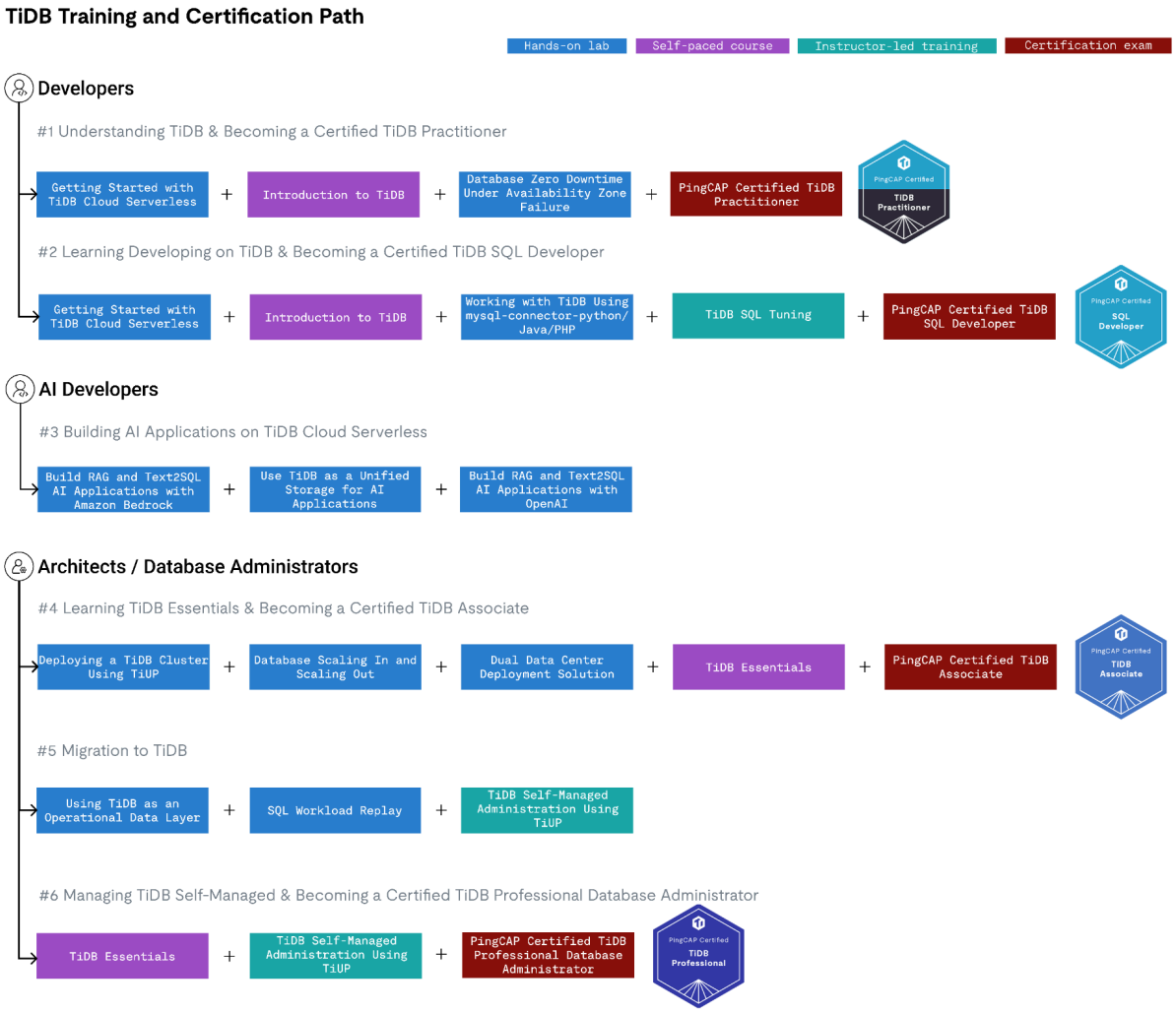
Table of Contents

Overview

PingCAP offers interactive hands-on labs, self-paced courses, and professional instructor-led training classes to help users get ramped up quickly on TiDB and TiDB Cloud. Architects, backend developers, AI developers, database administrators and operations professionals can benefit from the training program and demonstrate their expertise by earning a globally recognized certification.



