Practical MySQL

Session 9

Replication and Scalability

Session Overview

- Explain MySQL replication architecture

- Develop and build on replication

- Describe replication topologies

- List replication use cases

- Summarize types of replications

- Identify advantages and disadvantages of MySQL replication
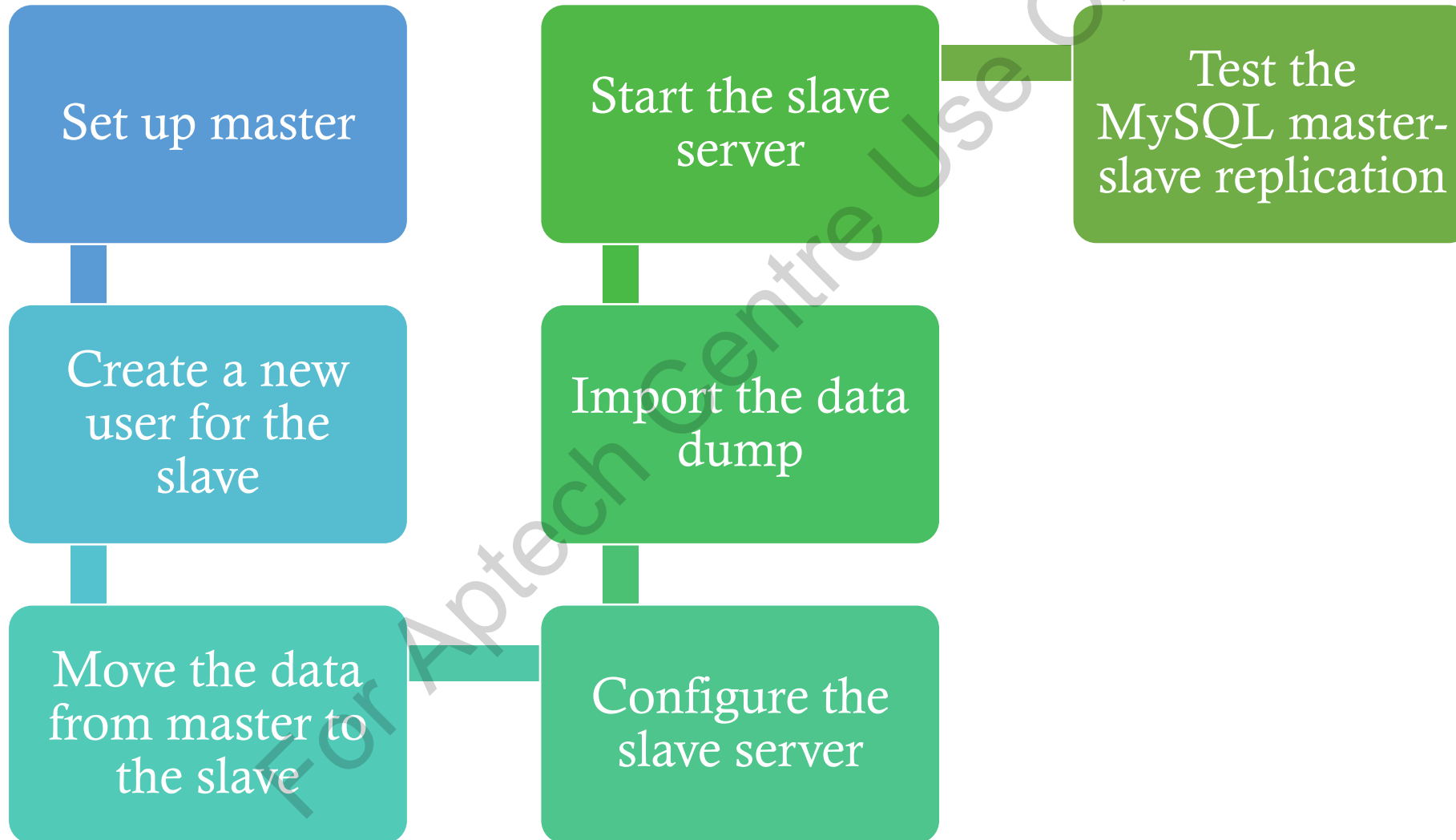
MySQL Replication Architecture

All operations related to databases should be copied to the masters binary log.

