no** certificate or with the option *`--ssl`* and a **valid** certificate. See *TLS/SSL Configuration for Clients* (page 80) for more information on SSL connections for clients.

Note: If the client presents a certificate, the certificate must be a valid certificate.

All connections, including those that have not presented certificates are encrypted using SSL.

Disallow Protocols

New in version 3.0.7.

To prevent MongoDB servers from accepting incoming connections that use specific protocols, include the `--sslDisabledProtocols` option, or if using the `configuration file` the `net.ssl.disabledProtocols` setting.

For example, the following configuration uses `--sslDisabledProtocols` option to prevent `mongod` from accepting incoming connections that use either `TLS1_0` or `TLS1_1`:

```
mongod --sslMode requireSSL --sslDisabledProtocols TLS1_0,TLS1_1 --sslPEMKeyFile /etc/ssl/mongodb.pem
```

If using the `YAML configuration file format`:

```
net:
   ssl:
      mode: requireSSL
      PEMKeyFile: /etc/ssl/mongodb.pem
      CAFile: /etc/ssl/ca.pem
      disabledProtocols: TLS1_0,TLS1_1
```

For more information, including the protocols recognized by the option, see `net.ssl.disabledProtocols` or the `--sslDisabledProtocols` option for `mongod` and `mongos`.

SSL Certificate Passphrase

The PEM files for `PEMKeyfile` and `ClusterFile` may be encrypted. With encrypted PEM files, you must specify the passphrase at startup with a command-line or a configuration file option or enter the passphrase when prompted.

Changed in version 2.6: In previous versions, you can only specify the passphrase with a command-line or a configuration file option.

To specify the passphrase in clear text on the command line or in a configuration file, use the `PEMKeyPassword` and/or the `ClusterPassword` option.

To have MongoDB prompt for the passphrase at the start of `mongod` or `mongos` and avoid specifying the passphrase in clear text, omit the `PEMKeyPassword` and/or the `ClusterPassword` option. MongoDB will prompt for each passphrase as necessary.

Important: The passphrase prompt option is available if you run the MongoDB instance in the foreground with a connected terminal. If you run `mongod` or `mongos` in a non-interactive session (e.g. without a terminal or as a service on Windows), you cannot use the passphrase prompt option.

Run in FIPS Mode

Note: FIPS-compatible SSL is available only in MongoDB Enterprise[22]. See *Configure MongoDB for FIPS* (page 84) for more information.

See *Configure MongoDB for FIPS* (page 84) for more details.

7.4.2 TLS/SSL Configuration for Clients

Clients must have support for TLS/SSL to work with a `mongod` or a `mongos` instance that has TLS/SSL support enabled.

Important: A full description of TLS/SSL, PKI (Public Key Infrastructure) certificates, and Certificate Authority is beyond the scope of this document. This page assumes prior knowledge of TLS/SSL as well as access to valid certificates.

Note: Although TLS is the successor to SSL, this page uses the more familiar term SSL to refer to TLS/SSL.

See also:

Configure mongod and mongos for TLS/SSL (page 75).

`mongo` Shell SSL Configuration

For SSL connections, you must use the `mongo` shell built with SSL support or distributed with MongoDB Enterprise.

New in version 3.0: Most MongoDB distributions now include support for SSL.

The `mongo` shell provides various *mongo-shell-ssl* settings, including:

- `--ssl`
- `--sslPEMKeyFile` with the name of the `.pem` file that contains the SSL certificate and key.
- `--sslCAFile` with the name of the `.pem` file that contains the certificate from the Certificate Authority (CA).

  Changed in version 3.0: When running `mongo` with the `--ssl` option, you must include either `--sslCAFile` or `--sslAllowInvalidCertificates`.

  This restriction does not apply to the MongoDB tools. However, running the tools without `-sslCAFile` creates the same vulnerability to invalid certificates.

  Warning: For SSL connections (`--ssl`) to `mongod` and `mongos`, if the `mongo` shell (or *MongoDB tools* (page 82)) runs without the `--sslCAFile <CAFile>` option (i.e. specifies the `--sslAllowInvalidCertificates` instead), the `mongo` shell (or *MongoDB tools* (page 82)) will not attempt to validate the server certificates. This creates a vulnerability to expired `mongod` and `mongos` certificates as well as to foreign processes posing as valid `mongod` or `mongos` instances. Ensure that you *always* specify the CA file to validate the server certificates in cases where intrusion is a possibility.

- `--sslPEMKeyPassword` option if the client certificate-key file is encrypted.

[22] http://www.mongodb.com/products/mongodb-enterprise?jmp=docs

For a complete list of the `mongo` shell's SSL settings, see *mongo-shell-ssl*.

Connect to MongoDB Instance with SSL Encryption

To connect to a `mongod` or `mongos` instance that requires *only a SSL encryption mode* (page 77), start `mongo` shell with `--ssl` and include the `--sslCAFile` to validate the server certificates.

```
mongo --ssl --sslCAFile /etc/ssl/ca.pem
```

Changed in version 3.0: When running `mongo` with the `--ssl` option, you must include either `--sslCAFile` or `--sslAllowInvalidCertificates`.

This restriction does not apply to the MongoDB tools. However, running the tools without `-sslCAFile` creates the same vulnerability to invalid certificates.

Connect to MongoDB Instance that Requires Client Certificates

To connect to a `mongod` or `mongos` that requires *CA-signed client certificates* (page 77), start the `mongo` shell with `--ssl`, the `--sslPEMKeyFile` option to specify the signed certificate-key file, and the `--sslCAFile` to validate the server certificates.

```
mongo --ssl --sslPEMKeyFile /etc/ssl/client.pem --sslCAFile /etc/ssl/ca.pem
```

Changed in version 3.0: When running `mongo` with the `--ssl` option, you must include either `--sslCAFile` or `--sslAllowInvalidCertificates`.

This restriction does not apply to the MongoDB tools. However, running the tools without `-sslCAFile` creates the same vulnerability to invalid certificates.

Connect to MongoDB Instance that Validates when Presented with a Certificate

To connect to a `mongod` or `mongos` instance that *only requires valid certificates when the client presents a certificate* (page 78), start `mongo` shell either:

- with the `--ssl`, `--sslCAFile`, and **no** certificate or
- with the `--ssl`, `--sslCAFile`, and a **valid** signed certificate.

Changed in version 3.0: When running `mongo` with the `--ssl` option, you must include either `--sslCAFile` or `--sslAllowInvalidCertificates`.

This restriction does not apply to the MongoDB tools. However, running the tools without `-sslCAFile` creates the same vulnerability to invalid certificates.

For example, if `mongod` is running with weak certificate validation, both of the following `mongo` shell clients can connect to that `mongod`:

```
mongo --ssl --sslCAFile /etc/ssl/ca.pem
mongo --ssl --sslPEMKeyFile /etc/ssl/client.pem --sslCAFile /etc/ssl/ca.pem
```

Important: If the client presents a certificate, the certificate must be valid.

MongoDB Cloud Manager and Ops Manager Monitoring Agent

The MongoDB Cloud Manager Monitoring agent will also have to connect via SSL in order to gather its statistics. Because the agent already utilizes SSL for its communications to the MongoDB Cloud Manager servers, this is just a matter of enabling SSL support in MongoDB Cloud Manager itself on a per host basis. å See the MongoDB Cloud Manager documentation[23] for more information about SSL configuration.

For Ops Manager, see Ops Manager documentation[24].

MongoDB Drivers

The MongoDB Drivers support for connection to SSL enabled MongoDB. See:

- C Driver[25]
- C++ Driver[26]
- C# Driver[27]
- Java Driver[28]
- Node.js Driver[29]
- Perl Driver[30]
- PHP Driver[31]
- Python Driver[32]
- Ruby Driver[33]
- Scala Driver[34]

MongoDB Tools

Changed in version 2.6.

Various MongoDB utility programs supports SSL. These tools include:

- `mongodump`
- `mongoexport`
- `mongofiles`
- `mongoimport`
- `mongooplog`
- `mongorestore`
- `mongostat`

[23] https://docs.cloud.mongodb.com/
[24] https://docs.opsmanager.mongodb.com/current/
[25] http://api.mongodb.org/c/current/advanced-connections.html
[26] https://github.com/mongodb/mongo-cxx-driver/wiki/Configuring%20the%20Legacy%20Driver
[27] http://mongodb.github.io/mongo-csharp-driver/2.0/reference/driver/ssl/
[28] http://mongodb.github.io/mongo-java-driver/3.0/driver/reference/connecting/ssl/
[29] http://mongodb.github.io/node-mongodb-native/2.0/tutorials/enterprise_features/
[30] https://metacpan.org/pod/MongoDB::MongoClient#ssl
[31] http://php.net/manual/en/mongo.connecting.ssl.php
[32] http://api.mongodb.org/python/current/examples/tls.html
[33] http://docs.mongodb.org/ecosystem/tutorial/ruby-driver-tutorial/#mongodb-x509-mechanism
[34] http://mongodb.github.io/casbah/guide/connecting.html#ssl-connections

- `mongotop`

To use SSL connections with these tools, use the same SSL options as the `mongo` shell. See *mongo Shell SSL Configuration* (page 80).

7.4.3 Upgrade a Cluster to Use TLS/SSL

Changed in version 3.0: Most MongoDB distributions now include support for TLS/SSL. See *Configure mongod and mongos for TLS/SSL* (page 75) and *TLS/SSL Configuration for Clients* (page 80) for more information about TLS/SSL and MongoDB.

Important: A full description of TLS/SSL, PKI (Public Key Infrastructure) certificates, and Certificate Authority is beyond the scope of this document. This page assumes prior knowledge of TLS/SSL as well as access to valid certificates.

Changed in version 2.6.

The MongoDB server supports listening for both TLS/SSL encrypted and unencrypted connections on the same TCP port. This allows upgrades of MongoDB clusters to use TLS/SSL encrypted connections.

To upgrade from a MongoDB cluster using no TLS/SSL encryption to one using *only* TLS/SSL encryption, use the following rolling upgrade process:

1. For each node of a cluster, start the node with the option `--sslMode` set to `allowSSL`. The `--sslMode allowSSL` setting allows the node to accept both TLS/SSL and non-TLS/non-SSL incoming connections. Its connections to other servers do not use TLS/SSL. Include other *TLS/SSL options* (page 75) as well as any other options that are required for your specific configuration. For example:

   ```
   mongod --replSet <name> --sslMode allowSSL --sslPEMKeyFile <path to TLS/SSL Certificate and key
   ```

   Upgrade all nodes of the cluster to these settings.

   You may also specify these options in the `configuration file`. If using a `YAML format configuration file`, specify the following settings in the file:

   ```
   net:
      ssl:
         mode: <disabled|allowSSL|preferSSL|requireSSL>
         PEMKeyFile: <path to TLS/SSL certificate and key PEM file>
         CAFile: <path to root CA PEM file>
   ```

   Or, if using the older configuration file format[35]:

   ```
   sslMode = <disabled|allowSSL|preferSSL|requireSSL>
   sslPEMKeyFile = <path to TLS/SSL certificate and key PEM file>
   sslCAFile = <path to root CA PEM file>
   ```

2. Switch all clients to use TLS/SSL. See *TLS/SSL Configuration for Clients* (page 80).

3. For each node of a cluster, use the `setParameter` command to update the `sslMode` to `preferSSL`. [36] With `preferSSL` as its `net.ssl.mode`, the node accepts both TLS/SSL and non-TLS/non-SSL incoming connections, and its connections to other servers use TLS/SSL. For example:

   ```
   db.getSiblingDB('admin').runCommand( { setParameter: 1, sslMode: "preferSSL" } )
   ```

[35] https://docs.mongodb.org/v2.4/reference/configuration-options

[36] As an alternative to using the `setParameter` command, you can also restart the nodes with the appropriate TLS/SSL options and values.

