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Megaplex: An Odyssey of Innovation

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Tandem Computers was born 35 years ago. My, how time flies. The Digest editor's[1] first experience with Tandem was 32 years ago when he was responsible for developing the racetrack totalizator system to be sold by Autotote of Wilmington, DE. The availability of this system was paramount, as there had been riots at racetracks when earlier totalizators had failed just before race time, and no one could buy last-minute tickets. Tandem was the obvious solution.

Jim Johnson of The Standish Group has memorialized the impact that Tandem has had on the computing industry in his paper, "Megaplex: An Odyssey of Innovation," freely available at www.standishgroup.com/megaplex. In this paper, he traces the history of Tandem's unique technical innovations and extends them to the Megaplex. He defines the Megaplex as "a fabric of resources that will provide for application services for the next 35 years."

Johnson introduces his paper with the following opening paragraph:

> *Three decades and five years ago, four founders, James Treybig, Mike Green, Jim Katzman, and Jack Loustaunou, brought forth a new system, conceived in availability, and dedicated to the proposition that there will be no single point of failure. Started in 1974, Tandem Computers quickly became a poster child for fast-paced, venture-backed high technology firms. During the past 35 years, some of the brightest and most creative engineers have worked on the Tandem NonStop platform. They have contributed to the IT industry some of the most important innovations for high-end commercial computing. This report will take you on a small stroll down memory lane, looking at the current NonStop position and usage as well as how The Standish Group believes NonStop may evolve into the future. To make this journey, we investigate 10 areas of innovation and NonStop's role in these.*

He goes on to say:

> *While it is interesting to study the past, organizations are making decisions now and need to consider how these decisions will affect them today and into the future. Today's NonStop is full of innovation and technology. In the future, NonStop technology will be the base for the Megaplex, a fabric of resources that will provide for application services for the next 35 years.*

The ten areas of innovation visited in the paper are the following:

[1] Dr. Bill Highleyman, Managing Editor

CPU (Central Processing Unit)

Johnson traces Tandem's central processing unit from the 1970's 16-bit proprietary CPU using transistor-transistor logic (TTL) to the MIPS chip sets and now to Intel's Itanium-based Integrity processors.

The Megaplex will be a fabric comprising a wide variety of processors from low-end to highly redundant systems. Organizations will be able to manage their resources by dynamically deploying services to match performance, availability, and budgetary requirements.

Operating Systems

Tandem's first operating system, and still the kernel for its current operating systems, was Guardian (later a personality along with OSS on top of the NonStop Kernel). Guardian was unique for its time since it was a message-oriented, distributed processing operating system that provided fault tolerance, data integrity, and scalability.

The Standish Group sees today's operating systems merging into a Megaplex operating environment comprising a lightweight kernel surrounded by operating utilities. These utilities will provide personas such as NonStop or VMS incorporating Tandem's fault-tolerant facilities.

Programming Language

Tandem's first programming language was TAL – the Tandem Application Language. To speed application development, Tandem offered Encompass to speed the writing of online transactions and Enform for report writing. NonStop systems now support the object-oriented languages C++ and Java. Today, NonStop applications can be developed on any platform using Eclipse.

In the future, organizations will do away with periodic releases of massive applications and will instead have a continuous development process of smaller units of work. These micro-applications will be managed through the Megaplex fabric.

Database

Tandem's databases have progressed from flat files through Enscribe to the linearly scalable, massively parallel NonStop SQL.

In the Megaplex, all databases will be equal and transparent. Data will reside in any database, including Oracle, Sybase, NonStop SQL, SQL Server, and DB2. Data will be reorganized to reflect the operational needs of the function (OLTP, ODS, BI, etc.). This reorganization will be accomplished by the Megaplex with little if any intervention from operations staff.

Storage

Applications to which Tandem systems were originally applied – stock exchanges, ATM, and POS – had relatively small storage requirements. However, data integrity was paramount and was supplied by Tandem's mirrored disks with dual data paths. The NonStop platform was able to scale to massive amounts of directly-attached or network-attached storage to satisfy the requirements for such applications as data warehousing and business intelligence.

The future of NonStop storage is in the transparent, virtualized storage of the Megaplex. This storage will benefit from industry-wide advances in storage technology that require no application changes.

Networks

Tandem's influence on network technology was driven by its need for high-speed, reliable interprocessor communication. Starting with the dual Dynabus, Tandem followed with the fiber-optic FOX interconnect and then today's ServerNet fabric, which has become the basis for the industry-standard InfiniBand.

NonStop has an extremely low rate of security incidents. In the Megaplex, NonStop will be the heart of a smart network that will direct activities to achieve the best use of the Megaplex's resources while protecting them from unwanted intrusion and malicious behavior.

Systems

Tandem's real innovation was reflected in its multiprocessor system architecture. This provided not only massive scalability but also fault tolerance – all the way down to dual fans. Though until recently using proprietary components, NonStop BladeSystems now use standard HP blade components. The only unique component is a ServerNet board in each blade processor.

In the Megaplex, there will be no specific NonStop hardware. The innovative functional technology brought about by Tandem will live on to provide availability, scalability, and security of all of the resources within the Megaplex.

Administration

The number of people required to manage a NonStop system is a fraction of what is required by other systems. A single operator can manage hundreds of NonStop processors and dozens of systems from a single console. Other administrative advancements include remote problem resolution, rolling software and hardware upgrades, and online backups and restores.

The Megaplex will inherit HP's fully automated management capability, which it calls Business Technology Optimization (BTO). BTO will benefit from the capabilities of NonStop, making the Megaplex even richer in capability.

Applications

Tandem's NonStop architecture tended to keep projects small, a factor that even today enhances project success rate. Tandem's three-tier architecture led to small, modular programs that provided a means for iterative delivery. The absence of a large number of off-the-shelf applications has stunted the growth of NonStop. However, where applications do exist, such as in payments, cell-phone infrastructure, and stock trading, Tandem enjoys a near monopoly.

In the Megaplex, only that part of an application – typically five percent - that requires high availability can be run in a NonStop environment, leading to significant cost savings.

Service Delivery

It has been said that the greatest invention for mankind was self-service. Tandem was at the heart of this new paradigm with its ATM services. Today, such transactions can touch systems all over the world; and most of these systems will be NonStop computers.

In effect, NonStop was the originator of the cloud platform, which can deliver services faster, at lower cost, and with greater accountability. The Megaplex is the perfect platform for cloud computing. NonStop technology will offer Megaplex consumers the ability to choose higher reliability and greater security for those applications that require these attributes.

Summary

The next stage in the evolution of NonStop will be software advances; the uniqueness of its hardware will disappear. NonStop will join the innovations from many companies to create the Megaplex. The rebirth of NonStop will be the Megaplex.

In the Megaplex, NonStop will become the heart of the operating environment service. Much of the NonStop technology will be used by all the operating environments within the Megaplex.

"Megaplex: An Odyssey of Innovation," was written by Jim Johnson, Chairman of The Standish Group (www.standishgroup.com). The Standish Group provides research services focused on improving project success through its CHAOS services and on enhancing the value of IT investments via its TCO/ROI benchmarking.