Note:

1. All the hands-on lab resources are available at the TiDB Hand-on Lab Platform.
2. All the self-paced learning and certification resources are available at the TiDB Training and Certification Platform.
3. Instructor-led training includes public training class and private training class, and can be delivered remotely or in person.

TiDB Training and Certification Paths

#1 Understanding TiDB & Becoming a Certified TiDB Practitioner

Training and Certification	Duration	Content Type	Get Started
Lab - Getting Started with TiDB Cloud Serverless	90 minutes	Hands-on Lab	Start lab
Course - Introduction to TiDB	1.5 hours	Self-paced online learning	See details
Lab - Database Zero Downtime Under AZ Failure	60 minutes	Hands-on Lab	Start lab
Exam - PingCAP Certified TiDB Practitioner	50 minutes	Online proctored	See details

#2 Learning Developing on TiDB & Becoming a Certified TiDB SQL Developer

Training and Certification	Duration	Content Type	Details
Lab - Getting Started with TiDB Cloud Serverless	90 minutes	Hands-on Lab	Start lab
Course - Introduction to TiDB	1.5 hours	Self-paced online learning	See details
Lab - Working with TiDB Using mysql-connector-python	90 minutes	Hands-on Lab	Start lab
Lab - Working with TiDB Using JDBC	90 minutes	Hands-on Lab	Start lab
Course - Working with TiDB from PHP	3 hours	Self-paced online learning	See details
Course - TiDB SQL Tuning	2 days	Instructor-led training	See details
Exam - TiDB SQL Developer	90 minutes	Online proctored	See details

#3 Building AI Applications on TiDB Cloud Serverless

Training and Certification	Duration	Content Type	Details
Lab - Build RAG and Text2SQL AI Applications with Amazon Bedrock	90 minutes	Hands-on Lab	Start lab
Lab - Use TiDB as a Unified Storage for AI Applications	90 minutes	Hands-on Lab	Start lab
Lab - Build RAG and Text2SQL AI Applications with OpenAI	90 minutes	Hands-on Lab	Start lab

#4 Learning TiDB Essentials & Becoming a Certified TiDB Associate

Training and Certification	Duration	Content Type	Details
Lab - Deploying a TiDB Cluster Using TiUP	90 minutes	Hands-on Lab	Start lab
Lab - Database Scaling In and Scaling Out	45 minutes	Hands-on Lab	Start lab
Lab - Dual Data Center Deployment Solution - TiDB Disaster Recovery Auto-Sync	100 minutes	Hands-on Lab	Start lab
Course - TiDB Essentials	1 day	Self-paced online learning	See details
Exam - TiDB Associate	80 minutes	Online proctored	See details

#5 Migration to TiDB

Training and Certification	Duration	Content Type	Details
Lab - Using TiDB as an Operational Data Layer	90 minutes	Hands-on Lab	Start lab
Lab - SQL Workload Replay	90 minutes	Hands-on Lab	Start lab
Course - TiDB Self-Managed Administration Using TiUP	2 days	Instructor-led training	See details

#6 Managing TiDB Self-Managed & Becoming a Certified TiDB Professional Database Administrator

Training and Certification	Duration	Content Type	Details
Course - TiDB Essentials	1 day	Self-paced online learning	See details
Course - TiDB Self-Managed Administration Using TiUP	2 days	Instructor-led training	See details
Exam - TiDB Professional Database Administrator	80 minutes	Online proctored	See details

Appendix

1. Course - Introduction to TiDB

This course introduces the core components and their concepts to build up the distributed TiDB cluster and TiDB Cloud.

