

Planning for Streams Replication Manager

Date published: 2019-08-22

Date modified: 2024-07-19



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Streams Replication Manager requirements

When planning and designing your Streams Replication Manager (SRM) deployment that has multiple instances of the SRM service, there are a number of practices that you must follow. Otherwise, you might encounter issues when you are replicating data with SRM.

Kafka cluster aliases must be uniform across clusters

When you have multiple SRM services, the cluster aliases must be defined identically in all instances. SRM utilizes the cluster alias to detect replication loops.

The heartbeats topic must be present on all source clusters

To be able to properly monitor and discover replications, the heartbeats topic must be present on all source clusters. The heartbeats topic is created by the SRM Driver when a target cluster is set with the Streams Replication Manager Driver Target Cluster property and when heartbeating is enabled for the replication. This means that to ensure that the heartbeats topic is created, and has data written into it periodically, at least a single SRM Driver cluster must target each source cluster.

Driver targets must be managed correctly

The Streams Replication Manager Cluster alias and the Streams Replication Manager Driver Target Cluster properties must be managed correctly when you have multiple SRM services. If a target is specified for the replication in the Streams Replication Manager Driver Target Cluster property, a Connect worker is created for each possible cluster pair based on the aliases present in Streams Replication Manager Cluster alias. As a result of this, it is possible for different SRM Driver clusters to merge through their Connect workers. To avoid this, ensure that different SRM Driver clusters target different Kafka clusters.

Service targets must be managed correctly

The Streams Replication Manager Cluster alias and the Streams Replication Manager Service Target Cluster properties must be managed correctly when you have multiple SRM services. If a target is specified for monitoring in the Streams Replication Manager Service Target Cluster property, a Kafka Streams application instance is created for each cluster present in the Streams Replication Manager Service Target Cluster property. As a result of this, it is possible for different SRM Service clusters to merge through their Kafka Streams application instances. To avoid this, ensure that different SRM Service clusters target different Kafka clusters.

All SRM services must use the same replication policy

SRM ships with and supports multiple replication policies. Using a mix of these policies in a single deployment is not supported. Decide which replication policy you want to use and ensure that all SRM services are configured to use your chosen policy. In addition transitioning from one policy to another is not recommended.

Ensure that you do not create replication loops if using the IdentityReplicationPolicy

The IdentityReplicationPolicy cannot detect replication loops. As a result, if you are planning to create a setup with bidirectional replication using the IdentityReplicationPolicy, you must ensure that you do not create any replication loops when you set up your allowlists and denylists (topic filters) with srm-control.

Streams Replication Manager recommended deployment architecture

Learn about pull mode, which is the Cloudera-recommended deployment architecture for Streams Replication Manager.

While Streams Replication Manager (SRM) can be deployed in many different ways, the Cloudera recommended setup is pull mode. Pull mode refers to an SRM deployment where data replication happens by pulling data from remote source clusters, rather than pushing data into remote target clusters. An SRM deployment that is in pull mode conforms to the following:

- An instance of the SRM service (Driver and Service roles) is deployed on all clusters that host a target Kafka cluster. In other words, each target Kafka cluster in the deployment has a co-located SRM service.
- All instances of the SRM service use the same replication policy.
- SRM Driver roles only execute replications that target their co-located Kafka cluster.
- SRM Service roles only target their co-located Kafka cluster.
- If using the `IdentityReplicationPolicy` in a bidirectional setup, no replication loops are present.

The reason why pull mode is recommended is because this is the deployment type that was found to provide the highest amount of resilience against various timeout and network instability issues. For example:

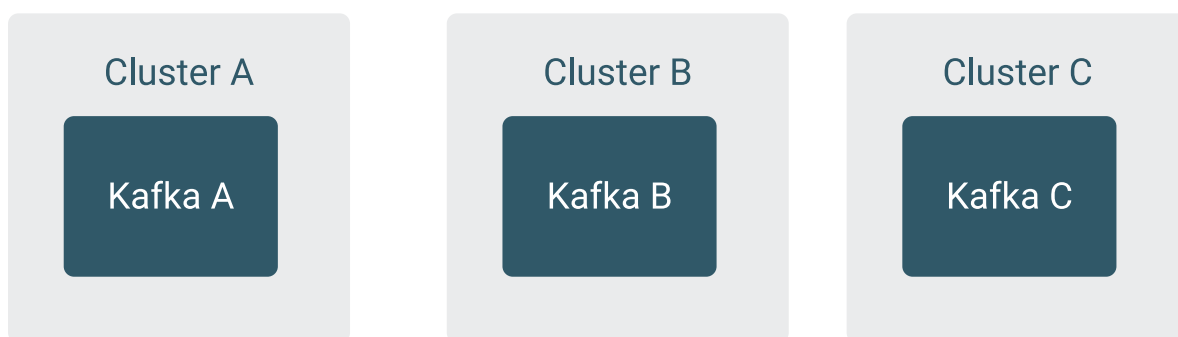
- SRM Driver roles run Connect workers which are coordinating through the target cluster of the replication flow. This means that Connect workers are more closely tied to the target cluster than the source cluster. Having the SRM Drivers and the target Kafka cluster closely located to each other minimizes group membership and rebalance related timeout issues. Additionally, this also minimizes the network instability on the producer side of the SRM Drivers which reduces data duplication in the target cluster.
- SRM Service roles also coordinate through the target cluster. This makes them more sensitive to timeout and network partition issues tied to the target cluster. In addition, the SRM Service reads from and writes to the target Kafka through the Kafka Streams application. Having the SRM Services and the target Kafka clusters closely located to each other can minimize timeout and network partition issues. Additionally, for Kafka clusters in the cloud, hosting the SRM Service in the same data center as the Kafka cluster can help keep cloud costs to a minimum.
- In a situation where there is a network partition, or one of the clusters in the replication is unavailable, it is preferable to let the target cluster pull the data when the connection is established, rather than the source cluster trying to push data indefinitely.

