CASE STUDY
Intel® Xeon® Processor E5 v2 and E7 v2 Processor Families
Intel® Ethernet Converged Network Adapter X520 Family
Intel® Solid-State Drive DC S3700 Series
Transportation
Internet of Things
Big Data

Look Inside.™

Data center architecture for Internet of Vehicles

Beijing TransWiseWay Information Technology Co., Ltd. chooses Intel® and open-source software and utilizes Intel® architecture-based solutions to establish an information service platform of Internet of Vehicles that utilize big data storage and high-performance data analysis

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"Building an Intel® architecture-based commercial and open-source platform based on Intel® Xeon® processor, Intel® Ethernet Converged Network Adapter, and Intel® Solid-State Drive that harnesses cloud computing and big data processing technology allowed us to address current business needs while providing flexibility to meet future business developments."

Xu Yingwei
Manager,
Operation and Maintenance
System Support Division, IT Center,
TransWiseWay

With the support of the government and economic growth, the number of commercial vehicles in China has increased significantly. This drives the demand for remote management and data services for commercial vehicles. As a leading provider of Internet of Vehicles services for commercial vehicles, and a supplier of public monitoring and service platforms for freight vehicles, Beijing TransWiseWay Information Technology Co., Ltd. (TransWiseWay) needed to update its data center to support the growing number of commercial vehicles. TransWiseWay deployed a commercial and open-source software solution based on Intel® architecture to build an information platform that can meet the performance challenges of massive data storage, processing, and analysis.

CHALLENGES

- **Increase storage capacity.** Expands data storage to handle existing 10 petabyte (PB)-level data from millions of commercial vehicles while enhancing storage performance and flexibility to address future data demands.
- **Improve big data processing and analysis.** Collect, process, store, and analyze vehicle terminal data in real time, and support real-time access from a large number of end points.
- **Provide blueprint for Internet of Vehicles.** Enable a safe, stable, and complete information service solution for the Internet of Vehicles and dynamically expand platform performance to meet increasing business demands.

SOLUTIONS

- **Utilize cloud computing architecture.** Deploy servers based on Intel® Xeon® processor E5-2600 v2 and E7-4800 v2 product families running on VMware vCenter* as the cloud computing architecture.
- **Harness big data processing.** Servers based on Intel Xeon processor E7-4800 v2 product family provide real-time data processing. Servers based on Intel Xeon E5-2600 v2 product family running an Apache Hadoop*/HBase* big data platform provide offline data analysis.
- **Deploy software-defined storage.** Build a software-defined and distributed storage architecture using Intel® Solid-State Drive (Intel® SSD) DC S3700 Series and Intel® Ethernet Converged Network Adapter X520 to provide highly reliable data storage and flexible expansion on a 10GbE network to improve data throughput and network performance.

IMPACT

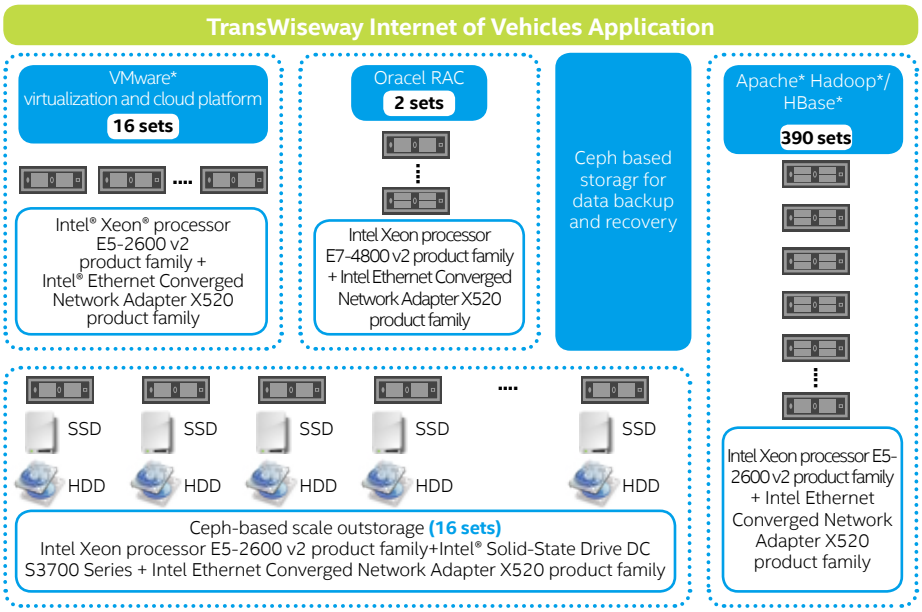
- **Addressed business needs of Internet of Vehicles for commercial vehicles.** Improved vehicle positioning, vehicle surveillance and management, analysis of traffic data, and other business needs by enabling a centralized storage and management of PB-level massive data in the data center.
- **Ensured vehicle safety and real-time tracking.** Allowed real-time management and monitoring by collecting real-time status and information from vehicles for analysis and diagnostics.
- **Ready for future business growth.** Established an agile next-generation data center architecture including storage, network, and computing performance that supports future business demands and the growth of the Internet of Vehicles.