Course Overview	
• **Audience:** Architects, Developers and DBAs • **Level:** Introductory	• **Duration:** 1.5 hours • **Prerequisites:** None
Free, on-demand videos and exercises available. *Start free learning*	
Course Outline	
• The Reasons for Choosing TiDB • TiDB Overall Architecture • The SQL Layer - A Distributed MySQL • The Storage Layer - A Distributed Key-Value Store • The Translytical Platform - TiDB HTAP • TiDB Cloud Introduction • Real-World User Cases	

2. Course - TiDB Essentials

This course focuses on the architecture and design principles of TiDB, which is the basis for administration, development, performance tuning and troubleshooting.

Course Overview	
• **Audience:** Architects, Developers and DBAs • **Level:** Intermediate • **Duration:** 1 day	• **Prerequisites:** Basic computer, operating system, network and database knowledge; Ability to read simple SQL statements.
Free, on-demand videos and exercises available. ***Start free learning***	
Course Outline	

01: TiDB Database Architecture Overview
• TiDB Database Architecture Overview
  ○ Understand the overall architecture of TiDB
  ○ Describe the key features of TiDB server, TiKV server, and Placement Driver (PD) server
• TiDB Server
  ○ Describe TiDB server's architecture
  ○ Describe TiDB server's role in TiDB cluster
  ○ Describe TiDB server's processes
  ○ Describe TiDB server's server cache
• TiKV Server
  ○ Understand TiKV server's architecture
  ○ Describe the data persistence and read operations in TiKV
  ○ Understand how TiKV cluster provides MVCC and distributed transaction support
  ○ Understand the distributed consistency based on the Raft algorithm
  ○ Understand TiKV server's Coprocessor
• Placement Driver Server
  ○ Understand PD server's architecture and features
  ○ Understand TSO (Timestamp Oracle) concept and its purpose
  ○ Understand scheduling process
  ○ Understand the relationship between labels and high availability
	• TiDB SQL Execution Process
	  ○ Describe the process of reading and writing data with DML
	  ○ Describe the execution flow of DDL
	02: TiDB HTAP
	• HTAP Overview
	  ○ Understand HTAP (Hybrid Transactional/Analytical Processing) technology
	  ○ Understand the HTAP architecture of TiDB database
	  ○ Understand the HTAP core functions of the TiDB database
	• TiFlash Overview
	  ○ Describe the architecture of TiFlash
	  ○ Understand the main functions of TiFlash
	03: New Features of TiDB v6.0
	• Understand Placement Rules in SQL
	• Describe small table cache
	• Understand in-memory pessimistic lock
	• Understand Top SQL
	04: TiDB Cloud
	• Describe why you should consider the "The Cloud"
	• Describe TiDB Cloud account types
	• Compare and contrast TiDB and TiDB Cloud
	• Get you to create a TiDB Cloud account and try it

3. Course - TiDB Self-Managed Administration Using TiUP

This course guides you learn about managing TiDB Self-Managed, backup and restore strategies, as well as the scenarios and common usage of some ecosystem tools.

<table>
<tr><th colspan="3">Course Overview</th></tr>
<tr><td colspan="2">

- **Audience:** Database administrators
- **Level:** Intermediate
- **Duration:** 2 days

</td><td>

- **Prerequisites:** You have completed TiDB Essentials, or you should be familiar with distributed database operation and administer or equivalent work experience.