Upgrade all nodes of the cluster to these settings.

At this point, all connections should be using TLS/SSL.

4. For each node of the cluster, use the `setParameter` command to update the `sslMode` to `requireSSL`. [1] With `requireSSL` as its `net.ssl.mode`, the node will reject any non-TLS/non-SSL connections. For example:

```
db.getSiblingDB('admin').runCommand( { setParameter: 1, sslMode: "requireSSL" } )
```

5. After the upgrade of all nodes, edit the `configuration file` with the appropriate TLS/SSL settings to ensure that upon subsequent restarts, the cluster uses TLS/SSL.

7.4.4 Configure MongoDB for FIPS

New in version 2.6.

Overview

The Federal Information Processing Standard (FIPS) is a U.S. government computer security standard used to certify software modules and libraries that encrypt and decrypt data securely. You can configure MongoDB to run with a FIPS 140-2 certified library for OpenSSL. Configure FIPS to run by default or as needed from the command line.

Prerequisites

Important: A full description of FIPS and TLS/SSL is beyond the scope of this document. This tutorial assumes prior knowledge of FIPS and TLS/SSL.

Only the MongoDB Enterprise[37] version supports FIPS mode. See `https://docs.mongodb.org/manual/administration/` to download and install MongoDB Enterprise[38] to use FIPS mode.

Your system must have an OpenSSL library configured with the FIPS 140-2 module. At the command line, type `openssl version` to confirm your OpenSSL software includes FIPS support.

For Red Hat Enterprise Linux 6.x (RHEL 6.x) or its derivatives such as CentOS 6.x, the OpenSSL toolkit must be at least `openssl-1.0.1e-16.el6_5` to use FIPS mode. To upgrade the toolkit for these platforms, issue the following command:

```
sudo yum update openssl
```

Some versions of Linux periodically execute a process to *prelink* dynamic libraries with pre-assigned addresses. This process modifies the OpenSSL libraries, specifically `libcrypto`. The OpenSSL FIPS mode will subsequently fail the signature check performed upon startup to ensure `libcrypto` has not been modified since compilation.

To configure the Linux prelink process to not prelink `libcrypto`:

```
sudo bash -c "echo '-b /usr/lib64/libcrypto.so.*' >>/etc/prelink.conf.d/openssl-prelink.conf"
```

[37] http://www.mongodb.com/products/mongodb-enterprise?jmp=docs
[38] http://www.mongodb.com/products/mongodb-enterprise?jmp=docs

Considerations

FIPS is property of the encryption system and not the access control system. However, if your environment requires FIPS compliant encryption *and* access control, you must ensure that the access control system uses only FIPS-compliant encryption.

MongoDB's FIPS support covers the way that MongoDB uses OpenSSL for network encryption and X509 authentication. If you use Kerberos or LDAP Proxy authentication, you muse ensure that these external mechanisms are FIPS-compliant. `MONGODB-CR` authentication is *not* FIPS compliant.

Procedure

Configure MongoDB to use TLS/SSL

See *Configure mongod and mongos for TLS/SSL* (page 75) for details about configuring OpenSSL.

Run `mongod` or `mongos` instance in FIPS mode

Perform these steps after you *Configure mongod and mongos for TLS/SSL* (page 75).

Step 1: Change configuration file. To configure your `mongod` or `mongos` instance to use FIPS mode, shut down the instance and update the configuration file with the following setting:

```
net:
   ssl:
      FIPSMode: true
```

Step 2: Start `mongod` or `mongos` instance with configuration file. For example, run this command to start the `mongod` instance with its configuration file:

```
mongod --config /etc/mongod.conf
```

Confirm FIPS mode is running

Check the server log file for a message FIPS is active:

```
FIPS 140-2 mode activated
```

7.4.5 Configure Linux `iptables` Firewall for MongoDB

On contemporary Linux systems, the `iptables` program provides methods for managing the Linux Kernel's `netfilter` or network packet filtering capabilities. These firewall rules make it possible for administrators to control what hosts can connect to the system, and limit risk exposure by limiting the hosts that can connect to a system.

This document outlines basic firewall configurations for `iptables` firewalls on Linux. Use these approaches as a starting point for your larger networking organization. For a detailed overview of security practices and risk management for MongoDB, see *Security* (page 1).

See also:

For MongoDB deployments on Amazon's web services, see the Amazon EC2[39] page, which addresses Amazon's Security Groups and other EC2-specific security features.

Overview

Rules in `iptables` configurations fall into chains, which describe the process for filtering and processing specific streams of traffic. Chains have an order, and packets must pass through earlier rules in a chain to reach later rules. This document addresses only the following two chains:

`INPUT` Controls all incoming traffic.

`OUTPUT` Controls all outgoing traffic.

Given the `default ports` of all MongoDB processes, you must configure networking rules that permit *only* required communication between your application and the appropriate `mongod` and `mongos` instances.

Be aware that, by default, the default policy of `iptables` is to allow all connections and traffic unless explicitly disabled. The configuration changes outlined in this document will create rules that explicitly allow traffic from specific addresses and on specific ports, using a default policy that drops all traffic that is not explicitly allowed. When you have properly configured your `iptables` rules to allow only the traffic that you want to permit, you can *Change Default Policy to DROP* (page 88).

Patterns

This section contains a number of patterns and examples for configuring `iptables` for use with MongoDB deployments. If you have configured different ports using the `port` configuration setting, you will need to modify the rules accordingly.

Traffic to and from `mongod` Instances

This pattern is applicable to all `mongod` instances running as standalone instances or as part of a *replica set*.

The goal of this pattern is to explicitly allow traffic to the `mongod` instance from the application server. In the following examples, replace `<ip-address>` with the IP address of the application server:

```
iptables -A INPUT -s <ip-address> -p tcp --destination-port 27017 -m state --state NEW,ESTABLISHED -
iptables -A OUTPUT -d <ip-address> -p tcp --source-port 27017 -m state --state ESTABLISHED -j ACCEPT
```

The first rule allows all incoming traffic from `<ip-address>` on port `27017`, which allows the application server to connect to the `mongod` instance. The second rule, allows outgoing traffic from the `mongod` to reach the application server.

Optional

If you have only one application server, you can replace `<ip-address>` with either the IP address itself, such as: `198.51.100.55`. You can also express this using CIDR notation as `198.51.100.55/32`. If you want to permit a larger block of possible IP addresses you can allow traffic from a `/24` using one of the following specifications for the `<ip-address>`, as follows:

```
10.10.10.10/24
10.10.10.10/255.255.255.0
```

---

[39] https://docs.mongodb.org/ecosystem/platforms/amazon-ec2

Traffic to and from mongos Instances

mongos instances provide query routing for *sharded clusters*. Clients connect to mongos instances, which behave from the client's perspective as mongod instances. In turn, the mongos connects to all mongod instances that are components of the sharded cluster.

Use the same iptables command to allow traffic to and from these instances as you would from the mongod instances that are members of the replica set. Take the configuration outlined in the *Traffic to and from mongod Instances* (page 86) section as an example.

Traffic to and from a MongoDB Config Server

Config servers, host the *config database* that stores metadata for sharded clusters. Each production cluster has three config servers, initiated using the *mongod --configsvr* option. [40] Config servers listen for connections on port 27019. As a result, add the following iptables rules to the config server to allow incoming and outgoing connection on port 27019, for connection to the other config servers.

```
iptables -A INPUT -s <ip-address> -p tcp --destination-port 27019 -m state --state NEW,ESTABLISHED -
iptables -A OUTPUT -d <ip-address> -p tcp --source-port 27019 -m state --state ESTABLISHED -j ACCEPT
```

Replace <ip-address> with the address or address space of *all* the mongod that provide config servers.

Additionally, config servers need to allow incoming connections from all of the mongos instances in the cluster *and* all mongod instances in the cluster. Add rules that resemble the following:

```
iptables -A INPUT -s <ip-address> -p tcp --destination-port 27019 -m state --state NEW,ESTABLISHED -
```

Replace <ip-address> with the address of the mongos instances and the shard mongod instances.

Traffic to and from a MongoDB Shard Server

For shard servers, running as *mongod --shardsvr* [41] Because the default port number is 27018 when running with the shardsvr value for the clusterRole setting, you must configure the following iptables rules to allow traffic to and from each shard:

```
iptables -A INPUT -s <ip-address> -p tcp --destination-port 27018 -m state --state NEW,ESTABLISHED -
iptables -A OUTPUT -d <ip-address> -p tcp --source-port 27018 -m state --state ESTABLISHED -j ACCEPT
```

Replace the <ip-address> specification with the IP address of all mongod. This allows you to permit incoming and outgoing traffic between all shards including constituent replica set members, to:

- all mongod instances in the shard's replica sets.
- all mongod instances in other shards. [42]

Furthermore, shards need to be able make outgoing connections to:

- all mongod instances in the config servers.

Create a rule that resembles the following, and replace the <ip-address> with the address of the config servers and the mongos instances:

[40] You also can run a config server by using the configsvr value for the clusterRole setting in a configuration file.
[41] You can also specify the shard server option with the shardsvr value for the clusterRole setting in the configuration file. Shard members are also often conventional replica sets using the default port.
[42] All shards in a cluster need to be able to communicate with all other shards to facilitate *chunk* and balancing operations.

```
iptables -A OUTPUT -d <ip-address> -p tcp --source-port 27018 -m state --state ESTABLISHED -j ACCEPT
```

Provide Access For Monitoring Systems

1. The `mongostat` diagnostic tool, when running with the *`--discover`* needs to be able to reach all components of a cluster, including the config servers, the shard servers, and the `mongos` instances.
2. If your monitoring system needs access the HTTP interface, insert the following rule to the chain:

   ```
   iptables -A INPUT -s <ip-address> -p tcp --destination-port 28017 -m state --state NEW,ESTABLISH
   ```

   Replace `<ip-address>` with the address of the instance that needs access to the HTTP or REST interface. For *all* deployments, you should restrict access to this port to *only* the monitoring instance.

   Optional

   For config server `mongod` instances running with the `shardsvr` value for the `clusterRole` setting, the rule would resemble the following:

   ```
   iptables -A INPUT -s <ip-address> -p tcp --destination-port 28018 -m state --state NEW,ESTABLISH
   ```

   For config server `mongod` instances running with the `configsvr` value for the `clusterRole` setting, the rule would resemble the following:

   ```
   iptables -A INPUT -s <ip-address> -p tcp --destination-port 28019 -m state --state NEW,ESTABLISH
   ```

Change Default Policy to `DROP`

The default policy for `iptables` chains is to allow all traffic. After completing all `iptables` configuration changes, you *must* change the default policy to `DROP` so that all traffic that isn't explicitly allowed as above will not be able to reach components of the MongoDB deployment. Issue the following commands to change this policy:

```
iptables -P INPUT DROP

iptables -P OUTPUT DROP
```

Manage and Maintain `iptables` Configuration

This section contains a number of basic operations for managing and using `iptables`. There are various front end tools that automate some aspects of `iptables` configuration, but at the core all `iptables` front ends provide the same basic functionality:

Make all `iptables` Rules Persistent

By default all `iptables` rules are only stored in memory. When your system restarts, your firewall rules will revert to their defaults. When you have tested a rule set and have guaranteed that it effectively controls traffic you can use the following operations to you should make the rule set persistent.

