(intel®)

Real-Time Video Surveillance Across Locations

Shanghai Ideal upgrades its regional Global Eye digital video monitoring system for real-time analytics and storage, using Intel® Distribution for Apache Hadoop* Software

> "By introducing Intel® Xeon® processors and Intel® Distribution for Apache Hadoop software into our Global Eye parallelization massive video analysis and application, our system's query and analysis capabilities have improved by more than 10 times, providing stronger support for our solutions."
>
> Dr. Ding Fujiang
> Research and Development Center
> Shanghai Ideal Information
> Industry (Group) Co. Ltd.

Shanghai Ideal Information Industry (Group) Co. Ltd., is a wholly owned subsidiary of China Telecom. It has a goal of becoming a top IT service provider, offering network and application systems integration, and software product development services.

CHALLENGES

- **Distributed analytics.** Deliver real-time analysis of video content across regional camera deployments.
- **Efficient storage.** Deliver a storage and processing solution that can scale linearly with redundant failover.

SOLUTIONS

- **Parallelized Hadoop video processing.** Deployed Intel® Distribution for Apache Hadoop software on Intel® Xeon® processor-based servers, where new processing nodes could be dynamically added without degrading video search performance.

IMPACT

- **Improved performance.** Thanks to the comprehensive optimization of the Intel hardware platform by Intel Distribution for Apache Hadoop software, the performance of Shanghai Ideal's Global Eye* system, which is based on the Intel server's platform, has been further improved.
- **Refined job control.** The Intel Distribution for Apache Hadoop software delivered more efficient job resource allocation across nodes with automated back-up.

Video Monitoring for the Masses

Video surveillance and monitoring systems have become a standard practice within urban settings to help coordinate emergency responses, route traffic, and deliver enhanced security for citizens. To deliver these services in a coordinated fashion, Shanghai Ideal created the Global Eye digital monitoring system. The system links image information from previously independent image collection points through to a broadband networked video monitoring platform. Using this centralized architecture and a tiered distributed storage system, Shanghai Ideal was able to roll out video services across previously separated regions.

"Video monitoring has become part of our lives," says Dr. Ding Fujiang of the Research and Development Center of Shanghai Ideal. "From a project as big as dam surveillance to one as small as monitoring supermarkets, digital video monitoring continues to play an important role in ensuring efficient monitoring and information transfer. However, the conventional video monitoring system operates individually, and there is no link between systems. Shanghai Ideal launched the Global Eye digital monitoring system to address this problem."

Since its deployment, Global Eye has been widely used by customers across Shanghai, including enterprises, public institutions and administrative agencies. Each of these organizations has a charter to oversee activities that may be distributed across geographic locations. Global Eye assists in this endeavor by providing thousands of monitoring points scattered across the city. By delivering convenient and accurate video data, Global Eye has become an indispensable asset to regional companies.

As deployment of new camera nodes increased Global Eye's background data entry load, the analysis application platform could no longer keep up with increased data throughput pressures. A more efficient data processing solution was needed and Shanghai Ideal chose Intel in technical cooperation.

Addressing Real-time Video Needs

A fundamental design requirement for the new system was to equip businesses with real-time image services. Businesses utilize these video feeds to make actionable decisions in times of emergencies. This dictated

Intel® Distribution for Apache Hadoop Software Equips Shanghai Ideal to Deliver Distributed Video Processing in Real-Time

high-speed performance for the background video parallelization analysis, storage, and processing subsystems.

The platform had to address two primary design goals:

▪ **Real-time analysis of video images.** For example, in security systems, once a suspect's image is collected in the front-end camera, the image collected needs to be analyzed quickly to identify the suspect and help the security team take appropriate actions.

▪ **Efficient video data storage system.** In the Global Eye system, each front-end camera's stream rate is above 6Mbps. With a large number of front-end cameras deployed in the system, the background data ingress load has dramatically increased. The new system must be able to handle the massive data capacity for background data analysis.

