



# Intel® Select Solutions for PingCAP TiDB\*



TiDB launched by data company PingCAP\* is an open source converged database product targeted at online hybrid transactional/analytical processing (HTAP). It features one-click horizontal scaling, strongly consistent multi-copy data security, distributed transactions, and real-time OLAP. At present, some enterprises have hundreds of millions of data entries and hope to achieve good OLTP and QPS performance while maintaining massive data storage capacity, and obtain real-time computing capabilities. In this regard, TiDB database is their preferred choice.

At present, TiDB has been widely used in financial services, Internet, manufacturing and other industries, providing high performance capabilities such as real-time data processing and real-time business analysis. For TiDB users, Intel offers performance-validated and optimized Intel® Select solutions that include Intel® Xeon® Gold 5118/6140 processors, Intel® SSD DC P4510 Series, Intel® Ethernet Adapter X710-DA2 to help users to efficiently leverage TiDB performance and better explore the value of data.

## TiDB Provides Open Source Distributed Database Solutions

In recent years, with the rapid development of technologies such as mobile Internet, Internet of Things, and artificial intelligence has driven the explosive data growth, which requires enterprise databases to be able to cope with massive data and instant requests for ultra-large networks, and urges the traditional IT architectures to increase their flexibility, reliability, mobility and security. Compared with traditional databases, TiDB supports distributed ACID transactions through such features as high concurrency, high availability and elastic scalability, and can handle both transactional and analytical services.

For enterprises facing massive data storage and processing, TiDB has several advantages to help improve their database capabilities:

- It provides hybrid transactional and analytical processing capabilities, and supports both real-time online transaction processing (OLTP) and online analytical processing (OLAP) through a unified platform.
- TiDB database is highly compatible with MySQL databases and supports the switching of the business back-end support database from MySQL to TiDB without affecting the normal operation of the business system.
- With horizontal elastic scalability, when database performance encounters bottlenecks, it allows enterprises to realize horizontal expansion of TiDB by adding nodes, making it easy to cope with high concurrency and massive data scenarios.

- TiDB database provides strong consistency guarantee, making it easy to implement automated recovery in the event of a failure without any required manual intervention.
- Integrated with cloud platforms, users can run TiDB database on cloud computing, and it supports public cloud, private cloud and hybrid clouds, providing a comprehensive cloud database solution.

## Intel® Select Solutions for PingCAP TiDB

Intel® Select Solutions for PingCAP TiDB use workload-optimized and validated components to help enterprise users optimize the performance and cost efficiency of TiDB database deployment while significantly reducing the time required to evaluate, test, and configure the infrastructure.

Specifically, Intel® Select Solutions for PingCAP TiDB are powered by Intel® Xeon® Gold 5118/6140 processors, Intel® SSD DC P4510 Series and Intel® Ethernet Adapter X710-DA2, enabling enterprises to quickly leverage reliable and comprehensive solutions. The Solutions also provide the following outstanding features:

- Optimized performance makes TiDB database solutions better, to achieve data processing needs in high-concurrency and massive data scenarios.
- It can save the total cost of ownership (TCO) of database system, reduce the time for managing multiple database solutions, and thus spare more time to deliver business values to your company and your customers.
- It provides a verified and optimized software and hardware integration solution to reduce deployment and operation and maintenance difficulties and time.

### Hardware Selections

In this solution, Intel and PingCAP chose the Intel® Xeon® Scalable processor that can support the most demanding workloads. The "Base" configuration uses the Intel® Xeon® Gold 5118 processor which can provide an optimal balance of price and performance, while the "Plus" configuration uses the Intel® Xeon® Gold 6140 processor which can provide enhanced performance and meet more stringent performance requirements (a list of configurations is shown in Appendix 1).