On Red Hat Enterprise Linux, Fedora Linux, and related distributions you can issue the following command:

```
service iptables save
```

On Debian, Ubuntu, and related distributions, you can use the following command to dump the `iptables` rules to the `/etc/iptables.conf` file:

```
iptables-save > /etc/iptables.conf
```

Run the following operation to restore the network rules:

```
iptables-restore < /etc/iptables.conf
```

Place this command in your `rc.local` file, or in the `/etc/network/if-up.d/iptables` file with other similar operations.

List all `iptables` Rules

To list all of currently applied `iptables` rules, use the following operation at the system shell.

```
iptables -L
```

Flush all `iptables` Rules

If you make a configuration mistake when entering `iptables` rules or simply need to revert to the default rule set, you can use the following operation at the system shell to flush all rules:

```
iptables -F
```

If you've already made your `iptables` rules persistent, you will need to repeat the appropriate procedure in the *Make all iptables Rules Persistent* (page 88) section.

7.4.6 Configure Windows `netsh` Firewall for MongoDB

On Windows Server systems, the `netsh` program provides methods for managing the *Windows Firewall*. These firewall rules make it possible for administrators to control what hosts can connect to the system, and limit risk exposure by limiting the hosts that can connect to a system.

This document outlines basic *Windows Firewall* configurations. Use these approaches as a starting point for your larger networking organization. For a detailed over view of security practices and risk management for MongoDB, see *Security* (page 1).

See also:

Windows Firewall[43] documentation from Microsoft.

Overview

Windows Firewall processes rules in an ordered determined by rule type, and parsed in the following order:

1. `Windows Service Hardening`
2. `Connection security rules`
3. `Authenticated Bypass Rules`
4. `Block Rules`
5. `Allow Rules`

[43] http://technet.microsoft.com/en-us/network/bb545423.aspx

6. Default Rules

By default, the policy in *Windows Firewall* allows all outbound connections and blocks all incoming connections.

Given the default ports of all MongoDB processes, you must configure networking rules that permit *only* required communication between your application and the appropriate mongod.exe and mongos.exe instances.

The configuration changes outlined in this document will create rules which explicitly allow traffic from specific addresses and on specific ports, using a default policy that drops all traffic that is not explicitly allowed.

You can configure the *Windows Firewall* with using the netsh command line tool or through a windows application. On Windows Server 2008 this application is *Windows Firewall With Advanced Security* in *Administrative Tools*. On previous versions of Windows Server, access the *Windows Firewall* application in the *System and Security* control panel.

The procedures in this document use the netsh command line tool.

Patterns

This section contains a number of patterns and examples for configuring *Windows Firewall* for use with MongoDB deployments. If you have configured different ports using the port configuration setting, you will need to modify the rules accordingly.

Traffic to and from mongod.exe Instances

This pattern is applicable to all mongod.exe instances running as standalone instances or as part of a *replica set*. The goal of this pattern is to explicitly allow traffic to the mongod.exe instance from the application server.

```
netsh advfirewall firewall add rule name="Open mongod port 27017" dir=in action=allow protocol=TCP lo
```

This rule allows all incoming traffic to port 27017, which allows the application server to connect to the mongod.exe instance.

Windows Firewall also allows enabling network access for an entire application rather than to a specific port, as in the following example:

```
netsh advfirewall firewall add rule name="Allowing mongod" dir=in action=allow program=" C:\mongodb\b
```

You can allow all access for a mongos.exe server, with the following invocation:

```
netsh advfirewall firewall add rule name="Allowing mongos" dir=in action=allow program=" C:\mongodb\b
```

Traffic to and from mongos.exe Instances

mongos.exe instances provide query routing for *sharded clusters*. Clients connect to mongos.exe instances, which behave from the client's perspective as mongod.exe instances. In turn, the mongos.exe connects to all mongod.exe instances that are components of the sharded cluster.

Use the same *Windows Firewall* command to allow traffic to and from these instances as you would from the mongod.exe instances that are members of the replica set.

```
netsh advfirewall firewall add rule name="Open mongod shard port 27018" dir=in action=allow protocol=
```

Traffic to and from a MongoDB Config Server

Configuration servers, host the *config database* that stores metadata for sharded clusters. Each production cluster has three configuration servers, initiated using the *mongod --configsvr* option. [44] Configuration servers listen for connections on port 27019. As a result, add the following *Windows Firewall* rules to the config server to allow incoming and outgoing connection on port 27019, for connection to the other config servers.

```
netsh advfirewall firewall add rule name="Open mongod config svr port 27019" dir=in action=allow prot
```

Additionally, config servers need to allow incoming connections from all of the mongos.exe instances in the cluster *and* all mongod.exe instances in the cluster. Add rules that resemble the following:

```
netsh advfirewall firewall add rule name="Open mongod config svr inbound" dir=in action=allow protoco
```

Replace <ip-address> with the addresses of the mongos.exe instances and the shard mongod.exe instances.

Traffic to and from a MongoDB Shard Server

For shard servers, running as *mongod --shardsvr* [45] Because the default port number is 27018 when running with the shardsvr value for the clusterRole setting, you must configure the following *Windows Firewall* rules to allow traffic to and from each shard:

```
netsh advfirewall firewall add rule name="Open mongod shardsvr inbound" dir=in action=allow protocol=
netsh advfirewall firewall add rule name="Open mongod shardsvr outbound" dir=out action=allow protoco
```

Replace the <ip-address> specification with the IP address of all mongod.exe instances. This allows you to permit incoming and outgoing traffic between all shards including constituent replica set members to:

- all mongod.exe instances in the shard's replica sets.
- all mongod.exe instances in other shards. [46]

Furthermore, shards need to be able make outgoing connections to:

- all mongos.exe instances.
- all mongod.exe instances in the config servers.

Create a rule that resembles the following, and replace the <ip-address> with the address of the config servers and the mongos.exe instances:

```
netsh advfirewall firewall add rule name="Open mongod config svr outbound" dir=out action=allow proto
```

Provide Access For Monitoring Systems

1. The mongostat diagnostic tool, when running with the *--discover* needs to be able to reach all components of a cluster, including the config servers, the shard servers, and the mongos.exe instances.
2. If your monitoring system needs access the HTTP interface, insert the following rule to the chain:

   ```
   netsh advfirewall firewall add rule name="Open mongod HTTP monitoring inbound" dir=in action=all
   ```

[44] You also can run a config server by using the configsrv value for the clusterRole setting in a configuration file.
[45] You can also specify the shard server option with the shardsvr value for the clusterRole setting in the configuration file. Shard members are also often conventional replica sets using the default port.
[46] All shards in a cluster need to be able to communicate with all other shards to facilitate *chunk* and balancing operations.

Replace `<ip-address>` with the address of the instance that needs access to the HTTP or REST interface. For *all* deployments, you should restrict access to this port to *only* the monitoring instance.

Optional

For config server `mongod` instances running with the `shardsvr` value for the `clusterRole` setting, the rule would resemble the following:

```
netsh advfirewall firewall add rule name="Open mongos HTTP monitoring inbound" dir=in action=all
```

For config server `mongod` instances running with the `configsvr` value for the `clusterRole` setting, the rule would resemble the following:

```
netsh advfirewall firewall add rule name="Open mongod configsvr HTTP monitoring inbound" dir=in
```

Manage and Maintain *Windows Firewall* Configurations

This section contains a number of basic operations for managing and using `netsh`. While you can use the GUI front ends to manage the *Windows Firewall*, all core functionality is accessible is accessible from `netsh`.

Delete all *Windows Firewall* Rules

To delete the firewall rule allowing `mongod.exe` traffic:

```
netsh advfirewall firewall delete rule name="Open mongod port 27017" protocol=tcp localport=27017
```

```
netsh advfirewall firewall delete rule name="Open mongod shard port 27018" protocol=tcp localport=270
```

List All *Windows Firewall* Rules

To return a list of all *Windows Firewall* rules:

```
netsh advfirewall firewall show rule name=all
```

Reset *Windows Firewall*

To reset the *Windows Firewall* rules:

```
netsh advfirewall reset
```

Backup and Restore *Windows Firewall* Rules

To simplify administration of larger collection of systems, you can export or import firewall systems from different servers) rules very easily on Windows:

Export all firewall rules with the following command:

```
netsh advfirewall export "C:\temp\MongoDBfw.wfw"
```

Replace `"C:\temp\MongoDBfw.wfw"` with a path of your choosing. You can use a command in the following form to import a file created using this operation:

```
netsh advfirewall import "C:\temp\MongoDBfw.wfw"
```

7.5 Auditing

The following tutorials provide instructions on how to enable auditing for system events and specify which events to audit.

Configure Auditing **(page 93)** Enable and configure MongoDB Enterprise system event auditing feature.

Configure Audit Filters **(page 95)** Specify which events to audit.

7.5.1 Configure Auditing

New in version 2.6.

MongoDB Enterprise[47] supports *auditing* (page 31) of various operations. A complete auditing solution must involve **all** `mongod` server and `mongos` router processes.

The audit facility can write audit events to the console, the *syslog* (option is unavailable on Windows), a JSON file, or a BSON file. For details on the audited operations and the audit log messages, see *System Event Audit Messages* (page 123).

Enable and Configure Audit Output

Use the `--auditDestination` option to enable auditing and specify where to output the audit events.

> **Warning:** For sharded clusters, if you enable auditing on `mongos` instances, you must enable auditing on all `mongod` instances in the cluster, i.e. shards and config servers.

Output to Syslog

To enable auditing and print audit events to the syslog (option is unavailable on Windows) in JSON format, specify `syslog` for the `--auditDestination` setting. For example:

```
mongod --dbpath data/db --auditDestination syslog
```

> **Warning:** The syslog message limit can result in the truncation of the audit messages. The auditing system will neither detect the truncation nor error upon its occurrence.

You may also specify these options in the `configuration file`:

```
storage:
   dbPath: data/db
auditLog:
   destination: syslog
```

[47] https://www.mongodb.com/products/mongodb-enterprise-advanced?jmp=docs

Output to Console

To enable auditing and print the audit events to standard output (i.e. `stdout`), specify `console` for the *`--auditDestination`* setting. For example:

```
mongod --dbpath data/db --auditDestination console
```

You may also specify these options in the `configuration file`:

```
storage:
   dbPath: data/db
auditLog:
   destination: console
```

Output to JSON File

To enable auditing and print audit events to a file in JSON format, specify `file` for the *`--auditDestination`* setting, `JSON` for the *`--auditFormat`* setting, and the output filename for the *`--auditPath`*. The *`--auditPath`* option accepts either full path name or relative path name. For example, the following enables auditing and records audit events to a file with the relative path name of `data/db/auditLog.json`:

```
mongod --dbpath data/db --auditDestination file --auditFormat JSON --auditPath data/db/auditLog.json
```

The audit file rotates at the same time as the server log file.