At the same time, the platform needs to solve limitations posted by the existing conventional system:

Inefficient video search. High-priority queries such as security-related requests not only needed to be in real time, they needed to return accurate and reliable results. Current real-time query accuracy was lagging.

Limited throughput on queries. The video of the existing system is stored in a centralized data store; in the case of large number of queries and calls, the storage system bandwidth becomes a bottleneck, hindering the overall query performance.

Poor reliability. Occasional errors in the individual cluster server can result in the failure of the entire search task because it is unable to automatically repair the clusters.

Limited management and maintenance capability. The existing system does not have a comprehensive monitoring and management system spanning hardware and software components for real-time operational response.

## An Intel Optimized Big Data Processing Solution

Since Global Eye is a platform for video parallelization, storage and analysis, it requires data-intensive distributed processing across regional servers. The Apache Hadoop platform fits nicely into that requirement. The Hadoop big data processing framework delivers the ability for dynamic scale-out capacity expansion without switching off the system. As video is imported, the system can add processing nodes in real time without degrading video search performance.

Shanghai Idea has chosen Intel Distribution for Apache Hadoop software in its implementation since it is optimized for great performance and throughput on Intel Xeon processor-based infrastructure. Intel's software teams have optimized the open source Hadoop stack to take full advantage of the Intel Xeon processor family and instruction sets such as SSE4.2 for outstanding performance.

Since Hadoop code is highly distributed, coding efficiencies are multiplied across the infrastructure, improving performance, energy consumption, and capacity requirements for servers and storage controllers. The optimizations in the Intel Distribution, along with the Intel Xeon processor family's high CPU and I/O performance, also reduce network impacts.

Intel Optimized Big Data
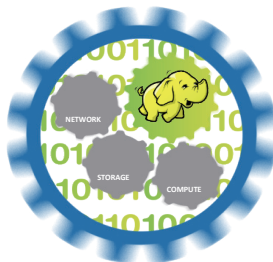
The Intel® Manager for Apache Hadoop software also delivers the management and monitoring capabilities required by Shanghai Ideal. Comprehensive management tasks, including system installation and configuration, and parameter adjustment and optimization, are all centrally controlled through the Intel Manager. Reliability is ensured with proactive alerts for key admin-defined thresholds or network events. Health checks for each node in the cluster are delivered in real time.

Efficient Distributed Video Surveillance Realized

Using Intel Distribution for Apache Hadoop software's partitioned storage architecture, the time consumed for analysis of various video applications has been dramatically shortened when compared to traditional relational database systems. The servers in the Hadoop distributed database cluster are both compute nodes and storage nodes, and use an HDFS distributed file system to unite all the nodes in the cluster into a unified file system. The access bandwidth of the HDFS distributed file system is the aggregate bandwidth for the entire network, and can be as high as several hundreds of Gbps. This completely eliminates the access bandwidth limitation for the video storage. When allocating the search tasks, Intel Distribution for Apache Hadoop software can realize storage location awareness, and then allocate the tasks to the nodes storing the videos.
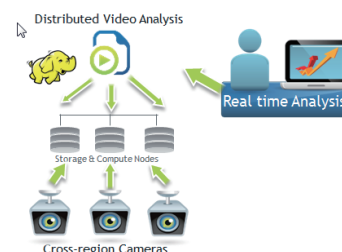
The local hard disk's bandwidth is maximized and total throughput further improved.

Increased Performance

Shanghai's system benchmarking data showed that an application that would take one hour in the previous Oracle database system improved five-fold using the Intel Distribution for Apache Hadoop software.

Reliable Search Queries

Intel Distribution for Apache Hadoop software delivers fine-grain job scheduling control and task scheduling. As the system is implementing long-lived video search tasks, the system is prepared to handle failures utilizing a stand-by task scheduler that automatically takes control. The task scheduler can be automatically re-tried on another node in the cluster.

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