</td></tr>
<tr><td colspan="3">Public training available. Check the public training schedule and purchase a seat.</td></tr>
<tr><td colspan="3">Private training available. To purchase a private training, please speak to your PingCAP representative or contact sales.</td></tr>
<tr><th colspan="3">Course Outline (1/2)</th></tr>
<tr><td>

01: TiDB Cluster Deployment

- Describe TiUP
- Understand how to deploy a TiDB Cluster
- Understand how to connect to TiDB

02: Connecting to TiDB

- Understand the scope of TiDB system variables
- Understand TiDB configuration file parameters
- Describe how to modify TiDB system variables
- Describe how to modify TiDB configuration file parameterS

</td><td>

03: Security and User Management

- Understand authentication and authorization
- Understand the levels of access privileges for users
- Manage TiDB user accounts
- Grant and revoke privileges
- Use SQL statements to manage accounts

04: Maintaining a TiDB cluster

- Understand how to scale out and scale in TiDB cluster components
- Understand how to clean up and Delete a TiDB cluster
- Understand the timezone in TiDB
- Describe placement rule
- Understand how to upgrade a TiDB cluster
- Understand how to monitor a TiDB cluster

</td><td>

05: Resource Control

- Describe what resource control is
- Understand the decision logic of resource control
- Discuss the usage scenarios of resource control
- Explain how to use resource control
- Understand a real-world use case of resource control

06: Backup Terminology and Strategies

- Describe TiDB backup types
- Compare the various backup techniques

07: Importing Data using TiDB Lightning

- Describe what TiDB Lightning is
- Explain when and how to use TiDB Lightning
- Using TiDB Lightning to import data

</td></tr>
<tr><th colspan="3">Course Outline (2/2)</th></tr>
</table>

08: Exporting Data using Dumpling

- Explain when and how to use Dumpling
- Use Dumpling to perform logical backups

09: Backup and Restore

- Describe what BR is
- Explain when and how to use BR
- Using BR to backup and restore TiDB cluster data
- Understand point-in-time recovery (PITR)
- Understand how to recover from data loss

10: Using sync-diff-inspector to Validate Data

- Describe the key features of sync-diff-inspector
- Explain when and how to use sync-diff-inspector
- Using sync-diff-inspector to compare schema and data

11: Migrating Data from MySQL-compatible Databases with TiDB Data Migration (DM)

- Describe the key features of TiDB Data Migration
- Explain when and how to use TiDB Data Migration
- Replicate data from MySQL-compatible upstream by using TiDB Data Migration cluster

12: Replicating TiDB Change Events Using TiCDC

- Describe the key features of TiCDC cluster
- Explain when and how to use TiCDC cluster
- Using TiCDC cluster to fan out database change events to downstreams

4. Course - TiDB SQL Tuning

This course provides in-depth knowledge and practical skills to optimize SQL performance in TiDB. You will learn to design effective table and index structures, manage partitioned tables, and understand the SQL optimization processes.

Course Overview

- **Audience:** SQL developers or DBAs
- **Level:** Intermediate
- **Duration:** 2 days

- **Prerequisites:** A good working knowledge and understanding of SQL statements is assumed. Completing the TiDB training courses, Introduction to TiDB is recommended.

Public training available. ***Check the public training schedule and purchase a seat***.

Private training available. To purchase a private training, please speak to your PingCAP representative or ***contact sales***.

Course Outline

01: Clustered and Non-Clustered Indexes Considerations for Performance

- Understand the primary key and the underlying indexes in TiDB
- Describe the query (SELECT) process
- Describe the data modification (INSERT / UPDATE / DELETE) process
- Describe the TiKV Region split process
- Performance tune common TiKV Region hotspots issues

02: Secondary Indexes and Partitioned Tables

- Understand and create secondary indexes
- Understand the table partition types
- Create partitioned tables
- Modify partitioned tables
- Describe the best practices with partitioned tables

03: Optimizer Fundamentals

- Describe each phase of SQL statements processing
- Explain the functionality of the optimizer
- Explain the various phases of optimization
- Display execution plans
- Monitor SQL statements

04: Optimizing Queries

- Describe the operators and data aggregators for tables and indexes
- List the possible access paths for tables and indexes
- Use indexes to improve query performance
- Describe the aggregation function operators
- Describe the operators for joins
- List the possible access paths for joins
- Describe the TiFlash MPP architecture
- Use TiFlash to improve query performance