Pull mode deployment example



Note: The following simple example does not go into the detail regarding the exact configuration steps required to set up SRM or your clusters. It is meant to provide you with a general overview of how a pull mode deployment looks like. For configuration how to documentation see, [How to StreamingConfiguring Streams Replication Manager in the Cloudera Runtime documentation](#).

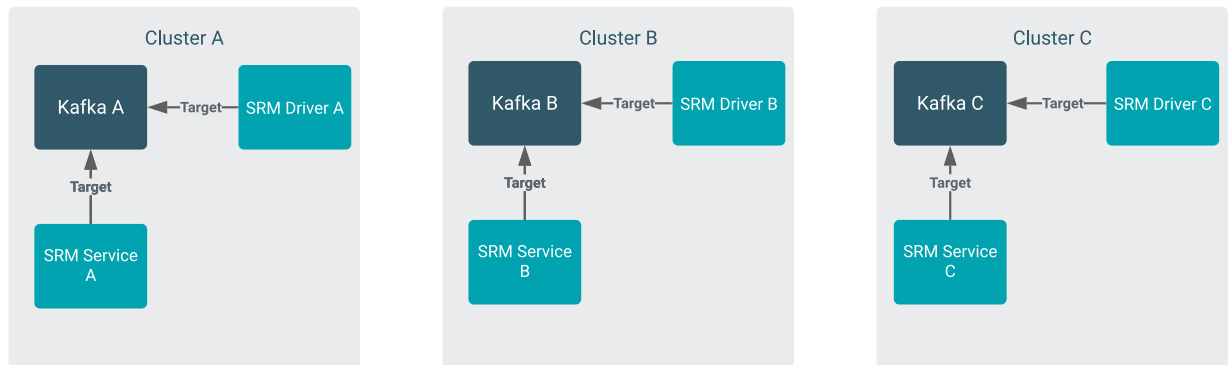
Consider a simple deployment that has three clusters. Cluster A, B, and C. Each of them has a Kafka cluster.



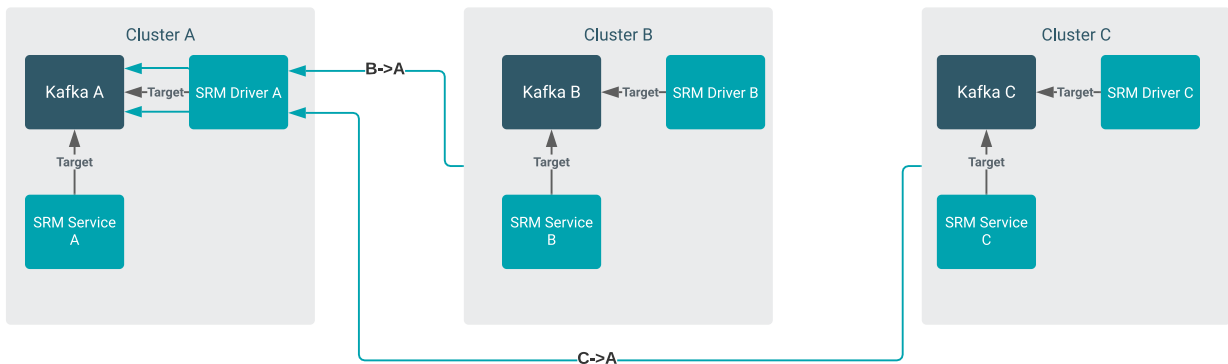
To achieve a pull mode deployment, you must deploy the SRM service (both Driver and Service roles) on all three clusters. The Driver and Service roles must target their co-located Kafka cluster.

To be more precise, in the case of Driver targets, what you must ensure is that each source cluster is targeted by at least a single Driver. This is required so that a heartbeats topic is created in that cluster. This is ensured in this example because each Kafka has a co-located Driver targeting it. However, if you have a unidirectional replication

setup, where the source Kafka cluster does not have a co-located SRM service, you must ensure that one of your Drivers is targeting that Kafka cluster.



Once setup is complete, you can start configuring your replications. For example, assume that you want to have data replicated from Cluster B and C to cluster A. In this case, you need to enable two separate replications, B->A and C->A. To achieve pull mode, the two replications must be executed by SRM Driver A.



Any number of replications can be set up between the clusters, but you must always ensure that each Driver is only executing the replications targeting their co-located cluster. For example, assume that in addition to the replications set up previously, you also want to set up replication to Cluster B from Cluster A and Cluster C. In this case, the deployment would change as follows.