You may also specify these options in the `configuration file`:

```
storage:
   dbPath: data/db
auditLog:
   destination: file
   format: JSON
   path: data/db/auditLog.json
```

Note: Printing audit events to a file in JSON format degrades server performance more than printing to a file in BSON format.

Output to BSON File

To enable auditing and print audit events to a file in BSON binary format, specify `file` for the *`--auditDestination`* setting, `BSON` for the *`--auditFormat`* setting, and the output filename for the *`--auditPath`*. The *`--auditPath`* option accepts either full path name or relative path name. For example, the following enables auditing and records audit events to a BSON file with the relative path name of `data/db/auditLog.bson`:

```
mongod --dbpath data/db --auditDestination file --auditFormat BSON --auditPath data/db/auditLog.bson
```

The audit file rotates at the same time as the server log file.

You may also specify these options in the `configuration file`:

```
storage:
   dbPath: data/db
auditLog:
   destination: file
```

```
   format: BSON
   path: data/db/auditLog.bson
```

To view the contents of the file, pass the file to the MongoDB utility `bsondump`. For example, the following converts the audit log into a human-readable form and output to the terminal:

```
bsondump data/db/auditLog.bson
```

See also:

Configure Audit Filters (page 95), *Auditing* (page 31), *System Event Audit Messages* (page 123)

7.5.2 Configure Audit Filters

MongoDB Enterprise[48] supports *auditing* (page 31) of various operations. When *enabled* (page 93), the audit facility, by default, records all auditable operations as detailed in *Audit Event Actions, Details, and Results* (page 124). To specify which events to record, the audit feature includes the `--auditFilter` option.

`--auditFilter` Option

The `--auditFilter` option takes a string representation of a query document of the form:

```
{ <field1>: <expression1>, ... }
```

- The `<field>` can be *any field in the audit message* (page 123), including fields returned in the *param* (page 124) document.
- The `<expression>` is a *query condition expression*.

To specify an audit filter, enclose the filter document in single quotes to pass the document as a string.

To specify the audit filter in a `configuration file`, you must use the YAML format of the configuration file.

Examples

Filter for Multiple Operation Types

The following example audits only the `createCollection` (page 118) and `dropCollection` (page 119) actions by using the filter:

```
{ atype: { $in: [ "createCollection", "dropCollection" ] } }
```

To specify an audit filter, enclose the filter document in single quotes to pass the document as a string.

```
mongod --dbpath data/db --auditDestination file --auditFilter '{ atype: { $in: [ "createCollection",
```

To specify the audit filter in a `configuration file`, you must use the YAML format of the configuration file.

```
storage:
   dbPath: data/db
auditLog:
   destination: file
   format: BSON
   path: data/db/auditLog.bson
   filter: '{ atype: { $in: [ "createCollection", "dropCollection" ] } }'
```

[48] https://www.mongodb.com/products/mongodb-enterprise-advanced?jmp=docs

Filter on Authentication Operations on a Single Database

The <field> can include *any field in the audit message* (page 123). For authentication operations (i.e. atype: "authenticate"), the audit messages include a db field in the param document.

The following example audits only the authenticate operations that occur against the test database by using the filter:

```
{ atype: "authenticate", "param.db": "test" }
```

To specify an audit filter, enclose the filter document in single quotes to pass the document as a string.

```
mongod --dbpath data/db --auth --auditDestination file --auditFilter '{ atype: "authenticate", "paran
```

To specify the audit filter in a configuration file, you must use the YAML format of the configuration file.

```
storage:
   dbPath: data/db
security:
   authorization: enabled
auditLog:
   destination: file
   format: BSON
   path: data/db/auditLog.bson
   filter: '{ atype: "authenticate", "param.db": "test" }'
```

To filter on all authenticate operations across databases, use the filter { atype: "authenticate" }.

Filter on Collection Creation and Drop Operations for a Single Database

The <field> can include *any field in the audit message* (page 123). For collection creation and drop operations (i.e. atype: "createCollection" and atype: "dropCollection"), the audit messages include a namespace ns field in the param document.

The following example audits only the createCollection and dropCollection operations that occur against the test database by using the filter:

Note: The regular expression requires two backslashes (\\) to escape the dot (.).

```
{ atype: { $in: [ "createCollection", "dropCollection" ] }, "param.ns": /^test\\./ } }
```

To specify an audit filter, enclose the filter document in single quotes to pass the document as a string.

```
mongod --dbpath data/db --auth --auditDestination file --auditFilter '{ atype: { $in: [ "createColle
```

To specify the audit filter in a configuration file, you must use the YAML format of the configuration file.

```
storage:
   dbPath: data/db
security:
   authorization: enabled
auditLog:
   destination: file
   format: BSON
   path: data/db/auditLog.bson
   filter: '{ atype: { $in: [ "createCollection", "dropCollection" ] }, "param.ns": /^test\\./ } }'
```

Filter by Authorization Role

The following example audits operations by users with `readWrite` (page 104) role on the `test` database, including users with roles that inherit from `readWrite` (page 104), by using the filter:

```
{ roles: { role: "readWrite", db: "test" } }
```

To specify an audit filter, enclose the filter document in single quotes to pass the document as a string.

```
mongod --dbpath data/db --auth --auditDestination file --auditFilter '{ roles: { role: "readWrite",
```

To specify the audit filter in a `configuration file`, you must use the YAML format of the configuration file.

```
storage:
   dbPath: data/db
security:
   authorization: enabled
auditLog:
   destination: file
   format: BSON
   path: data/db/auditLog.bson
   filter: '{ roles: { role: "readWrite", db: "test" } }'
```

Filter on Read and Write Operations

To capture `read` and `write` operations in the audit, you must also enable the audit system to log authorization successes using the `auditAuthorizationSuccess` parameter. [49]

Note: Enabling `auditAuthorizationSuccess` degrades performance more than logging only the authorization failures.

The following example audits the `find()`, `insert()`, `remove()`, `update()`, `save()`, and `findAndModify()` operations by using the filter:

```
{ atype: "authCheck", "param.command": { $in: [ "find", "insert", "delete", "update", "findandmodify"
```

To specify an audit filter, enclose the filter document in single quotes to pass the document as a string.

```
mongod --dbpath data/db --auth --setParameter auditAuthorizationSuccess=true --auditDestination file
```

To specify the audit filter in a `configuration file`, you must use the YAML format of the configuration file.

```
storage:
   dbPath: data/db
security:
   authorization: enabled
auditLog:
   destination: file
   format: BSON
   path: data/db/auditLog.bson
   filter: '{ atype: "authCheck", "param.command": { $in: [ "find", "insert", "delete", "update", "fi
setParameter: { auditAuthorizationSuccess: true }
```

[49] You can enable `auditAuthorizationSuccess` parameter without enabling `--auth`; however, all operations will return success for authorization checks.

Filter on Read and Write Operations for a Collection

To capture `read` and `write` operations in the audit, you must also enable the audit system to log authorization successes using the `auditAuthorizationSuccess` parameter. [1]

Note: Enabling `auditAuthorizationSuccess` degrades performance more than logging only the authorization failures.

The following example audits the `find()`, `insert()`, `remove()`, `update()`, `save()`, and `findAndModify()` operations for the collection `orders` in the database `test` by using the filter:

```
{ atype: "authCheck", "param.ns": "test.orders", "param.command": { $in: [ "find", "insert", "delete"
```

To specify an audit filter, enclose the filter document in single quotes to pass the document as a string.

```
mongod --dbpath data/db --auth --setParameter auditAuthorizationSuccess=true --auditDestination file
```

To specify the audit filter in a `configuration file`, you must use the YAML format of the configuration file.

```
storage:
   dbPath: data/db
security:
   authorization: enabled
auditLog:
   destination: file
   format: BSON
   path: data/db/auditLog.bson
   filter: '{ atype: "authCheck", "param.ns": "test.orders", "param.command": { $in: [ "find", "inse
setParameter: { auditAuthorizationSuccess: true }
```

See also:

Configure Auditing (page 93), *Auditing* (page 31), *System Event Audit Messages* (page 123)

7.6 Miscellaneous

The following pages provide additional information regarding handling security.

Implement Field Level Redaction **(page 98)** Procedure to set up different access levels for the document content.

Create a Vulnerability Report **(page 101)** Report a vulnerability in MongoDB.

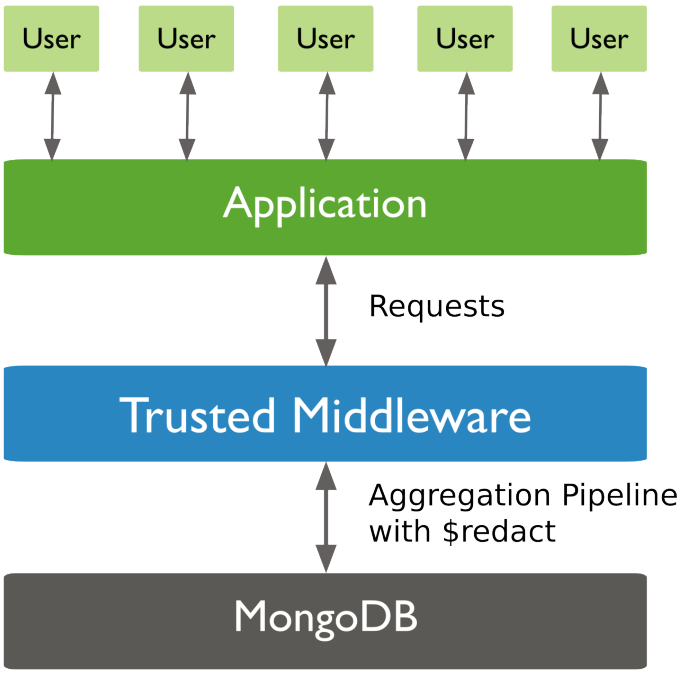
7.6.1 Implement Field Level Redaction

The `$redact` pipeline operator restricts the contents of the documents based on information stored in the documents themselves.

To store the access criteria data, add a field to the documents and embedded documents. To allow for multiple combinations of access levels for the same data, consider setting the access field to an array of arrays. Each array element contains a required set that allows a user with that set to access the data.

Then, include the `$redact` stage in the `db.collection.aggregate()` operation to restrict contents of the result set based on the access required to view the data.

For more information on the `$redact` pipeline operator, including its syntax and associated system variables as well as additional examples, see `$redact`.



Procedure

For example, a `forecasts` collection contains documents of the following form where the `tags` field determines the access levels required to view the data:

```
{
   _id: 1,
   title: "123 Department Report",
   tags: [ [ "G" ], [ "FDW" ] ],
   year: 2014,
   subsections: [
       {
           subtitle: "Section 1: Overview",
           tags: [ [ "SI", "G" ], [ "FDW" ] ],
           content:  "Section 1: This is the content of section 1."
       },
       {
           subtitle: "Section 2: Analysis",
           tags: [ [ "STLW" ] ],
           content: "Section 2: This is the content of section 2."
       },
       {
           subtitle: "Section 3: Budgeting",
           tags: [ [ "TK" ], [ "FDW", "TGE" ] ],
           content: {
               text: "Section 3: This is the content of section3.",
               tags: [ [ "HCS"], [ "FDW", "TGE", "BX" ] ]
           }
       }
   ]
```

```
}
```

For each document, the `tags` field contains various access groupings necessary to view the data. For example, the value `[ [ "G" ], [ "FDW", "TGE" ] ]` can specify that a user requires either access level `["G"]` or both `[ "FDW", "TGE" ]` to view the data.

