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WIN THE WAR AGAINST TERRORISM?**

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DATA-THROUGHPUT ACCELERATION TO SPEED ACCESS TO TERRORIST THREAT INFORMATION

By LeRoy Hand III

PERHAPS THE MOST CRITICAL CAPABILITY THAT THE TERRORIST THREAT INTEGRATION CENTER MUST DELIVER WILL BE THE NEARLY INSTANTANEOUS RETRIEVAL OF INFORMATION.

“TiGi products deliver the most powerful solutions for accelerating database system response that I am aware of today. The products do not merely enhance storage system performance – they accelerate them by many orders of magnitude”

Vice Admiral Jerry O Tuttle, USN (Ret.), Former Director Command, Control and Communications Systems for the Joint Staff

Vice Admiral Jerry O Tuttle, USN (Ret.), a highly regarded information technology strategist, recently said: “The near real-time speed by which information will need to be retrieved from the Terrorist Threat Integration Center (TTIC) network will be the alchemy of its success.” Tuttle is the former Director, Command, Control and Communications Systems for the Joint Staff.

It is easy to imagine hundreds, if not thousands, of analysts, government officials, CIA and FBI agents as well as state and local law enforcement officers all querying TTIC’s central database – or multiple databases integrated through TTIC – at the same time. All of these users will need their requested information immediately, so a correlation can be made, a plot uncovered or a suspect identified.

There are a number of hardware, software and networking combinations that can make terabytes of data accessible to users anywhere at anytime. Design approaches such as extensive use of metadata or advanced techniques to bypass normal search patterns could reduce to only seconds a query response that takes hours today. While we can’t predict the database’s eventual design, architecture or interface, we can offer with certainty one method to make any chosen approach faster: the storage of key data components using solid state devices to achieve data-throughput acceleration.

THE NEED FOR SPEED

Ask any database administrator, and he or she will confirm that the more an organization uses and depends on large networked databases, the less its mission-critical server and storage infrastructure can keep up with the demands placed on it. Broadly integrated and heavily accessed database systems of the type envisioned for TTIC are commonly plagued by latency issues – slow or no response – which seem impossible to overcome and quickly become strategic problems. Symptoms include:

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A NEW EVOLUTION IN SOLID STATE TECHNOLOGY

Over 20 years of field-tested history has proven the performance advantages of solid state media. Solid state devices have none of the moving parts that cause mechanical latency in hard drives. Operating at the speed of RAM, solid state devices offer seek times 100 to 400 times faster than hard drives. They can handle up to 35,000 I/O transactions per second, for example, compared with a typical disk drive's 150 per second transaction limit.

For years, cost was the primary obstacle to widespread reliance on solid state. Today, thanks in part to development efforts at TiGi Corporation, government and corporate organizations have begun to recognize the cost-effectiveness of solid state technology when used to accelerate rather than to store massive databases. TiGiJet data-throughput accelerators and TiGi DataManager systems innovatively combine solid state technology and rotating media with advanced software to eliminate the causes of database performance problems and thereby speed data response time.

TiGiJet data-throughput accelerators fit into any standard disk drive slot, configuring easily and without disruption to any environment to increase application performance and improve system scalability. With a 20-year estimated life cycle and non-volatile back-up to protect against loss of information, TiGiJet devices offer the reliability required for demanding environments, such as TTIC. TiGi DataManager is an intelligent data-throughput accelerator and management system that automatically and efficiently moves frequently requested data to solid state media located throughout a network.

"TiGi products deliver the most powerful solutions for accelerating database system response that I am aware of today," Vice Admiral Tuttle has said. "The products do not merely enhance storage system performance – they accelerate them by many orders of magnitude."

PROVEN IN REAL-WORLD ENVIRONMENTS

TiGi's easily duplicated real-world tests and our customers' own experiences demonstrate time and again that I/O bottlenecks are the leading cause of poor database performance. Retrieving and waiting for data stored on conventional disks strains and binds even the most powerful CPUs. By holding or storing the most-requested data in solid state, TiGiJet relieves bottlenecks, reduces processor utilization and eliminates latency.

The US Naval Research Laboratory (NRL) Center for Computational Science in Maryland has verified TiGiJet performance both in tests and daily use. NRL described TiGiJet as "capable of performing I/Os dramatically faster than conventional rotating hard disk drives. So impressive were the initial tests of the TiGiJet, that one was also used in NRL's production environment."

In one NRL test, TiGiJet delivered 54.4MB per second of sustained data throughput for block size of 64K, compared to only 9.1MB per second for their fastest magnetic hard drive. These advantages were further borne out in a recent Oracle test in which two identical 2.1GB databases with four million 24-field records were stored on both a TiGiJet and conventional hard disks. TiGiJet outperformed hard disk storage by every significant measure:

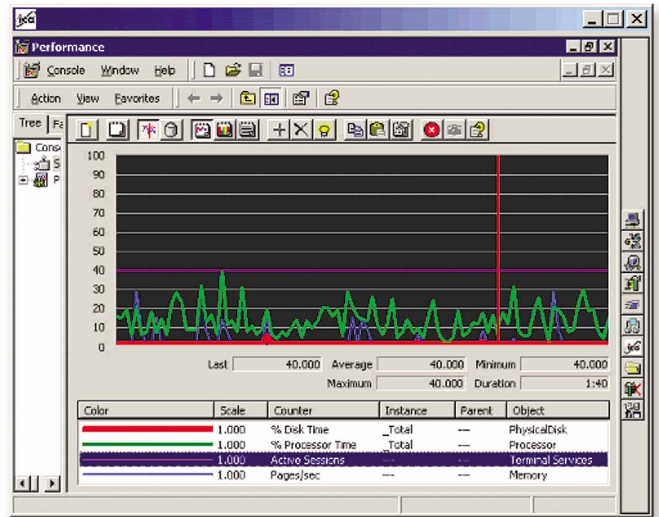
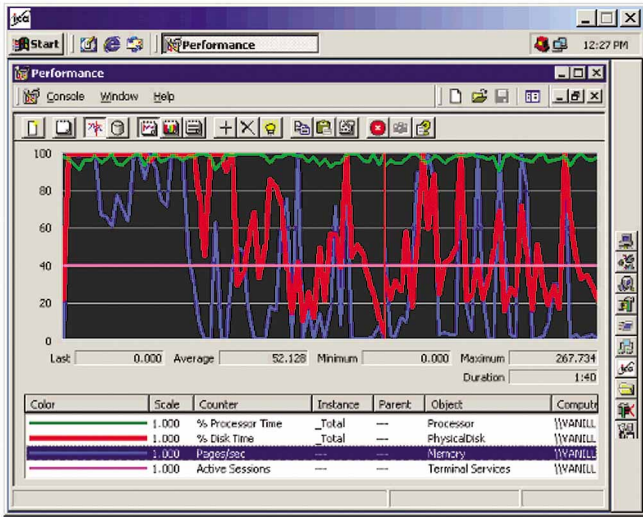
- 1522% performance advantage in random writes, in both I/O and MB per second.
- 2310% advantage in transaction completions.
- 9130% advantage in average I/O response time.
- 1431% performance advantage for total MB written and 266% performance advantage for total MB read.

While these tests involved storing an entire database on TiGiJet devices, this is not necessary to achieve the benefits of data-throughput acceleration. Performance improvements can be realized by moving only the most accessed tables, such as transaction logs or pagefiles, onto TiGiJet. In the case of TTIC, response time could be dramatically reduced by using TiGiJet to hold metadata that points to information stored in other databases or that retains previous queries.

CONCLUSION

Rapid – virtually instant – response to users' database queries will be the most important functional capability of the system deployed by the Terrorist Threat Integration Center. Regardless of the actual database architecture chosen by the system's designers, TiGi data-throughput acceleration can improve database performance by up to 2300%. TiGiJet data-throughput accelerators, TiGi DataManager software and TiGiJet Station storage solutions relieve bottlenecks, reduce processor utilization and eliminate database latency issues by moving most-requested data to RAM-fast solid state storage.

These performance advantages come without the cost of additional software development or modifications to an already complex computing environment.



Above is a typical side-by-side comparison of a system working without (left) the TiGiJet and one working with it (right). TiGiJet relieves I/O bottlenecks (red and blue lines) and reduces CPU utilization (green line) to dramatically improve performance of server-based systems.

- Unreliable or inconsistent access to information or applications that are supposed to be continuously available.
- Delayed receipt of critical communications.
- Poor user service, threatening the system’s very mission.

The first response to these performance problems is often to install more servers, increase RAM or expand storage capacity. It is possible that to reduce problems, TTIC designers will incorporate some of these solutions at the outset. But they won’t produce the intended result.

Assuming the data is properly structured and the database engine is properly tuned, the primary cause of poor database response lies elsewhere: in I/O response. Measured processor inefficiency and the resulting slow response to database queries usually indicate CPUs struggling to overcome limitations elsewhere in the system. The most effective solution to this problem is a data-throughput accelerator – such as TiGiJet – which bridges the capability gap, bringing database servers and storage into the balance required for optimum performance. ■

“The near real-time speed by which information will need to be retrieved from the Terrorist Threat Integration Center (TTIC) network will be the alchemy of its success.”

LeRoy Hand III is President and Chief Executive Officer of TiGi Corporation (www.tigicorp.com). His 35 years in Government and corporate technology management includes C3IR system engineering for DOD, NATO and OSD as well as database information systems development, analysis and architectural design. Mr Hand provided lead architectural design support to the SPAWAR 2000 Information System, Y2K Risk Assessment and Certification to the Office of the Secretary of Defense and Defense Threat Reduction Agency, and was the Program Manager and technical lead in developing the first USCINCLANT C3 Master Plan, and Joint Staff/J6 Global C3 Master Plan which used computer-based algorithms to help determine the success or failure of the US Military’s C3 Systems.

From its foundation in 2000, one of TiGi Corporation’s primary goals was to be a close partner to the US Government. The company has devoted three years to advancing its data-throughput acceleration products developed specifically to meet the government’s high-speed computational requirements. TiGi now brings to that partnership a full range of complete server, network and ultra high-speed storage and data-throughput acceleration solutions delivering Government-certified performance for the vital missions in defense, intelligence and homeland security. TiGi is an SBA-certified woman-owned small business offering products on a Small Disadvantaged Business (SDB) GSA Schedule, SEWP III and other contract vehicles.

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