05: Cost Based Optimizer (CBO) Statistics Management

- Explain how CBO statistics works
- Understand the fundamental components of statistics
- Display CBO statistics
- Gather CBO statistics
- Import and export statistics
- Use dynamic pruning to optimize queries for partitioned tables

06: Best Practices for SQL Tuning in TiDB

- Control execution plans with optimizer hints
- Control execution plans with SQL Plan Management (SPM)
- Understand the best practices for using indexes and writing effective SQL

6. Course - Working with TiDB from PHP

This course guides you through a series of concepts and hands-on best practices to implement read and write operations via PHP. Two APIs are introduced: mysqli and PDO_MySQL.

Course Overview

- **Audience:** SQL and PHP developers
- **Level:** Introductory
- **Duration:** 3 hours
- **Prerequisites:** Experience with PHP programming and SQL

Free, on-demand videos and exercises available. ***Start free learning***

Course Outline

01: Using Database Connector

- Explain what a database connector is
- Describe TiDB Connector
- Access TiDB via PHP
- Describe the benefits of connection pooling
- Handle NULL values in the result set

02: Using Prepared Statements

- Describe the reasons for using prepared statement and its limitations
- Use MySQL Client to execute PREPARE, EXECUTE, and DEALLOCATE on prepared statement
- Describe the execution plan cache
- Use prepared statement in your program

03: Exception Handling

- Set SQL mode to modify the behavior of error output
- Use SHOW WARNINGS and SHOW ERRORS
- Interpret error messages
- Handle exceptions in PHP

7. Exam - TiDB Practitioner

The PingCAP Certified TiDB Practitioner demonstrates your understanding of the TiDB's basic concepts, terminology, and use cases. It is an **entry-level** certification designed for anyone who is interested in TiDB, even if you have little experience with TiDB or database technologies. This **beginner-friendly, absolutely free** certification can be retaken as many times as necessary until you succeed. It is a good starting point to pursue advanced PingCAP Certifications on TiDB.

<table>
<tr><th colspan="2">Exam Overview</th></tr>
<tr><td>

Audience: Any roles
Prerequisites: None
Level: Foundational
Price: Free
Time Allotted: 50 minutes

</td><td>

Format: 20 questions that may be multiple choice, multiple response
Delivery Method: Online proctored
Prepare for the exam: #1 Understanding TiDB & Becoming a Certified TiDB Practitioner

</td></tr>
<tr><td colspan="2">Free, Online proctored exam available. Register Now!</td></tr>
<tr><th colspan="2">Exam Outline</th></tr>
<tr><td colspan="2">

TiDB Basic Concepts and Terminologies
TiDB Core Components
TiDB Features for Analytical Workloads
TiDB Use Cases

</td></tr>
</table>

8. Exam - TiDB Associate

This credential helps organizations identify and develop talent with critical skills for deploying, managing, and operating workloads on TiDB and TiDB Cloud. **To earn this certification, you can either purchase a seat on the training and certification platform by yourself or speak to your PingCAP Sales representative directly.**

Exam Overview	
• **Audience:** Database administrator • **Objective:** To validate candidates' proficiency in the architecture, core principles, and design principles of the TiDB database. • **Prerequisites:** None • **Level:** Associate • **Price:** $100 USD	• **Time Allotted:** 80 minutes • **Format:** 50 questions that may be multiple choice, multiple response, fill-in-the-blanks or ordering. • **Delivery Method:** Online proctored • **Prepare for the exam:** #4 Learning TiDB Essentials & Becoming a Certified TiDB Associate
Exam Outline (1/2)	
01: TiDB Database Architecture - 50% of exam	