Consider a user who only has access to view information tagged with either `"FDW"` or `"TGE"`. To run a query on all documents with year `2014` for this user, include a `$redact` stage as in the following:

```
var userAccess = [ "FDW", "TGE" ];
db.forecasts.aggregate(
   [
     { $match: { year: 2014 } },
     { $redact:
        {
          $cond: {
                   if: { $anyElementTrue:
                          {
                            $map: {
                                     input: "$tags" ,
                                     as: "fieldTag",
                                     in: { $setIsSubset: [ "$$fieldTag", userAccess ] }
                                   }
                          }
                      },
                    then: "$$DESCEND",
                    else: "$$PRUNE"
                  }
        }
     }
   ]
)
```

The aggregation operation returns the following "redacted" document for the user:

```
{ "_id" : 1,
  "title" : "123 Department Report",
  "tags" : [ [ "G" ], [ "FDW" ] ],
  "year" : 2014,
  "subsections" :
     [
        {
          "subtitle" : "Section 1: Overview",
          "tags" : [ [ "SI", "G" ], [ "FDW" ] ],
          "content" : "Section 1: This is the content of section 1."
        },
       {
         "subtitle" : "Section 3: Budgeting",
         "tags" : [ [ "TK" ], [ "FDW", "TGE" ] ]
       }
     ]
}
```

See also:

`$map`, `$setIsSubset`, `$anyElementTrue`

7.6.2 Create a Vulnerability Report

If you believe you have discovered a vulnerability in MongoDB or have experienced a security incident related to MongoDB, please report the issue to aid in its resolution.

To report an issue, we strongly suggest filing a ticket in the SECURITY[50] project in JIRA. MongoDB, Inc responds to vulnerability notifications within 48 hours.

Create the Report in JIRA

Submit a Ticket[51] in the Security[52] project on our JIRA. The ticket number will become the reference identification for the issue for its lifetime. You can use this identifier for tracking purposes.

Information to Provide

All vulnerability reports should contain as much information as possible so MongoDB's developers can move quickly to resolve the issue. In particular, please include the following:

- The name of the product.
- *Common Vulnerability* information, if applicable, including:
- CVSS (Common Vulnerability Scoring System) Score.
- CVE (Common Vulnerability and Exposures) Identifier.
- Contact information, including an email address and/or phone number, if applicable.

Send the Report via Email

While JIRA is the preferred reporting method, you may also report vulnerabilities via email to security@mongodb.com[53].

You may encrypt email using MongoDB's public key at https://docs.mongodb.org/10gen-security-gpg-key.asc.

MongoDB, Inc. responds to vulnerability reports sent via email with a response email that contains a reference number for a JIRA ticket posted to the SECURITY[54] project.

Evaluation of a Vulnerability Report

MongoDB, Inc. validates all submitted vulnerabilities and uses Jira to track all communications regarding a vulnerability, including requests for clarification or additional information. If needed, MongoDB representatives set up a conference call to exchange information regarding the vulnerability.

Disclosure

MongoDB, Inc. requests that you do *not* publicly disclose any information regarding the vulnerability or exploit the issue until it has had the opportunity to analyze the vulnerability, to respond to the notification, and to notify key users, customers, and partners.

[50] https://jira.mongodb.org/browse/SECURITY
[51] https://jira.mongodb.org/secure/CreateIssue!default.jspa?project-field=%22Security%22
[52] https://jira.mongodb.org/browse/SECURITY
[53] security@mongodb.com
[54] https://jira.mongodb.org/browse/SECURITY

The amount of time required to validate a reported vulnerability depends on the complexity and severity of the issue. MongoDB, Inc. takes all required vulnerabilities very seriously and will always ensure that there is a clear and open channel of communication with the reporter.

After validating an issue, MongoDB, Inc. coordinates public disclosure of the issue with the reporter in a mutually agreed timeframe and format. If required or requested, the reporter of a vulnerability will receive credit in the published security bulletin.

CHAPTER 8

Security Reference

The following lists the security related methods available in the `mongo` shell as well as additional *security reference material* (page 104).

8.1 Security Methods in the `mongo` Shell

8.1.1 User Management and Authentication Methods

Name	Description
`db.auth()`	Authenticates a user to a database.
`db.createUser()`	Creates a new user.
`db.updateUser()`	Updates user data.
`db.changeUserPassword()`	Changes an existing user's password.
`db.removeUser()`	Deprecated. Removes a user from a database.
`db.dropAllUsers()`	Deletes all users associated with a database.
`db.dropUser()`	Removes a single user.
`db.grantRolesToUser()`	Grants a role and its privileges to a user.
`db.revokeRolesFromUser()`	Removes a role from a user.
`db.getUser()`	Returns information about the specified user.
`db.getUsers()`	Returns information about all users associated with a database.

8.1.2 Role Management Methods

Name	Description
`db.createRole()`	Creates a role and specifies its privileges.
`db.updateRole()`	Updates a user-defined role.
`db.dropRole()`	Deletes a user-defined role.
`db.dropAllRoles()`	Deletes all user-defined roles associated with a database.
`db.grantPrivilegesToRole()`	Assigns privileges to a user-defined role.
`db.revokePrivilegesFromRole()`	Removes the specified privileges from a user-defined role.
`db.grantRolesToRole()`	Specifies roles from which a user-defined role inherits privileges.
`db.revokeRolesFromRole()`	Removes inherited roles from a role.
`db.getRole()`	Returns information for the specified role.
`db.getRoles()`	Returns information for all the user-defined roles in a database.

8.2 Security Reference Documentation

Built-In Roles **(page 104)** Reference on MongoDB provided roles and corresponding access.

system.roles Collection **(page 112)** Describes the content of the collection that stores user-defined roles.

system.users Collection **(page 114)** Describes the content of the collection that stores users' credentials and role assignments.

Resource Document **(page 116)** Describes the resource document for roles.

Privilege Actions **(page 118)** List of the actions available for privileges.

System Event Audit Messages **(page 123)** Reference on system event audit messages.

8.2.1 Built-In Roles

MongoDB grants access to data and commands through *role-based authorization* (page 21) and provides built-in roles that provide the different levels of access commonly needed in a database system. You can additionally create *user-defined roles* (page 24).

A role grants privileges to perform sets of *actions* (page 118) on defined *resources* (page 116). A given role applies to the database on which it is defined and can grant access down to a collection level of granularity.

Each of MongoDB's built-in roles defines access at the database level for all *non*-system collections in the role's database and at the collection level for all `system collections`.

MongoDB provides the built-in *database user* (page 104) and *database administration* (page 105) roles on *every* database. MongoDB provides all other built-in roles only on the `admin` database.

This section describes the privileges for each built-in role. You can also view the privileges for a built-in role at any time by issuing the `rolesInfo` command with the `showPrivileges` and `showBuiltinRoles` fields both set to `true`.

Database User Roles

Every database includes the following client roles:

`read`
Provides the ability to read data on all *non*-system collections and on the following system collections: `system.indexes`, `system.js`, and `system.namespaces` collections. The role provides read access by granting the following *actions* (page 118):

- `collStats` (page 122)
- `dbHash` (page 122)
- `dbStats` (page 122)
- `find` (page 118)
- `killCursors` (page 119)
- `listIndexes` (page 122)
- `listCollections` (page 122)

`readWrite`
Provides all the privileges of the `read` (page 104) role plus ability to modify data on all *non*-system collections and the `system.js` collection. The role provides the following actions on those collections:

- collStats (page 122)
- convertToCapped (page 121)
- createCollection (page 118)
- dbHash (page 122)
- dbStats (page 122)
- dropCollection (page 119)
- createIndex (page 118)
- dropIndex (page 121)
- emptycapped (page 119)
- find (page 118)
- insert (page 118)
- killCursors (page 119)
- listIndexes (page 122)
- listCollections (page 122)
- remove (page 118)
- renameCollectionSameDB (page 121)
- update (page 118)

Database Administration Roles

Every database includes the following database administration roles:

dbAdmin

Provides the following *actions* (page 118) on the database's system.indexes, system.namespaces, and system.profile collections:

- collStats (page 122)
- dbHash (page 122)
- dbStats (page 122)
- find (page 118)
- killCursors (page 119)
- listIndexes (page 122)
- listCollections (page 122)
- dropCollection (page 119) and createCollection (page 118) on system.profile *only*

Changed in version 2.6.4: dbAdmin (page 105) added the createCollection (page 118) for the system.profile collection. Previous versions only had the dropCollection (page 119) on the system.profile collection.

Provides the following actions on all *non*-system collections. This role *does not* include full read access on non-system collections:

- collMod (page 121)
- collStats (page 122)

- compact (page 121)
- convertToCapped (page 121)
- createCollection (page 118)
- createIndex (page 118)
- dbStats (page 122)
- dropCollection (page 119)
- dropDatabase (page 121)
- dropIndex (page 121)
- enableProfiler (page 119)
- indexStats (page 122)
- reIndex (page 121)
- renameCollectionSameDB (page 121)
- repairDatabase (page 122)
- storageDetails (page 120)
- validate (page 122)

dbOwner

The database owner can perform any administrative action on the database. This role combines the privileges granted by the readWrite (page 104), dbAdmin (page 105) and userAdmin (page 106) roles.

userAdmin

Provides the ability to create and modify roles and users on the current database. This role also indirectly provides *superuser* (page 111) access to either the database or, if scoped to the admin database, the cluster. The userAdmin (page 106) role allows users to grant any user any privilege, including themselves.

The userAdmin (page 106) role explicitly provides the following actions:

- changeCustomData (page 118)
- changePassword (page 118)
- createRole (page 119)
- createUser (page 119)
- dropRole (page 119)
- dropUser (page 119)
- grantRole (page 119)
- revokeRole (page 119)
- viewRole (page 119)
- viewUser (page 119)

Cluster Administration Roles

The admin database includes the following roles for administering the whole system rather than just a single database. These roles include but are not limited to *replica set* and *sharded cluster* administrative functions.

clusterAdmin

Provides the greatest cluster-management access. This role combines the privileges granted by the clusterManager (page 107), clusterMonitor (page 108), and hostManager (page 108) roles. Additionally, the role provides the dropDatabase (page 121) action.

clusterManager

Provides management and monitoring actions on the cluster. A user with this role can access the config and local databases, which are used in sharding and replication, respectively.