Explosive data growth challenges data center storage and compute performance

TransWiseWay is one of the earliest to adopt an information platform of the Internet of Vehicles running on Intel architecture-based servers, and NAS storage architecture for data gathered from remote vehicles. However, when the number of vehicles approached millions, the information platform could no longer address growing business demand. The company found out that when the size of data grows above 10PB, the data center could no longer handle the collection, storage, and analysis of such massive data.

Every managed vehicle uploads about 20MB of real-time data a day. If a million vehicles are managed, the information data center will handle massive data of about 600TB a month or 7.2PB a year. To comply with government regulations and meet the needs of value-added services provided by TransWiseWay, the vehicle data needs to be stored for one year with dual-redundancy

Intel technologies provide unified storage and big data analytics capabilities for Internet of Vehicles system



System configuration of TransWiseWay's Internet of Vehicles platform under stress test

backups . Thus, one million managed vehicles would require about 14PB of storage space in the data center.

To handle the challenge of managing such a massive amount of data, TransWiseWay needed to separate the data access and storage from the rest of the Internet of Vehicles hardware platform. This allows the storage system to use new storage technology to improve performance and expand capacity.

"When the data storage capacity reaches 10PB or even higher, we have to make sure that the data center will be able to respond to data storage and performance challenges, as well as to improve data mining and analysis capabilities," said Xu Yingwei, manager for operation and maintenance at the System Support Division, IT Center, of TransWiseWay.

"Data gathered from vehicles needs to be processed in real time, with the result sent to other business systems of the Internet of Vehicles platform, such as vehicle condition warning, tracking, route calculation and planning, logistics management, and vehicle management. The data will also be used for further statistical analysis and forecasting, like analyzing average daily traffic volume and the speed of traffic and forecasting of road congestion. All these business needs depend on higher-performing servers and more advanced real-time and offline data analytics technologies," added Xu.

Improving data storage and analysis with cloud computing and big data technology

Collaborating with Intel's China Cloud Computing Innovation Center, TransWiseWay deployed an Intel® architecture-based hardware platform using both third-party commercial and open-source software and conducted a stress test on the Internet of Vehicles platform based on cloud computing and big data processing technology to address increasing computing and data storage demand from managing millions of vehicles.

During the stress testing program, 100,000, 300,000, and 500,000 vehicles' location and alarm data (speeding and fatigue driving) were simulated every hour.

LESSONS LEARNED

- Servers based on the Intel® Xeon® processor E5-2600 v2 product family running Apache Hadoop*/ HBase*platform provide high-performing big data analytics for millions of vehicles.
- Servers based on the Intel Xeon processor E7-4800 v2 product family can preform real-time analytics on large datasets in-memory and provide scalable expansion of computing performance.
- Servers based on the Intel Xeon processor E5-2600 v2 and E7-4800 v2 product families provide higher computing density and enhanced virtual support for cloud computing needs.
- Using Intel® Solid-State Drive DC S3700 Series as storage system cache significantly improves data I/O performance.
- Intel® Ethernet Converged Network Adapter X520 product family provides 10 Gbps of data throughput, preventing a bottleneck in data I/O that impacts the overall performance of the Internet of Vehicles system.

"We were extremely satisfied with the testing results. The hardware, as well as commercial and open-source software platform recommended by Intel, all met our performance requirements. They also allowed us to develop a blueprint for the Internet of Vehicles data center platform that could flexibly scale out according to our business and performance needs," explained Xu.

TransWiseWay aims to upgrade its existing data centers with the new platform based on Intel architecture. The company also sets its sights on collaborating with Intel once again to explore and analyze the development of the Internet of Vehicles system to further cater to the needs of China's transportation industry.

Find the solution that's right for your organization. Contact your Intel representative, visit Intel's **Business Success Stories for IT Managers**, and check out **IT Center**, Intel's resource for the IT industry.

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