Slaves should be in connection with the master and ready to retrieve the data.

The slaves servers get the masters binary log.

Application of the binary log to its real log is then taken care of by the slave.

Building on Replication

```
Set up master
   │
Create a new
user for the
slave
   │
Move the data
from master to
the slave ──── Configure the
              slave server
                  │
              Import the data
              dump
                  │
Start the slave ──── Test the
server              MySQL master-
                    slave replication
```

Set up master

Create a new user for the slave

Move the data from master to the slave

Configure the slave server

Import the data dump

Start the slave server

Test the MySQL master-slave replication

Replication Topologies

Replication topologies can add another replica to an existing replication configuration without the source server getting stopped.

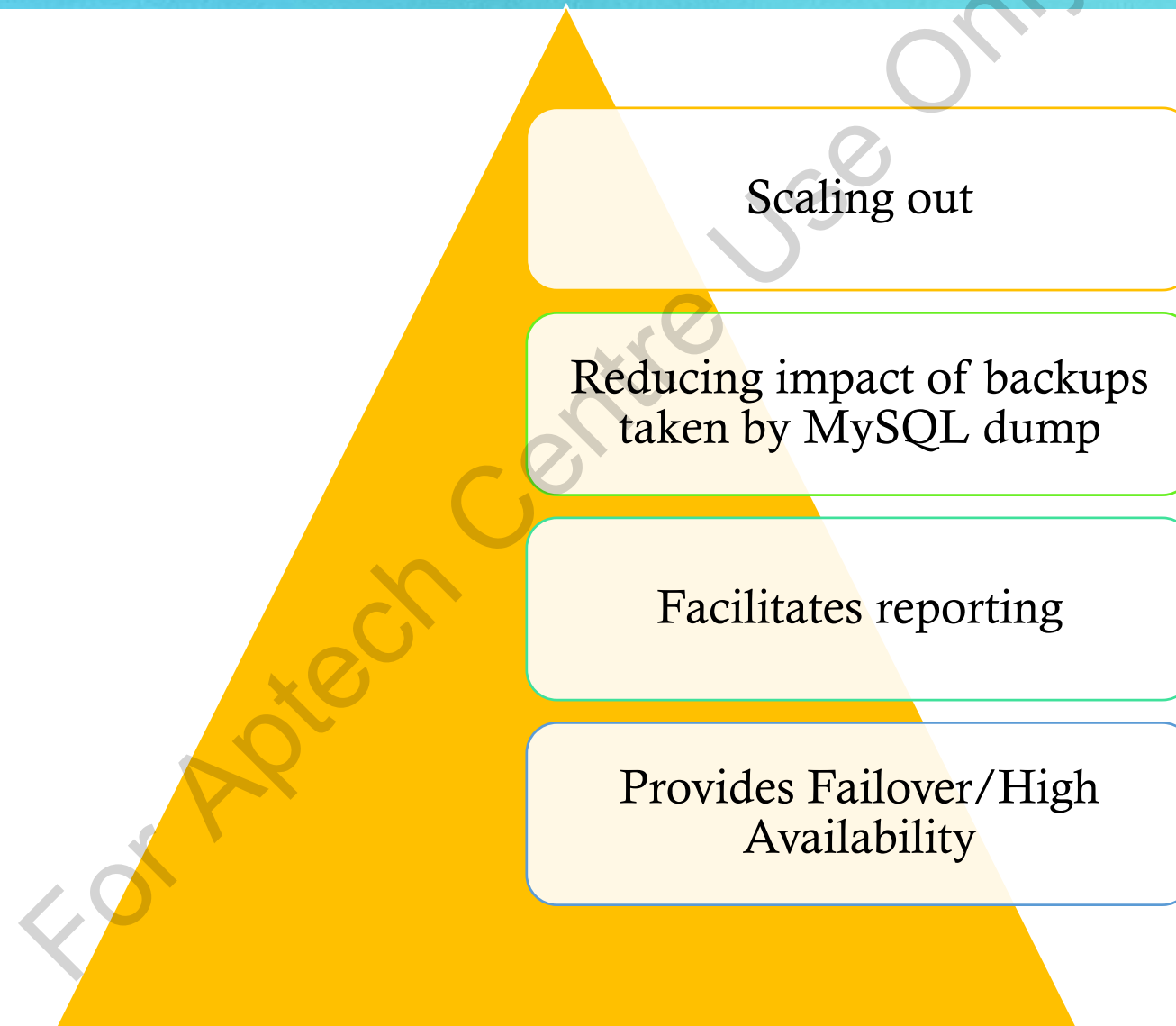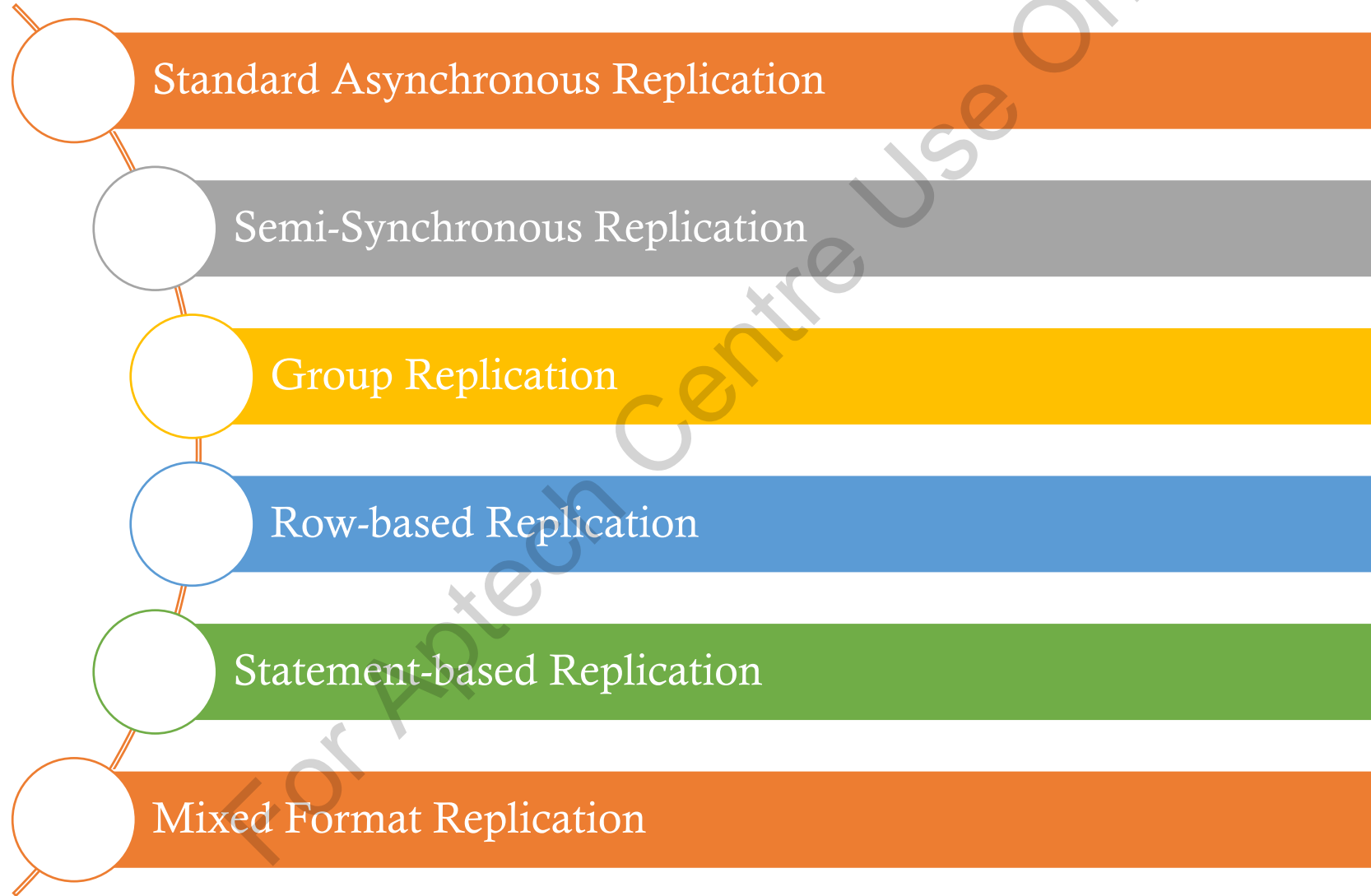| The replication topology manager helps in following ways:			
Store topology and its status	Provide the GUI,CUI, or the API to check the status and perform the required operations	Give support to automatic failure of master while fixing the replications tree	Support topologies from a single master-slave replication to complex multi layered replication trees