## What Are Intel® Select Solutions?

Intel Select Solutions are pre-defined, workload-optimized solutions designed to minimize the challenges of infrastructure evaluation and deployment. Solutions are validated by OEMs/ODMs, certified by ISVs, and verified by Intel. Intel develops these solutions in extensive collaboration with hardware, software and operating system vendor partners and with the world's leading data center and service providers. Every Intel Select Solution is a tailored combination of Intel® data center compute, memory, storage, and network technologies that delivers predictable, trusted, and compelling performance.

To qualify as an Intel® Select Solution, solution providers must:

1. Meet the software and hardware stack requirements outlined by the solution's reference-design specifications;
2. Replicate or exceed established reference-benchmark test results;
3. Publish a solution brief and a detailed implementation guide to facilitate customer deployment.

Solution providers can develop their own optimizations in order to give end customers a simpler, more consistent deployment experience.

### Intel® Xeon® Scalable processor

In business practice, TiDB databases often carry large amounts of data and support highly concurrent application scenarios, so processor performance is critical. Intel® Xeon® Scalable processor supports higher memory speed, increased memory capacity, and high scalability, delivering significant improvements in performance, advanced reliability, and hardware-enhanced security to meet the stringent workload demands of TiDB database.

### Intel® SSD DC P4510 Series

Storage data throughput and latency are critical for database performance. Intel® SSD DC P4510, designed on the basis of Intel® 3D NAND SSDs, achieves superior operational quality, reliability and advanced manageability, and can handle tasks such as read-intensive workloads, laying the foundation for higher performance of TiDB database.

## Intel® Xeon® Scalable Processors

2<sup>nd</sup> Generation Intel® Xeon® Scalable processors:

- Offer high scalability that is cost-efficient and flexible, from the multi-cloud to the intelligent edge
- Establish a seamless performance foundation to help accelerate data's transformative impact
- Support breakthrough Intel® Optane™ DC persistent memory technology
- Accelerate artificial-intelligence (AI) performance and help deliver AI readiness across the data center
- Provide hardware-enhanced platform protection and threat monitoring

Intel® Select Solutions for PingCAP TiDB feature Intel® Xeon® Gold processors.



## Intel® Ethernet Adapter X710-DA2

Powered by 10 Gigabit Intel® Ethernet 710 Series, this solution can provide validated performance and satisfy high quality thresholds for most media types and port speeds in terms of data resiliency and service reliability, and is backed by extensive testing, validation and global product support.

## Verified Performance through Benchmark Testing

All Intel® Select solutions are verified through benchmark testing to meet the specified level of functionality for workload-optimized performance. For Intel® Select Solutions for PingCAP TiDB, the TiDB database performance in "Base" and "Plus" configurations are respectively tested using Sysbench\*, a modular, cross-platform, multi-threaded benchmark testing tool intended to evaluate database load under various system parameters.<sup>1</sup>

Both the Base and Plus configurations of the Intel® Select Solutions for PingCAP TiDB have been successfully verified through benchmark testing. The performance of the Plus configuration is significantly improved compared to the Base configuration, enabling faster and more TPSs and QPSs. Enterprise users can flexibly choose different configuration schemes based on actual load conditions and scalability requirements.

## Technology Selections for Intel® Select Solutions for PingCAP TiDB\*

In addition to the basic hardware recommended by Intel® Select Solutions, the Intel® technologies integrated into Intel® Xeon® scalable processors can help users further improve performance, reliability and security:

- **Intel® Volume Management Device (Intel® VMD):** It supports hot-swappable replacement of NVMe Express\* (NVMe\*) SSDs via Peripheral Component Interface Express\* (PCIe\*) without shutting down the system, and has a feature of standardized LED management helping to quickly identify the status of the SSD. This standardized design delivers enterprise-grade reliability, availability and serviceability (RAS) to NVMe SSD, allowing users to confidently deploy next-generation storage systems.
- **Intel® QuickAssist Technology (Intel® QAT):** It can accelerate key workloads such as bulk encryption, public key exchange, and data compression based on Intel® architecture platforms. Intel® QAT on Intel® Xeon® Scalable processor delivers exceptional capabilities.
- **Intel® Platform Trust Technology (Intel® PTT):** It can integrate full trusted platform module functionality into platform firmware. The new Intel® PTT function is provided as an option rather than as a stand-alone chip, simplifying integration and activation.
- **Intel® Boot Guard (Security):** It is a hardware-based boot integrity protection that prevents unauthorized software and malware from taking over boot blocks that are critical to system functionality, providing additional hardware-based platform security.
- **Intel® Hyper-Threading (HT) Technology:** It enables more efficient use of processor resources by the system, and increases process throughput to improve the overall performance of threading software.