Provides the following actions on the cluster as a whole:

- addShard (page 120)
- applicationMessage (page 121)
- cleanupOrphaned (page 119)
- flushRouterConfig (page 120)
- listShards (page 120)
- removeShard (page 120)
- replSetConfigure (page 120)
- replSetGetStatus (page 120)
- replSetStateChange (page 120)
- resync (page 120)

Provides the following actions on *all* databases in the cluster:

- enableSharding (page 120)
- moveChunk (page 120)
- splitChunk (page 121)
- splitVector (page 121)

On the config database, provides the following actions on the settings collection:

- insert (page 118)
- remove (page 118)
- update (page 118)

On the config database, provides the following actions on all configuration collections and on the system.indexes, system.js, and system.namespaces collections:

- collStats (page 122)
- dbHash (page 122)
- dbStats (page 122)
- find (page 118)
- killCursors (page 119)

On the local database, provides the following actions on the replset collection:

- collStats (page 122)
- dbHash (page 122)
- dbStats (page 122)

- find (page 118)
- killCursors (page 119)

clusterMonitor

Provides read-only access to monitoring tools, such as the MongoDB Cloud Manager[1] and Ops Manager[2] monitoring agent.

Provides the following actions on the cluster as a whole:

- connPoolStats (page 122)
- cursorInfo (page 122)
- getCmdLineOpts (page 122)
- getLog (page 122)
- getParameter (page 121)
- getShardMap (page 120)
- hostInfo (page 121)
- inprog (page 119)
- listDatabases (page 122)
- listShards (page 120)
- netstat (page 122)
- replSetGetStatus (page 120)
- serverStatus (page 122)
- shardingState (page 121)
- top (page 123)

Provides the following actions on *all* databases in the cluster:

- collStats (page 122)
- dbStats (page 122)
- getShardVersion (page 120)

Provides the find (page 118) action on all `system.profile` collections in the cluster.

Provides the following actions on the `config` database's configuration collections and `system.indexes`, `system.js`, and `system.namespaces` collections:

- collStats (page 122)
- dbHash (page 122)
- dbStats (page 122)
- find (page 118)
- killCursors (page 119)

hostManager

Provides the ability to monitor and manage servers.

Provides the following actions on the cluster as a whole:

[1] https://cloud.mongodb.com/?jmp=docs
[2] https://docs.opsmanager.mongodb.com/current/

- applicationMessage (page 121)
- closeAllDatabases (page 121)
- connPoolSync (page 121)
- cpuProfiler (page 119)
- diagLogging (page 122)
- flushRouterConfig (page 120)
- fsync (page 121)
- invalidateUserCache (page 119)
- killop (page 119)
- logRotate (page 121)
- resync (page 120)
- setParameter (page 122)
- shutdown (page 122)
- touch (page 122)
- unlock (page 119)

Provides the following actions on *all* databases in the cluster:

- killCursors (page 119)
- repairDatabase (page 122)

Backup and Restoration Roles

The admin database includes the following roles for backing up and restoring data:

backup

Provides minimal privileges needed for backing up data. This role provides sufficient privileges to use the MongoDB Cloud Manager[3] backup agent, Ops Manager[4] backup agent, or to use mongodump to back up an entire mongod instance.

Provides the following *actions* (page 118) on the mms.backup collection in the admin database:

- insert (page 118)
- update (page 118)

Provides the listDatabases (page 122) action on the cluster as a whole.

Provides the listCollections (page 122) action on all databases.

Provides the listIndexes (page 122) action for all collections.

Provides the find (page 118) action on the following:

- all *non*-system collections in the cluster
- all the following system collections in the cluster: system.indexes, system.namespaces, and system.js
- the admin.system.users and admin.system.roles collections

[3] https://cloud.mongodb.com/?jmp=docs
[4] https://docs.opsmanager.mongodb.com/current/

- legacy `system.users` collections from versions of MongoDB prior to 2.6

To back up the `system.profile` collection, which is created when you activate *database profiling*, you must have **additional** `read` access on this collection. Several roles provide this access, including the `clusterAdmin` (page 106) and `dbAdmin` (page 105) roles.

`restore`

Provides privileges needed to restore data from backups. This role is sufficient when restoring data with `mongorestore` without the `--oplogReplay` option. If running `mongorestore` with `--oplogReplay`, however, the `restore` (page 110) role is insufficient to replay the oplog. To replay the oplog, create a *user-defined role* (page 68) that has `anyAction` (page 123) on *anyResource* (page 118) and grant only to users who must run `mongorestore` with `--oplogReplay`.

Provides the following actions on all *non*-system collections and `system.js` collections in the cluster; on the `admin.system.users` and `admin.system.roles` collections in the `admin` database; and on legacy `system.users` collections from versions of MongoDB prior to 2.6:

- `collMod` (page 121)
- `createCollection` (page 118)
- `createIndex` (page 118)
- `dropCollection` (page 119)
- `insert` (page 118)

Provides the `listCollections` (page 122) action on all databases.

Provides the following *additional* actions on `admin.system.users` and legacy `system.users` collections:

- `find` (page 118)
- `remove` (page 118)
- `update` (page 118)

Provides the `find` (page 118) action on all the `system.namespaces` collections in the cluster.

Although, `restore` (page 110) includes the ability to modify the documents in the `admin.system.users` collection using normal modification operations, *only* modify these data using the *user management methods*.

All-Database Roles

The `admin` database provides the following roles that apply to all databases in a `mongod` instance and are roughly equivalent to their single-database equivalents:

`readAnyDatabase`

Provides the same read-only permissions as `read` (page 104), except it applies to *all* databases in the cluster. The role also provides the `listDatabases` (page 122) action on the cluster as a whole.

`readWriteAnyDatabase`

Provides the same read and write permissions as `readWrite` (page 104), except it applies to *all* databases in the cluster. The role also provides the `listDatabases` (page 122) action on the cluster as a whole.

`userAdminAnyDatabase`

Provides the same access to user administration operations as `userAdmin` (page 106), except it applies to *all* databases in the cluster. The role also provides the following actions on the cluster as a whole:

- `authSchemaUpgrade` (page 119)
- `invalidateUserCache` (page 119)

- listDatabases (page 122)

The role also provides the following actions on the admin.system.users and admin.system.roles collections on the admin database, and on legacy system.users collections from versions of MongoDB prior to 2.6:

- collStats (page 122)
- dbHash (page 122)
- dbStats (page 122)
- find (page 118)
- killCursors (page 119)
- planCacheRead (page 119)

Changed in version 2.6.4: userAdminAnyDatabase (page 110) added the following permissions on the admin.system.users and admin.system.roles collections:

- createIndex (page 118)
- dropIndex (page 121)

The userAdminAnyDatabase (page 110) role does not restrict the permissions that a user can grant. As a result, userAdminAnyDatabase (page 110) users can grant themselves privileges in excess of their current privileges and even can grant themselves *all privileges*, even though the role does not explicitly authorize privileges beyond user administration. This role is effectively a MongoDB system *superuser* (page 111).

dbAdminAnyDatabase

Provides the same access to database administration operations as dbAdmin (page 105), except it applies to *all* databases in the cluster. The role also provides the listDatabases (page 122) action on the cluster as a whole.

Superuser Roles

Several roles provide either indirect or direct system-wide superuser access.

The following roles provide the ability to assign any user any privilege on any database, which means that users with one of these roles can assign *themselves* any privilege on any database:

- dbOwner (page 106) role, when scoped to the admin database
- userAdmin (page 106) role, when scoped to the admin database
- userAdminAnyDatabase (page 110) role

The following role provides full privileges on all resources:

root

Provides access to the operations and all the resources of the readWriteAnyDatabase (page 110), dbAdminAnyDatabase (page 111), userAdminAnyDatabase (page 110) and clusterAdmin (page 106) roles *combined*.

Changed in version 3.0.7: The root (page 111) has validate (page 122) action on system. collections. Previously, root (page 111) does **not** include any access to collections that begin with the system. prefix.

For example, without the ability to insert data directly into the system.users and system.roles collections in the admin database. root (page 111) is not suitable for writing or restoring data that have these collections (e.g. with mongorestore.) To perform these kinds of restore operations, provision users with the restore (page 110) role.

Internal Role

__system
MongoDB assigns this role to user objects that represent cluster members, such as replica set members and `mongos` instances. The role entitles its holder to take any action against any object in the database.

Do not assign this role to user objects representing applications or human administrators, other than in exceptional circumstances.

If you need access to all actions on all resources, for example to run `applyOps` commands, do not assign this role. Instead, *create a user-defined role* (page 68) that grants `anyAction` (page 123) on *anyResource* (page 118) and ensure that only the users who need access to these operations have this access.

8.2.2 `system.roles` Collection

New in version 2.6.

The `system.roles` collection in the `admin` database stores the user-defined roles. To create and manage these user-defined roles, MongoDB provides *role management commands*.

`system.roles` Schema

The documents in the `system.roles` collection have the following schema:

```
{
  _id: <system-defined id>,
  role: "<role name>",
  db: "<database>",
  privileges:
      [
          {
              resource: { <resource> },
              actions: [ "<action>", ... ]
          },
          ...
      ],
  roles:
      [
          { role: "<role name>", db: "<database>" },
          ...
      ]
}
```

A `system.roles` document has the following fields:

`admin.system.roles.`**`role`**
The `role` (page 112) field is a string that specifies the name of the role.

`admin.system.roles.`**`db`**
The `db` (page 112) field is a string that specifies the database to which the role belongs. MongoDB uniquely identifies each role by the pairing of its name (i.e. `role` (page 112)) and its database.

`admin.system.roles.`**`privileges`**
The `privileges` (page 112) array contains the privilege documents that define the *privileges* (page 21) for the role.

A privilege document has the following syntax:

```
{
  resource: { <resource> },
  actions: [ "<action>", ... ]
}
```

Each privilege document has the following fields:

`admin.system.roles.privileges[n].resource`
: A document that specifies the resources upon which the privilege `actions` (page 113) apply. The document has one of the following form:

```
{ db: <database>, collection: <collection> }
```

or

```
{ cluster : true }
```

See *Resource Document* (page 116) for more details.

`admin.system.roles.privileges[n].actions`
: An array of actions permitted on the resource. For a list of actions, see *Privilege Actions* (page 118).

`admin.system.roles.roles`
: The `roles` (page 113) array contains role documents that specify the roles from which this role *inherits* (page 21) privileges.

A role document has the following syntax:

```
{ role: "<role name>", db: "<database>" }
```

A role document has the following fields:

`admin.system.roles.roles[n].role`
: The name of the role. A role can be a *built-in role* (page 104) provided by MongoDB or a *user-defined role* (page 24).

`admin.system.roles.roles[n].db`
: The name of the database where the role is defined.

Examples

Consider the following sample documents found in `system.roles` collection of the `admin` database.

A User-Defined Role Specifies Privileges

The following is a sample document for a user-defined role `appUser` defined for the `myApp` database:

```
{
  _id: "myApp.appUser",
  role: "appUser",
  db: "myApp",
  privileges: [
       { resource: { db: "myApp" , collection: "" },
         actions: [ "find", "createCollection", "dbStats", "collStats" ] },
       { resource: { db: "myApp", collection: "logs" },
         actions: [ "insert" ] },
       { resource: { db: "myApp", collection: "data" },
         actions: [ "insert", "update", "remove", "compact" ] },
```

```
        { resource: { db: "myApp", collection: "system.js" },
          actions: [ "find" ] },
  ],
  roles: []
}
```

The `privileges` array lists the five privileges that the `appUser` role specifies:

- The first privilege permits its actions (`"find"`, `"createCollection"`, `"dbStats"`, `"collStats"`) on all the collections in the `myApp` database *excluding* its system collections. See *Specify a Database as Resource* (page 116).
- The next two privileges permits *additional* actions on specific collections, `logs` and `data`, in the `myApp` database. See *Specify a Collection of a Database as Resource* (page 116).
- The last privilege permits actions on one `system collections` in the `myApp` database. While the first privilege gives database-wide permission for the `find` action, the action does not apply to `myApp`'s system collections. To give access to a system collection, a privilege must explicitly specify the collection. See *Resource Document* (page 116).