Replication Use Cases

Scaling out

Reducing impact of backups taken by MySQL dump

Facilitates reporting

Provides Failover/High Availability

Different Types of Replication

Standard Asynchronous Replication

Semi-Synchronous Replication

Group Replication

Row-based Replication

Statement-based Replication

Mixed Format Replication

Difference Between SBR and RBR

Statement-Based Replication	Row-Based Replication
• All SQL statements which can carry out a modify operation gets logged to the binary log. • If the applications creates two update operations, then those two statements get executed on the slave.	• These represent complete copies of rows which are written to the binary log and later applied to the slaves. • If the same row in the application is modified two times, then two copies of that specific row will be written to binary log and the, applied to the slaves.

Master – Slave Replication Setup

Master configuration → Slave configuration → Copy data to slave → Start replication

Replication Errors

MySQL replication error 1146	• Generic error when the user sets up the MySQL Replication. • The main reason for this error is MySQL queries or non existing SQL Queries.
Error 1602	• This error may occur because of duplicate entry.
Error 1053	• This error may occur because of partial completed query.

Advantage and Disadvantages of MySQL Replication

Advantages of MySQL Replications	Disadvantages of MySQL Replications
• It provides a consistent copy of the data across the nodes to increase data availability. • Users can access data relevant to their tasks without interfering with the work of other users. • Improves data retrieval of global queries and performance. • Data is available on multiple locations and queries are executed faster.	• Achieving concurrency is hard. • Slow updating procedure as one particular update should be performed on multiple places.

Scalability in MySQL

Increase the disk size of the MySQL replica with shutdown

Increase the disk size of the MySQL primary with shutdown

Increase disk size of the MySQL replica without shutdown

Increase the disk size of the MySQL primary without shutdown

Advantages and Disadvantages of Row based Replication in MySQL

Advantages

- No context-based information is required for performing guaranteed operations which get executed in correct order
- Fewer amounts of row level locks are necessary

Disadvantages

- It makes it harder to audit the modifications to the databases
- It can increase disk space as large amounts of data are generated,
- It may lead to traffic in the network and IO related operations