## Optimized Basic Capabilities for TiDB Database Deployment

The Intel® Select Solutions for PingCAP TiDB provide a feasible solution for enterprises to run OLTP and OLAP services. Verified as scalable, these pre-tuned and -tested configurations can accelerate users' deployment of TiDB databases and improve performance, security, availability, etc.

## Learn More

Intel® Select Solutions: [intel.com/selectsolutions](https://intel.com/selectsolutions)

Intel® Xeon® Scalable processors: [intel.com/xeonscalable](https://intel.com/xeonscalable)

Intel® Select Solutions are supported by Intel® Builder: <http://builders.intel.com>

### Appendix 1: The Base and Plus Configurations for Intel® Select Solutions for PingCAP TiDB

PingCAP/Min 6 nodes	Base	Plus
Processor	2 x Intel® Xeon® Gold 5118 @ 2.30GHz 12C or Intel® Xeon® Gold 5218 @ 2.30GHz 16C or higher	2 x Intel® Xeon® Gold 6140 2.30GHz 18C or Intel® Xeon® Gold 6240 2.60GHz 18C or higher
Memory	96 GB or higher (12 x 8 GB DDR4-2400)	192 GB or higher (12 x 16 GB DDR4-2400)
Boot Drive	480 GB or larger Intel® SSD DC S4510	480 GB or larger Intel® SSD DC S4510
Storage Drive	4 x 1 TB or larger Intel® SSD DC P4510	4 x 1 TB or larger Intel® SSD DC P4510
Data Network	1 x 10 GB Dual-Port Intel® Ethernet Converged Network Adapter X710-DA2 SFP+ or better	1 x 10 GB Dual-Port Intel® Ethernet Converged Network Adapter X710-DA2 SFP+ or better
Management Network	Integrated 1 GbE	Integrated 1 GbE



<sup>1</sup> CONFIG1 - Base: Test by Intel & Pingcap as of 5/30/2019. 6-node, 2x Intel® Xeon® Gold 5118 Processor, 12 cores HT On Turbo ON Total Memory 96 GB (6 slots/ 16GB/ 2400 MHz), 2x 480 GB Intel® SSD DC S4510, 4x 1TB Intel® SSD DC P4501, Microcode:0x200005e, Centos 7.4, 3.10.0-957.12.2.el7.x86\_64, Sysbench 1.0.9, TiDB 2.1.8.

CONFIG2 - Plus: Test by Intel & Pingcap as of 5/30/2019. 6-node, 2x Intel® Xeon® Gold 6140 Processor, 18 cores HT On Turbo ON Total Memory 192 GB (12 slots/ 16GB/ 2400 MHz), 2x 480 GB Intel® SSD DC S4510, 8x 1TB Intel® SSD DC P4501, Microcode:0x200005e, Centos 7.4, 3.10.0-957.12.2.el7.x86\_64, Sysbench 1.0.9, TiDB 2.1.8.

Component performance tests are measured using specific computer systems. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, visit [intel.com/benchmarks](https://intel.com/benchmarks)

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark® and MobileMark®, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit [intel.com/benchmarks](https://intel.com/benchmarks)

Cost reduction scenarios described are intended as examples of how a given Intel- based product, in the specified circumstances and configurations, may affect future costs and provide cost savings. Circumstances will vary. Intel does not guarantee any costs or cost reduction.

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