Double the Power Half the Space

A 24-hour Storage Data Encryption Rally using **Spitfire StoreSafe** Enterprise Storage Security Server

AMD Opteron Dual-Core vs Intel Xeon Hyper-Threading

Why Storage Data Encryption

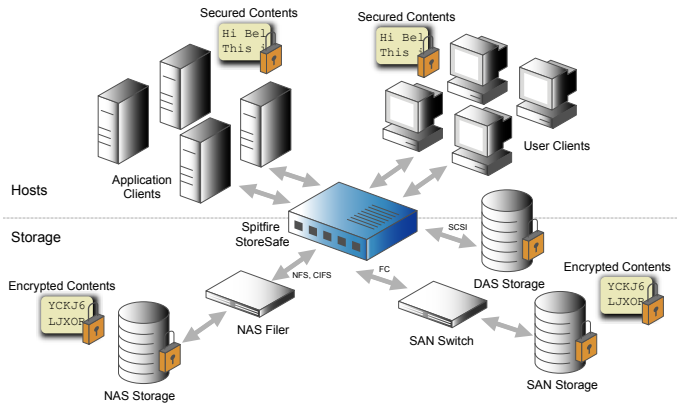
Advances in Internet, network infrastructure and technologies in the past decade opened up a new arena in network computing. Distributed data as a result of network storage, disaster recovery, backup-restore-archive, Internet and service-oriented architecture opens up data accessibility at the same time increasing risks of corporate confidential information exposure to unauthorized parties. Poor data management, virus-worms-spyware, outsourcing as well as system consolidation contribute and worsen the situation.

Perimeter security control measures like firewalls and content filters effectively block intrusions from outsiders, however, statistics have shown that there is a paradigm shift of attacks to company insiders. Having private business data lived with human operators whom can hardly be eliminated, encryption remains the last and only weapon to combat core intrusions, giving business owners a peaceful of mind in corporate data security.

Bloombase Spitfire StoreSafe

While existing cryptographic products are mostly piece-meal which are far from complete solutions, Bloombase develops and markets Spitfire StoreSafe enterprise-grade storage encryption servers to bring privacy to corporate data at transparency and efficiency.

Spitfire StoreSafe is a high performance cryptographic engine to act as a proxy to the protected storage. Spitfire StoreSafe sits half-way between enterprise application servers and storage network. By writing data through StoreSafe to the storage network, Spitfire encryption engine changes plain text data into ciphered data which appear like garbage. Trusted applications withdrawing data from storage through StoreSafe get data decrypted automatically. Spitfire StoreSafe acts as a middleman virtualizing encrypted data storage AS-IF in plain to client applications and end users.



A typical deployment of Spitfire StoreSafe for enterprise storage protection

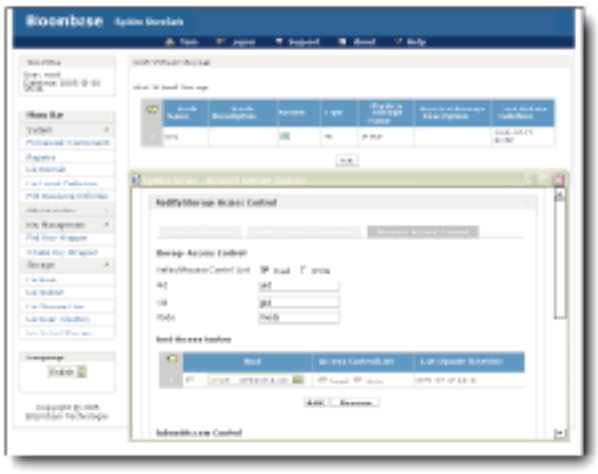
	AMD	Intel
Model	AMD Compute Node Prototype	Dell PowerEdge 2850
Chipset	AMD 8111/8131 chipset	Intel E7520 + 82801
Processor	Dual AMD Dual-core Opteron 265 at 1.8GHz/1MB Cache	Dual Intel Xeon at 3GHz/2MB Cache with Hyperthreading
Main Memory	2GB DDR400	2GB DDR2
Network Interface	Broadcom BCM5704 Gigabit Ethernet	Intel 82541 GI/PI Gigabit Ethernet
Storage	Seagate 120GB SATA hard-disk	Maxtor 36GB SCSI hard-disk ATLAS 12K2_36SCA
System	Spitfire StoreSafe for SAN 1.0 on SpitfireOS 1	Spitfire StoreSafe for SAN 1.0 on SpitfireOS 1
Form-factor	1U rack-dense	2U rack-dense

Spitfire StoreSafe appliance specifications

Cryptographic processes are complex mathematical operations which demand intensive computing resources. Enterprise core systems with data volume in terabyte order of magnitude need an efficient and scalable storage security solution to encrypt their data in wire-speed.

Real-time storage cryptography used to be an untouchable subject due to technical difficulties in numerous areas. As availability of stand -alone network storage, gigabit communications, efficient and secure cryptographic block ciphers, low cost yet high-performance computing infrastructure, as well as the increasing gap between cryptographic processing and storage speeds, one can afford to introduce encryption to persistence storage systems without degrading performance in an unacceptable extent.

This report summarizes the tests done using Spitfire StoreSafe servers running on AMD Opteron Dual-core and Intel Xeon Hyperthreading processors to study how high-performance computing can bring real -time storage encryption to reality and whether multi-core technologies would benefit the adoption of the technology.