As indicated by the empty `roles` array, `appUser` inherits no additional privileges from other roles.

User-Defined Role Inherits from Other Roles

The following is a sample document for a user-defined role `appAdmin` defined for the `myApp` database: The document shows that the `appAdmin` role specifies privileges as well as inherits privileges from other roles:

```
{
  _id: "myApp.appAdmin",
  role: "appAdmin",
  db: "myApp",
  privileges: [
                {
                  resource: { db: "myApp", collection: "" },
                  actions: [ "insert", "dbStats", "collStats", "compact", "repairDatabase" ]
                }
              ],
  roles: [
           { role: "appUser", db: "myApp" }
         ]
}
```

The `privileges` array lists the privileges that the `appAdmin` role specifies. This role has a single privilege that permits its actions (`"insert"`, `"dbStats"`, `"collStats"`, `"compact"`, `"repairDatabase"`) on all the collections in the `myApp` database *excluding* its system collections. See *Specify a Database as Resource* (page 116).

The `roles` array lists the roles, identified by the role names and databases, from which the role `appAdmin` inherits privileges.

8.2.3 `system.users` Collection

Changed in version 2.6.

The `system.users` collection in the `admin` database stores user *authentication* (page 7) and *authorization* (page 21) information. To manage data in this collection, MongoDB provides *user management commands*.

system.users Schema

The documents in the system.users collection have the following schema:

```
{
  _id: <system defined id>,
  user: "<name>",
  db: "<database>",
  credentials: { <authentication credentials> },
  roles: [
           { role: "<role name>", db: "<database>" },
           ...
         ],
  customData: <custom information>
 }
```

Each system.users document has the following fields:

admin.system.users.**user**
: The user (page 115) field is a string that identifies the user. A user exists in the context of a single logical database but can have access to other databases through roles specified in the roles (page 115) array.

admin.system.users.**db**
: The db (page 115) field specifies the database associated with the user. The user's privileges are not necessarily limited to this database. The user can have privileges in additional databases through the roles (page 115) array.

admin.system.users.**credentials**
: The credentials (page 115) field contains the user's authentication information. For users with externally stored authentication credentials, such as users that use *Kerberos* (page 52) or x.509 certificates for authentication, the system.users document for that user does not contain the credentials (page 115) field.

admin.system.users.**roles**
: The roles (page 115) array contains role documents that specify the roles granted to the user. The array contains both *built-in roles* (page 104) and *user-defined role* (page 24).

  A role document has the following syntax:

  ```
  { role: "<role name>", db: "<database>" }
  ```

  A role document has the following fields:

  admin.system.users.roles[n].**role**
  : The name of a role. A role can be a *built-in role* (page 104) provided by MongoDB or a *custom user-defined role* (page 24).

  admin.system.users.roles[n].**db**
  : The name of the database where role is defined.

  When specifying a role using the *role management* or *user management* commands, you can specify the role name alone (e.g. "readWrite") if the role that exists on the database on which the command is run.

admin.system.users.**customData**
: The customData (page 115) field contains optional custom information about the user.

Example

Changed in version 3.0.0.

Consider the following document in the system.users collection:

```
{
  _id : "home.Kari",
  user : "Kari",
  db : "home",
  credentials : {
         "SCRAM-SHA-1" : {
                 "iterationCount" : 10000,
                 "salt" : nkHYXEZTTYmn+hrY994y1Q==",
                 "storedKey" : "wxWGN3ElQ25WbPjACeXdUmN4nNo=",
                 "serverKey" : "h7vBq5tACT/BtrIElY2QTm+pQzM="
         }
  },
  roles : [
             { role: "read", db: "home" },
             { role: "readWrite", db: "test" },
             { role: "appUser", db: "myApp" }
           ],
  customData : { zipCode: "64157" }
}
```

The document shows that a user `Kari` is associated with the `home` database. `Kari` has the `read` (page 104) role in the `home` database, the `readWrite` (page 104) role in the `test` database, and the `appUser` role in the `myApp` database.

8.2.4 Resource Document

The resource document specifies the resources upon which a privilege permits `actions`.

Database and/or Collection Resource

To specify databases and/or collections, use the following syntax:

```
{ db: <database>, collection: <collection> }
```

Specify a Collection of a Database as Resource

If the resource document species both the `db` and `collection` fields as non-empty strings, the resource is the specified collection in the specified database. For example, the following document specifies a resource of the `inventory` collection in the `products` database:

```
{ db: "products", collection: "inventory" }
```

For a user-defined role scoped for a non-`admin` database, the resource specification for its privileges must specify the same database as the role. User-defined roles scoped for the `admin` database can specify other databases.

Specify a Database as Resource

If only the `collection` field is an empty string (`""`), the resource is the specified database, excluding the `system collections`. For example, the following resource document specifies the resource of the `test` database, excluding the system collections:

```
{ db: "test", collection: "" }
```

For a user-defined role scoped for a non-admin database, the resource specification for its privileges must specify the same database as the role. User-defined roles scoped for the admin database can specify other databases.

Note: When you specify a database as the resource, system collections are excluded, unless you name them explicitly, as in the following:

```
{ db: "test", collection: "system.js" }
```

System collections include but are not limited to the following:

- <database>.system.profile
- <database>.system.js
- *system.users Collection* (page 114) in the admin database
- *system.roles Collection* (page 112) in the admin database

Specify Collections Across Databases as Resource

If only the db field is an empty string (""), the resource is all collections with the specified name across all databases. For example, the following document specifies the resource of all the accounts collections across all the databases:

```
{ db: "", collection: "accounts" }
```

For user-defined roles, only roles scoped for the admin database can have this resource specification for their privileges.

Specify All Non-System Collections in All Databases

If both the db and collection fields are empty strings (""), the resource is all collections, excluding the system collections, in all the databases:

```
{ db: "", collection: "" }
```

For user-defined roles, only roles scoped for the admin database can have this resource specification for their privileges.

Cluster Resource

To specify the cluster as the resource, use the following syntax:

```
{ cluster : true }
```

Use the cluster resource for actions that affect the state of the system rather than act on specific set of databases or collections. Examples of such actions are shutdown, replSetReconfig, and addShard. For example, the following document grants the action shutdown on the cluster.

```
{ resource: { cluster : true }, actions: [ "shutdown" ] }
```

For user-defined roles, only roles scoped for the admin database can have this resource specification for their privileges.

anyResource

The internal resource `anyResource` gives access to every resource in the system and is intended for internal use. **Do not** use this resource, other than in exceptional circumstances. The syntax for this resource is `{ anyResource: true }`.

8.2.5 Privilege Actions

New in version 2.6.

Privilege actions define the operations a user can perform on a *resource* (page 116). A MongoDB *privilege* (page 21) comprises a *resource* (page 116) and the permitted actions. This page lists available actions grouped by common purpose.

MongoDB provides built-in roles with pre-defined pairings of resources and permitted actions. For lists of the actions granted, see *Built-In Roles* (page 104). To define custom roles, see *Create a User-Defined Role* (page 68).

Query and Write Actions

find
User can perform the `db.collection.find()` method. Apply this action to database or collection resources.

insert
User can perform the `insert` command. Apply this action to database or collection resources.

remove
User can perform the `db.collection.remove()` method. Apply this action to database or collection resources.

update
User can perform the `update` command. Apply this action to database or collection resources.

Database Management Actions

changeCustomData
User can change the custom information of any user in the given database. Apply this action to database resources.

changeOwnCustomData
Users can change their own custom information. Apply this action to database resources. See also *Change Your Password and Custom Data* (page 73).

changeOwnPassword
Users can change their own passwords. Apply this action to database resources. See also *Change Your Password and Custom Data* (page 73).

changePassword
User can change the password of any user in the given database. Apply this action to database resources.

createCollection
User can perform the `db.createCollection()` method. Apply this action to database or collection resources.

createIndex
Provides access to the `db.collection.createIndex()` method and the `createIndexes` command. Apply this action to database or collection resources.

createRole
User can create new roles in the given database. Apply this action to database resources.

createUser
User can create new users in the given database. Apply this action to database resources.

dropCollection
User can perform the `db.collection.drop()` method. Apply this action to database or collection resources.

dropRole
User can delete any role from the given database. Apply this action to database resources.

dropUser
User can remove any user from the given database. Apply this action to database resources.

emptycapped
User can perform the `emptycapped` command. Apply this action to database or collection resources.

enableProfiler
User can perform the `db.setProfilingLevel()` method. Apply this action to database resources.

grantRole
User can grant any role in the database to any user from any database in the system. Apply this action to database resources.

killCursors
User can kill cursors on the target collection.

revokeRole
User can remove any role from any user from any database in the system. Apply this action to database resources.

unlock
User can perform the `db.fsyncUnlock()` method. Apply this action to the `cluster` resource.

viewRole
User can view information about any role in the given database. Apply this action to database resources.

viewUser
User can view the information of any user in the given database. Apply this action to database resources.

Deployment Management Actions

authSchemaUpgrade
User can perform the `authSchemaUpgrade` command. Apply this action to the `cluster` resource.

cleanupOrphaned
User can perform the `cleanupOrphaned` command. Apply this action to the `cluster` resource.

cpuProfiler
User can enable and use the CPU profiler. Apply this action to the `cluster` resource.

inprog
User can use the `db.currentOp()` method to return pending and active operations. Apply this action to the `cluster` resource.

invalidateUserCache
Provides access to the `invalidateUserCache` command. Apply this action to the `cluster` resource.

killop
User can perform the `db.killOp()` method. Apply this action to the `cluster` resource.

planCacheRead
User can perform the `planCacheListPlans` and `planCacheListQueryShapes` commands and the `PlanCache.getPlansByQuery()` and `PlanCache.listQueryShapes()` methods. Apply this action to database or collection resources.

planCacheWrite
User can perform the `planCacheClear` command and the `PlanCache.clear()` and `PlanCache.clearPlansByQuery()` methods. Apply this action to database or collection resources.

storageDetails
User can perform the `storageDetails` command. Apply this action to database or collection resources.

Replication Actions

appendOplogNote
User can append notes to the oplog. Apply this action to the `cluster` resource.

replSetConfigure
User can configure a replica set. Apply this action to the `cluster` resource.

replSetGetStatus
User can perform the `replSetGetStatus` command. Apply this action to the `cluster` resource.

replSetHeartbeat
User can perform the `replSetHeartbeat` command. Apply this action to the `cluster` resource.

replSetStateChange
User can change the state of a replica set through the `replSetFreeze`, `replSetMaintenance`, `replSetStepDown`, and `replSetSyncFrom` commands. Apply this action to the `cluster` resource.

resync
User can perform the `resync` command. Apply this action to the `cluster` resource.