Describe the TiDB database architecture overview
• Describe the overall architecture of TiDB database
• Identify the key features of TiDB Server, TiKV, and PD
  ○ Identify the TiDB Server features
  ○ Identify the PD features
  ○ Identify the TiKV features
TiDB Server
• Describe the TiDB Server architecture
• Identify the functions of TiDB Server
  ○ Compiling SQL statements
  ○ Parse of SQL statements
  ○ Understand the modules related to SQL reads and writes
  ○ Understand the relational data and KV transformation
  ○ Online DDL
  ○ TiDB Server GC
• Understand the process of TiDB Server
• Understand the cache of TiDB Server
TiKV (1/2)
• Describe the architecture and features of TiKV
	TiKV (2/2)
	• Understand the data persistence of TiKV
	  ○ Identify RocksDB features
	  ○ Understand RocksDB writing process
	  ○ Understand RocksDB query
	• Describe how TiKV provides MVCC and distributed transaction
	• MVCC
	• Distributed transactions
	• Understand the consistency of TiKV based on raft
	  ○ Understand the Raft log replication
	  ○ Understand the write to TiKV
	  ○ Understand the read to TiKV
	• Coprocessor
	PD（Placement Driver）
	• Describe the architecture and functions of PD
	• Understand the allocation of TSO
	• Understand the scheduling process
	  ○ Scheduling: general process
	  ○ Scheduling: information gathering
	  ○ Scheduling: generating schedules
	• Understand the labels and high availability

Exam Outline (2/2)	
02: TiDB HTAP - 20% of exam	

Describe the TiDB database HTAP overview
• Understand the HTAP technology
• Describe the TiDB HTAP architecture
• Understand the core features of HTAP
  ○ MPP features
• Understand the hybrid workload scenario
• Understand the streaming scenario
	TiDB HTAP
	• Describe the DML process
	  ○ The writes execution
	  ○ The reads execution
	• Describe the DDL process
	  ○ online DDL
	TiFlash
	• Describe the architecture and features of TiFlash
	• Understand the core functions of TiFlash

03: TiDB 6.1 New Features - 20% of exam	
• Understand the placement rules in SQL • Cached Tables • In-memory pessimistic lock	• Top SQL • TiUniManage
04: TiDB Cloud - 10% of exam	
• Describe the architecture of TiDB Cloud	• Identify the features of TiDB Cloud

9. Exam - TiDB Professional Database Administrator

This credential is designed to validate candidates' proficiency in TiDB's principles, large-scale TiDB clusters management as well as TiDB tools, such as TiDB Lightning, TiDB Data Migration, TiCDC, sync-diff-inspector and troubleshooting skills. **To earn this certification, you can either purchase a seat on the training and certification platform by yourself or speak to your PingCAP Sales representative directly.**

<table>
<tr><th colspan="2">Exam Overview</th></tr>
<tr><td>

- **Audience:** Database administrator
- **Objective:** To validate candidates' proficiency in TiDB's principles, large-scale TiDB clusters management as well as TiDB tools
- **Prerequisites:** You have to pass the TiDB Associate certification exam.
- **Level:** Professonal

</td><td>

- **Price:** $240 USD
- **Time Allotted:** 80 minutes
- **Format:** 50 questions that may be multiple choice, multiple response or ordering
- **Delivery Method:** Online proctored
- **Prepare for the exam**: #6 Managing TiDB Self-Managed & Becoming a Certified TiDB Professional Database Administrator

</td></tr>
<tr><th colspan="2">Exam Outline (1/2)</th></tr>
<tr><td colspan="2">01: TiDB Cluster Administration - 50% of exam</td></tr>
<tr><td>

TiDB Cluster Deployment
- Use TiUP to deploy TiDB cluster
- Start and Stop TiDB cluster
- Describe the stages of TiDB cluster startup
- Describe TiDB cluster configuration and log files
- Create TiDB cluster in the TiDB Cloud

Connecting to TiDB
- Understand the TiDB compatibility with MySQL
- Describe how to connect to TiDB server

Configuring TiDB
- Understand TiDB system variables
- Understand the scope of TiDB system variables
- Understand TiDB configuration file parameters
- Describe how to modify TiDB system variables
- Describe how to modify TiDB configuration file parameters

