

Tandem Concepts: An Introduction for UNIX techies

Introduction

This document was prepared from some investigation work on the Tandem Non-Stop system.

Background to Tandem

Tandem was founded as a company to develop fault-tolerant systems in 1976 by ex-Hewlett Packard engineers, and the first **Tandem NonStop** system was based on HP3000 CPUs with a custom bus called **Dynabus** to provide fault-tolerance of the I/O and CPU.

The Operating System was called **Guardian**, which implemented message passing on a common stack to ensure resilience.

The key architecture of Tandem is the (RPC-like) message-passing mechanism. The kernel automatically re-routes a message from a failing component to a functioning one. This same approach is used both within a system and between systems.

In 1983, the **FOX** fibre-optic interconnect was launched which enabled up to 14 individual nodes to participate in a closely coupled network and share workloads between them. In 1986, FOX II enabled the network to be up to 4 Km distance, as well as introducing NonStop VLX, which increased the Dynabus speed from 13 to 40 MB/s. The same year, NonStop SQL was introduced.

1991 saw the first of several changes of architecture, with the introduction of the MIPS CPU, later replaced by the **MIPS R4400** in the NonStop **Himalaya** K-Series in 1993.

Tandem computers introduced the S-Series in 1997. This replaced Dynabus and FOX with a new **ServerNet** interconnect. ServerNet is a true peer-to-peer network (instead of the ring protocol of the earlier networks) and is the basis of the **InfiniBand** interconnect architect. The MIPS processors are R4400 and R10000.

Each logical processor consists of two microprocessors working in lockstep. If the two microprocessors produced different results, the entire logical processor was considered to be faulty, and Guardian would move the task to another processor.

Following the acquisition by Compaq, and now HP, the latest Tandem Computers are based on the Intel **Itanium** CPU and are called Integrity NonStop Servers.¹

The largest current HP Integrity NonStop Servers is the NS16000. This contains between 2 and 2048 Itanium 2 1.6GHZ processors. The Main memory is 4 to 16GB. The HP XP 12000 Storageworks sub-systems are supported, as well as internal 144GB or 72GB drives.

Supported Technologies

Disk Storage for Tandem appears to be propriety, because of the need for dual parallelized controllers. However, HP have introduced the NonStop Modular I/O subsystem which allows them to attach to the HP Storageworks XP subsystems.

Interfaces to TCP/IP, OSI and SNA networking are supported.

¹ The name "Integrity" was originally coined for a series of machines introduced in 1990 consisting of redundant CPUs running parallel instructions. The results were checked with each other ("lockstep") and if there was a mis-match, the failing module was disabled. This was similar to the Stratus architecture. These machines were merged back into the NonStop line in 1995. HP then took the name for the new range of Intel-based machines.

NonStop incorporates a POSIX-compliant environment (OSS) and Java.

Linux can be installed on a NonStop machine via a Virtual machine environment.

NonStop DOM/MP, NonStop JORB/MP and NonStop JTS/OTS are provided to support CORBA-compliant Java development. Web Services can also be supported.

NonStop (NSSQL or SQL/MP) is used as the database. This supports massive parallelism query processing.

The NonStop Database supports a Multi-Dimensional Access Method (MDAM) whereby B-Trees can be used to retrieve small subsets of databases, thus avoiding large scans of potentially huge tables. This also reduces the need for additional secondary indexes.

Batch processing is provided by HP Netbatch for job scheduling and control, and monitors logs

HP Guardian Performance Analyzer (GPA) optimizes the performance of the servers and implements load-balancing.

Systems Management is supported by Availability Monitoring and a web-based Systems Management tool. SNMP is supported, and there are agents from OpenView and Tivoli. BMC Patrol also has agents, as does CA Unicenter.

Distributed Software Management / Software Configuration Management (DSM/SCM) can be used to install and manage software.

References

There is a good introduction article on Tandem in Wikipedia

(http://en.wikipedia.org/wiki/Tandem_Computers)

The original Compaq website for Tandem appears to be still operational at this time, with the HP branding:

(<http://www.himalaya.compaq.com>)

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All errors, omissions etc. are my sole responsibility.

About the Author:

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