Sharding Actions

addShard
User can perform the `addShard` command. Apply this action to the `cluster` resource.

enableSharding
User can enable sharding on a database using the `enableSharding` command and can shard a collection using the `shardCollection` command. Apply this action to database or collection resources.

flushRouterConfig
User can perform the `flushRouterConfig` command. Apply this action to the `cluster` resource.

getShardMap
User can perform the `getShardMap` command. Apply this action to the `cluster` resource.

getShardVersion
User can perform the `getShardVersion` command. Apply this action to database resources.

listShards
User can perform the `listShards` command. Apply this action to the `cluster` resource.

moveChunk
User can perform the `moveChunk` command. In addition, user can perform the `movePrimary` command provided that the privilege is applied to an appropriate database resource. Apply this action to database or collection resources.

removeShard
User can perform the `removeShard` command. Apply this action to the `cluster` resource.

shardingState
User can perform the `shardingState` command. Apply this action to the `cluster` resource.

splitChunk
User can perform the `splitChunk` command. Apply this action to database or collection resources.

splitVector
User can perform the `splitVector` command. Apply this action to database or collection resources.

Server Administration Actions

applicationMessage
User can perform the `logApplicationMessage` command. Apply this action to the `cluster` resource.

closeAllDatabases
User can perform the `closeAllDatabases` command. Apply this action to the `cluster` resource.

collMod
User can perform the `collMod` command. Apply this action to database or collection resources.

compact
User can perform the `compact` command. Apply this action to database or collection resources.

connPoolSync
User can perform the `connPoolSync` command. Apply this action to the `cluster` resource.

convertToCapped
User can perform the `convertToCapped` command. Apply this action to database or collection resources.

dropDatabase
User can perform the `dropDatabase` command. Apply this action to database resources.

dropIndex
User can perform the `dropIndexes` command. Apply this action to database or collection resources.

fsync
User can perform the `fsync` command. Apply this action to the `cluster` resource.

getParameter
User can perform the `getParameter` command. Apply this action to the `cluster` resource.

hostInfo
Provides information about the server the MongoDB instance runs on. Apply this action to the `cluster` resource.

logRotate
User can perform the `logRotate` command. Apply this action to the `cluster` resource.

reIndex
User can perform the `reIndex` command. Apply this action to database or collection resources.

renameCollectionSameDB
Allows the user to rename collections on the current database using the `renameCollection` command. Apply this action to database resources.

Additionally, the user must either *have* `find` (page 118) on the source collection or *not have* `find` (page 118) on the destination collection.

If a collection with the new name already exists, the user must also have the `dropCollection` (page 119) action on the destination collection.

repairDatabase
User can perform the `repairDatabase` command. Apply this action to database resources.

setParameter
User can perform the `setParameter` command. Apply this action to the `cluster` resource.

shutdown
User can perform the `shutdown` command. Apply this action to the `cluster` resource.

touch
User can perform the `touch` command. Apply this action to the `cluster` resource.

Diagnostic Actions

collStats
User can perform the `collStats` command. Apply this action to database or collection resources.

connPoolStats
User can perform the `connPoolStats` and `shardConnPoolStats` commands. Apply this action to the `cluster` resource.

cursorInfo
User can perform the `cursorInfo` command. Apply this action to the `cluster` resource.

dbHash
User can perform the `dbHash` command. Apply this action to database or collection resources.

dbStats
User can perform the `dbStats` command. Apply this action to database resources.

diagLogging
User can perform the `diagLogging` command. Apply this action to the `cluster` resource.

getCmdLineOpts
User can perform the `getCmdLineOpts` command. Apply this action to the `cluster` resource.

getLog
User can perform the `getLog` command. Apply this action to the `cluster` resource.

indexStats
User can perform the `indexStats` command. Apply this action to database or collection resources.

Changed in version 3.0: MongoDB 3.0 removes the `indexStats` command.

listDatabases
User can perform the `listDatabases` command. Apply this action to the `cluster` resource.

listCollections
User can perform the `listCollections` command. Apply this action to database resources.

listIndexes
User can perform the `ListIndexes` command. Apply this action to database or collection resources.

netstat
User can perform the `netstat` command. Apply this action to the `cluster` resource.

serverStatus
User can perform the `serverStatus` command. Apply this action to the `cluster` resource.

validate
User can perform the `validate` command. Apply this action to database or collection resources.

top
User can perform the `top` command. Apply this action to the `cluster` resource.

Internal Actions

anyAction
Allows any action on a resource. **Do not** assign this action except for exceptional circumstances.

internal
Allows internal actions. **Do not** assign this action except for exceptional circumstances.

8.2.6 System Event Audit Messages

Note: Available only in MongoDB Enterprise[5].

Audit Message

The *event auditing feature* (page 31) can record events in JSON format. To configure auditing output, see *Configure Auditing* (page 93)

The recorded JSON messages have the following syntax:

```
{
  atype: <String>,
  ts : { "$date": <timestamp> },
  local: { ip: <String>, port: <int> },
  remote: { ip: <String>, port: <int> },
  users : [ { user: <String>, db: <String> }, ... ],
  roles: [ { role: <String>, db: <String> }, ... ],
  param: <document>,
  result: <int>
}
```

field string atype Action type. See *Audit Event Actions, Details, and Results* (page 124).

field document ts Document that contains the date and UTC time of the event, in ISO 8601 format.

field document local Document that contains the local `ip` address and the `port` number of the running instance.

field document remote Document that contains the remote `ip` address and the `port` number of the incoming connection associated with the event.

field array users Array of user identification documents. Because MongoDB allows a session to log in with different user per database, this array can have more than one user. Each document contains a `user` field for the username and a `db` field for the authentication database for that user.

field array roles Array of documents that specify the *roles* (page 21) granted to the user. Each document contains a `role` field for the name of the role and a `db` field for the database associated with the role.

[5] http://www.mongodb.com/products/mongodb-enterprise?jmp=docs

field document param Specific details for the event. See *Audit Event Actions, Details, and Results* (page 124).

field integer result Error code. See *Audit Event Actions, Details, and Results* (page 124).

Audit Event Actions, Details, and Results

The following table lists for each `atype` or action type, the associated `param` details and the `result` values, if any.

atype	param	result
`authenticate`	`{ user: <user name>, db: <database>, mechanism: <mechanism> }`	`0` - Success `18` - Authentication Failed
`authCheck`	`{ command: <name>, ns: <database>.<collection>, args: <command object> }` `ns` field is optional. `args` field may be redacted.	`0` - Success `13` - Unauthorized to perform the operation. By default, the auditing system logs only the authorization failures. To enable the system to log authorization successes, use the `auditAuthorizationSuccess` parameter. [6]
`createCollection` (page 118)	`{ ns: <database>.<collection> }`	`0` - Success
`createDatabase`	`{ ns: <database> }`	`0` - Success
`createIndex` (page 118)	`{ ns: <database>.<collection>, indexName: <index name>, indexSpec: <index specification> }`	`0` - Success
`renameCollection`	`{ old: <database>.<collection>, new: <database>.<collection> }`	`0` - Success
`dropCollection` (page 119)	`{ ns: <database>.<collection> }`	`0` - Success
`dropDatabase` (page 121)	`{ ns: <database> }`	`0` - Success

Continued on next page

[6] Enabling `auditAuthorizationSuccess` degrades performance more than logging only the authorization failures.

Table 8.1 – continued from previous page

atype	param	result
dropIndex (page 121)	{ ns: <database>.<collection>, indexName: <index name> }	0 - Success
createUser (page 119)	{ user: <user name>, db: <database>, customData: <document>, roles: [{ role: <role name>, db: <database> }, ...] } The customData field is optional.	0 - Success
dropUser (page 119)	{ user: <user name>, db: <database> }	0 - Success
dropAllUsersFromDatabase	{ db: <database> }	0 - Success
updateUser	{ user: <user name>, db: <database>, passwordChanged: <boolean>, customData: <document>, roles: [{ role: <role name>, db: <database> }, ...] } The customData field is optional.	0 - Success

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Table 8.1 – continued from previous page

atype	param	result
grantRolesToUser	{ user: <user name>, db: <database>, roles: [{ role: <role name>, db: <database> }, ...] }	0 - Success
revokeRolesFromUser	{ user: <user name>, db: <database>, roles: [{ role: <role name>, db: <database> }, ...] }	0 - Success
createRole (page 119)	{ role: <role name>, db: <database>, roles: [{ role: <role name>, db: <database> }, ...], privileges: [{ resource: <resource document>, actions: [<action>, ...] }, ...] } The roles and the privileges fields are optional. For details on the resource document, see *Resource Document* (page 116). For a list of actions, see *Privilege Actions* (page 118).	0 - Success

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Table 8.1 – continued from previous page

atype	param	result
updateRole	{ role: <role name>, db: <database>, roles: [{ role: <role name>, db: <database> }, ...], privileges: [{ resource: <resource document>, actions: [<action>, ...] }, ...] } The roles and the privileges fields are optional. For details on the resource document, see *Resource Document* (page 116). For a list of actions, see *Privilege Actions* (page 118).	0 - Success
dropRole (page 119)	{ role: <role name>, db: <database> }	0 - Success
dropAllRolesFromDatabase	{ db: <database> }	0 - Success
grantRolesToRole	{ role: <role name>, db: <database>, roles: [{ role: <role name>, db: <database> }, ...] }	0 - Success

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Table 8.1 – continued from previous page

atype	param	result
revokeRolesFromRole	{ role: <role name>, db: <database>, roles: [{ role: <role name>, db: <database> }, ...] }	0 - Success
grantPrivilegesToRole	{ role: <role name>, db: <database>, privileges: [{ resource: <resource document>, actions: [<action>, ...] }, ...] } For details on the resource document, see *Resource Document* (page 116). For a list of actions, see *Privilege Actions* (page 118).	0 - Success
revokePrivilegesFromRole	{ role: <role name>, db: <database name>, privileges: [{ resource: <resource document>, actions: [<action>, ...] }, ...] } For details on the resource document, see *Resource Document* (page 116). For a list of actions, see *Privilege Actions* (page 118).	0 - Success

Continued on next page

Table 8.1 – continued from previous page

atype	param	result
replSetReconfig	{ old: <configuration>, new: <configuration> } Indicates membership change in the replica set. The old field is optional.	0 - Success
enableSharding (page 120)	{ ns: <database> }	0 - Success
shardCollection	{ ns: <database>.<collection>, key: <shard key pattern>, options: { unique: <boolean> } }	0 - Success
addShard (page 120)	{ shard: <shard name>, connectionString: <hostname>:<port>, maxSize: <maxSize> } When a shard is a replica set, the connectionString includes the replica set name and can include other members of the replica set.	0 - Success
removeShard (page 120)	{ shard: <shard name> }	0 - Success
shutdown (page 122)	{ } Indicates commencement of database shutdown.	0 - Success
applicationMessage (page 121)	{ msg: <custom message string> } See logApplicationMessage.	0 - Success

CHAPTER 9

Additional Resources

- Making HIPAA Compliant MongoDB Applications[1]
- Security Architecture White Paper[2]
- Webinar: Securing Your MongoDB Deployment[3]

[1] https://www.mongodb.com/blog/post/making-hipaa-compliant-applications-mongodb?jmp=docs
[2] https://www.mongodb.com/lp/white-paper/mongodb-security-architecture?jmp=docs
[3] http://www.mongodb.com/presentations/webinar-securing-your-mongodb-deployment?jmp=docs