Security and User Management
- Understand authentication and authorization
- Understand the levels of access privileges for users
- Manage TiDB user accounts
- Grant and revoke privileges
- Use SQL statements to manage accounts

</td><td>

TiDB Monitoring Tools
- Describe the monitoring and alerting framework
- Identify common monitoring metrics
- Monitor TiDB cluster status on Grafana panels
- Monitor TiDB cluster status on TiDB Dashboard

TiDB Cluster Operational Tasks
- Rename a TiDB cluster
- Scale out TiDB cluster components
- Scale in TiDB cluster components
- Tear down a TiDB cluster
- Change the timezone of TiDB

Upgrading TiDB Cluster (On-premises)
- Describe the TiDB versioning
- Patch the TiDB cluster
- Upgrade the TiDB cluster

</td></tr>
<tr><th colspan="2">Exam Outline (2/2)</th></tr>
</table>

02: TiDB Cluster Backup and Recovery - 25% of exam	
Backup Terminology and Strategies • Describe TiDB backup types • Describe TiDB backup techniques • Compare the various backup techniques • Perform backups on TiDB Cloud cluster Exporting Data using Dumpling • Explain when and how to use Dumpling • Use Dumpling to perform logical backups Importing Data using TiDB Lightning • Describe what TiDB Lightning is • Explain when and how to use TiDB Lightning	Using TiDB Lightning to import data • Using BR for Backup and Restore • Describe what BR is • Explain when and how to use BR Using BR to backup and restore TiDB cluster data • Using sync-diff-inspector to Validate Data • Describe the key features of sync-diff-inspector • Explain when and how to use sync-diff-inspector • Using sync-diff-inspector to compare schema and data
03: TiDB Cluster Synchronizing and Migrating Data - 25% of exam	
Migrating Data from MySQL-compatible Databases with TiDB Data Migration (DM) • Describe the key features of TiDB Data Migration • Explain when and how to use TiDB Data Migration • Replicate data from MySQL-compatible upstream by using TiDB Data Migration cluster	Replicating TiDB Change Events Using TiCDC • Describe the key features of TiCDC cluster • Explain when and how to use TiCDC cluster • Using TiCDC cluster to fan out database change events to downstreams

10. Exam - TiDB SQL Developer

This credential is designed to assess the skills and knowledge of developers in using the unique features of TiDB, creating highly available and elastic applications with TiDB, and following best practices when working with the database. **To earn this certification, you can either purchase a seat on the training and certification platform by yourself or speak to your PingCAP Sales representative directly.**

Exam Overview	
• **Audience:** Developer • **Objective:** To assess the skills and knowledge of developers in using the unique features of TiDB, creating highly available and elastic applications with TiDB, and following best practices when working with the database. • **Prerequisites:** None • **Level:** Associate	• **Price:** $100 USD • **Time Allotted:** 90 minutes • **Format:** 60 questions that may be multiple choice, multiple response • **Delivery Method:** Online proctored • **Prepare for the exam**: #2 Learning Developing on TiDB & Becoming a Certified TiDB SQL Developer
Exam Outline	
01: TiDB Architecture - 15% of exam	
• Describe the TiDB Cluster Architecture • Identify the TiDB Server Features • Identify the PD Features • Identify the TiKV Features • Identify the TiFlash Features • Describe what HTAP is	
02: TiDB SQL Application - 30% of exam	
• Querying Data in TiDB • Data Types and Expressions • Functions and Expressions • Joins • Subqueries	
03: TiDB Specific Features and Transaction Control - 30% of exam	
• Use AUTO_RANDOM • Use AUTO_INCREMENT • Use Placement Policy • Use Temporary Table • Use Cached Table	
04: Best Practices for Developing on TiDB - 25% of exam	
• Understand Best Practices in Designing Tables • Understand Best Practices in Writing SQL	