Appendix 4: The High-Reliability, High-Speed Technology Underpinning New arrowhead

Fujitsu Limited

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High-Reliability, High-Speed Technology Underpinning arrowhead

Tokyo, September 24, 2015 – Fujitsu today announced that, to implement the upgrade to arrowhead, it has incorporated new cutting-edge technology and enhanced functionality in the middleware running on its mission critical servers, FUJITSU Server PRIMEQUEST, and x86 servers, FUJITSU Server PRIMERGY, while also bringing together its expertise in application development and systems integration. The features of the main Fujitsu products employed in this upgrade are laid out below.

1. **Improvements in speed and reliability through high-speed, in-memory data-management software FUJITSU Software Primesoft Server**

   Primesoft Server is a type of middleware that provides high response and throughput performance and enables microsecond-level (one millionth of a second) ultra-high-speed data access by holding in memory all data necessary for transaction processing. In addition, speed has been further increased through changes in data-processing architecture and communications using InfiniBand (*1).

   Furthermore, by regularly and automatically mirroring the data held in memory to idling servers for triple redundancy and processing them in parallel across multiple servers, the safety of the data and the ability to switch servers in seconds when there is a fault is guaranteed. Moreover, the system's reliability, prioritizing continuing operations, has been further improved by strengthening its fail-soft ability by activating multiple changeover mechanisms when there is a fault, ensuring a safe and speedy automatic changeover.

2. **Improvements in speed and reliability through the vertically integrated database system FUJITSU Integrated System PRIMEFLEX for HA Database**

   PRIMEFLEX for HA Database is a vertically integrated database system which, in order to process operational data more quickly and safely, unites Fujitsu's hardware and software technologies to produce performance improvements of 20 times (*2) that of conventional systems. It enables high-speed processing of large volumes of data by utilizing PCI-Express flash storage and implementing a cache algorithm that can fully utilize CPU performance. Also, with a redundant configuration of server and network hardware, and by keeping primary and secondary

databases synchronized through mirroring technology, if a problem were to happen, the databases could automatically and instantly change over and continue processing.

These technologies enable the high speed and reliability required for arrowhead.

Overview of Hardware and Middleware that Underpins arrowhead

Hardware	FUJITSU Server PRIMEQUEST – mission critical IA server FUJITSU Server PRIMERGY – x86 server FUJITSU Storage ETERNUS – storage FUJITSU Integrated System PRIMEFLEX for HA Database – vertically integrated database system FUJITSU Network IPCOM FUJITSU Network Si-R/SR-S/SR-X/SH Nexus 5596UP/Nexus 5548UP - Cisco Systems Nexus 5000 series switches FUJITSU PC ESPRIMO/LIFEBOOK – enterprise focused PCs
Basic Software	Red Hat Enterprise Linux Microsoft Windows Server
Middleware	FUJITSU Software Primesoft Server – high-speed in-memory data management software FUJITSU Software Interstage – business application platform FUJITSU Software Systemwalker – integrated operation management FUJITSU Software PRIMECLUSTER – high reliability platform software FUJITSU Storage ETERNUS SF – storage platform software

Related Links

Mission Critical IA Server PRIMEQUEST

http://www.fujitsu.com/global/products/computing/servers/mission-critical/primequest/

x86 Server Fujitsu Server PRIMERGY

http://www.fujitsu.com/global/products/computing/servers/primergy/

Vertically integrated database system FUJITSU Integrated System FUJITSU Integrated System PRIMEFLEX for HA Database

http://www.fujitsu.com/global/products/computing/integrated-systems/ha-database.html

Glossary and Notes

1. InfiniBand: A communications interconnect technology that makes possible a high-speed band by bundling multiple channels, as in PCI Express, through bi-directional serial point-to-point connections.

2. Improvements of 20 times: Results of a comparison of throughput performance with Fujitsu database products using hard disks (values measured by Fujitsu).

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