Advantages and Disadvantages of Statement-based Replication in MySQL
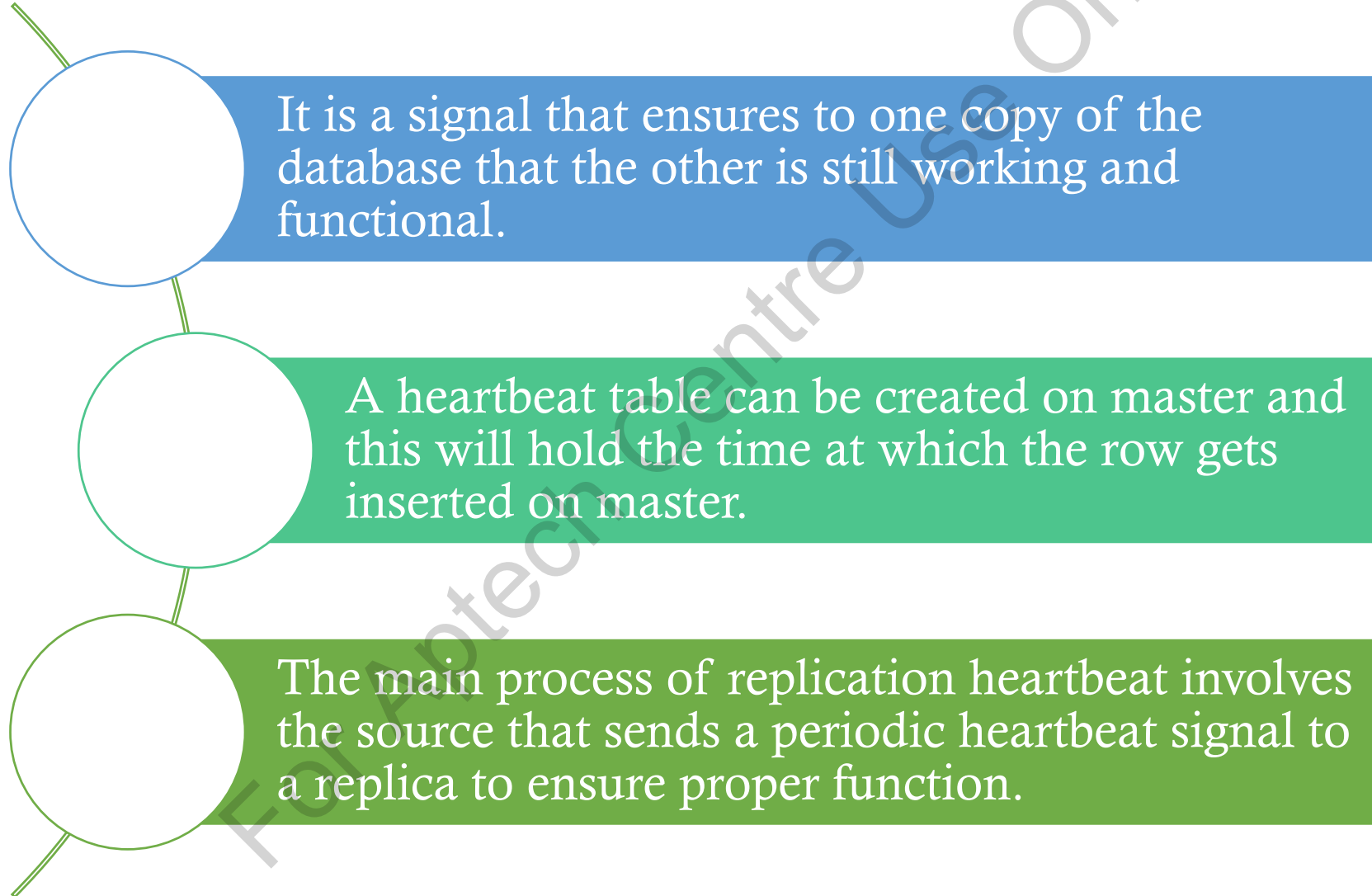
Advantages

Binary log takes less amount of space on disk

Small amounts of data will be transferred between master and slaves

Disadvantages

It is possible for non deterministic queries to carry out results on the slave that are completely different to the results that get returned

Replication Heartbeat

It is a signal that ensures to one copy of the database that the other is still working and functional.

A heartbeat table can be created on master and this will hold the time at which the row gets inserted on master.

The main process of replication heartbeat involves the source that sends a periodic heartbeat signal to a replica to ensure proper function.

Replication Solution

Handling unforeseen stoppage of replica

Use replication with several replica storages and sources

Use appropriate methods for replication as per the requirements

Improve the replication performance by having good hardware resources such as RAM.CPU, and SSD

Switch sources during failover

Summary

- Replication allows us to copy data from one MySQL database server which is also known as Source to one or more MySQL Database Servers which is known as replicas.
- By implementing different topologies. It is plausible to add another replica to a replication configuration that already exists without stopping the primary server (source).
- There are mainly two types Of replications format. One is statement Based Replication which replicates the entire SQL statement and the other is Row Based Replication where only the changed rows are replicated.
- Using Replication it is possible to perform Scale out operation on Database.
- Scalability refers to the capability to extend the Database and the load of the application queries across several MySQL Servers.