Spitfire StoreSafe management console

Start the Rally

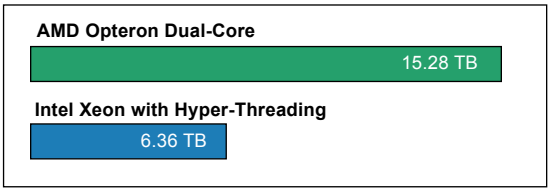
Spitfire StoreSafe enterprise storage encryption servers are installed on AMD and Intel rack-optimized server boxes. Both boxes are installed with dual processors. Intel Xeon's Hyper-Threading is turned on to establish a level playing field with AMD's dual-core. Each box has essentially four effective processing units. The machines are filled with abundant 2GB of main memory and are loaded the same version of SpitfireOS and Spitfire StoreSafe Core Cryptographic Engine.

Virtual encrypted disks are created on both machines where AES cryptographic cipher algorithm with 256-bit long encryption key is configured to secure the virtual storage. To eliminate the effect of latency which is caused by input/output (I/O) data access on physical disk systems, the virtual volumes are implemented by RAM drives of 1GB capacity such that one can achieve the minimum I/O latency. A multi-threaded data writer is launched on both systems which keeps writing random data to the encrypted volumes concurrently on random separate data blocks within the encrypted volume, creating encryption workload to Spitfire StoreSafe Core Cryptographic Engine, loading both AMD Opteron Dual-core and Intel Xeon HyperThreading processors.

The load creator is made to execute for 24 hours restless on both systems. The ensemble volume of data encrypted and written to the encrypted volumes are recorded. System resources are closely monitored during the rally to ensure they run at abundant amount of resources. Spitfire StoreSafe SNMP alerts are also monitored to observe if runtime exceptions are produced during the rally.

The Results

The tests were carried out successfully without errors found in syslog nor Spitfire StoreSafe. Majority of time both servers were running with full speed at more than 80% CPU utilization. Spitfire StoreSafe servers ran with memory consumption never exceeding 128MB over the entire rally.



Volume of data encrypted in 24 hours (Longer bar indicates better performance)

Within 24 hours, AMD-based Spitfire StoreSafe encrypted a total of 17.28TB data whereas Intel-based Spitfire StoreSafe encrypted 6.36TB. Spitfire StoreSafe running on AMD Opteron Dual-Core system is capable of encrypting more than double (2.4025 to 1) amount of those processed by Intel Xeon's. Spitfire StoreSafe easily attained an average 1.4148Gbps cryptographic throughput without creating bottleneck in nowadays storage network which operates at 1G-2G speed.

The Winner

Both servers have identical amount of memory and same configuration of Spitfire StoreSafe. They both have 4 effective processing units. AMD achieves 4-way processing by two physical dual-core Opteron chip. Intel box achieves the same by two Xeon chips with HyperThreading capability. Nevertheless, the 1U space saving AMD box brings encryption to gigabit speed that the 2U Intel box can hardly attained.

The result shows AMD's Opteron dual-core technology excels Intel Xeon's HyperThreading by more than 140% and is obviously the performance winner.

About AMD Opteron Multi-Core Processors

Multi-Core Processors - The Next Generation In Computing

Multi-core processors represent a major evolution in computing technology. This important development is coming at a time when businesses and consumers are beginning to require the benefits offered by these processors due to the exponential growth of digital data and the globalization of the Internet. Multi-core processors will eventually become the pervasive computing model because they offer performance and productivity benefits beyond the capabilities of today's single-core processors.

Multi-core processors exemplify AMD's vision to understand customers and deliver products that best meet their needs. AMD has been planning for this important evolution since the late 1990s when it first announced a strategy to place multiple cores on a single processor. Since AMD's multi-core processors will use the same straightforward and proven architecture available in single-core AMD64 processors, the company's multi-core processors will magnify the elegance of this design and offer the exceptional overall performance that AMD's customers expect.

AMD's enterprise customers can deploy new server blade systems without having to increase the physical footprint of their computer system resources, plan for additional heat dissipation, or provide additional power. Multi-core processor-based servers will deliver more overall performance than those powered by single-core processors, while at the same time will be easier to manage because more processing capacity can be concentrated into fewer servers. For the same reason, multi-core servers will be less costly to operate.

The AMD64 Multi-Core Advantage

- Ease of Migration to Multi-Core Processors
  - OEMs and system builders can easily incorporate multi-core products into their existing AMD Opteron™ processor-based and AMD Athlon™ 64 processor-based designs
  - Socket infrastructure compatible with existing 90nm single-core processor architectures (Contact your solution provider to guarantee system readiness.)
- Higher Performance Per Watt
  - Customers can experience the performance advantages of multi-core processors by getting the best performance per watt available in the market
- Direct Connect Architecture
  - For servers and workstations, the best 2-way and 4-way architecture for x86 computing
  - Addresses and helps reduce the real challenges and bottlenecks of system architecture because everything is directly connected to the CPU
  - Directly connects the processor cores to a single die to even further reduce latencies between processors

Dual-Core Processor Overview

- AMD64 processors were designed from the start to add a second core
- Port already existed on crossbar/SRI
- One die with 2 CPU cores, each core has its own 1MB L2 cache
- Drops into existing AMD Opteron processor 940-pin sockets and AMD Athlon 64 Dual-Core processor 939-pin sockets that are compatible with 90nm single -core processor architectures
- A BIOS update is all that is necessary to get a compatible system up and running with dual-core processors
- The 2 CPU cores leverage the same memory and HyperTransport™ technology resources available in single-core processors.

For more details please visit us at http://multicore.amd.com/en/

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