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Netra High-Availability Software: Migrating Toward Standardized COTS-Based Carrier-Grade HA Middleware

White Paper
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Chapter 1

Introduction

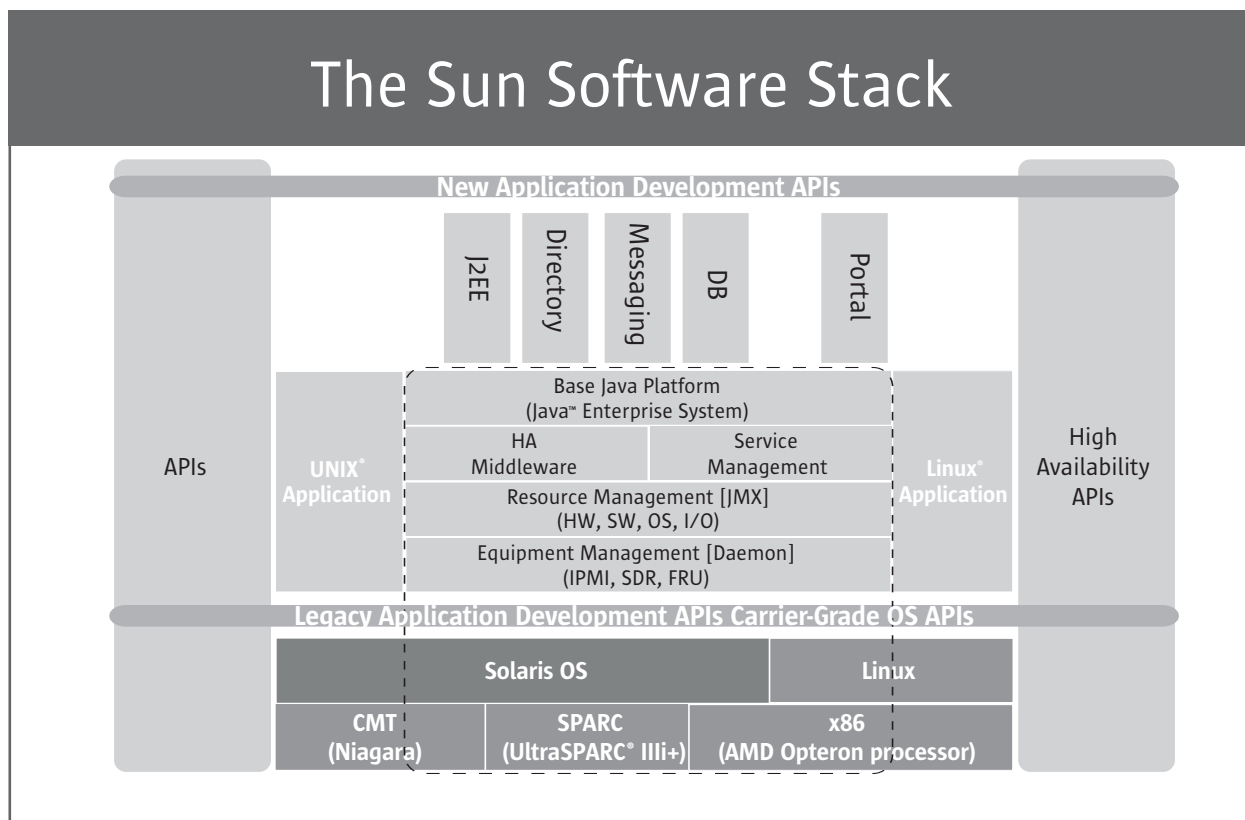
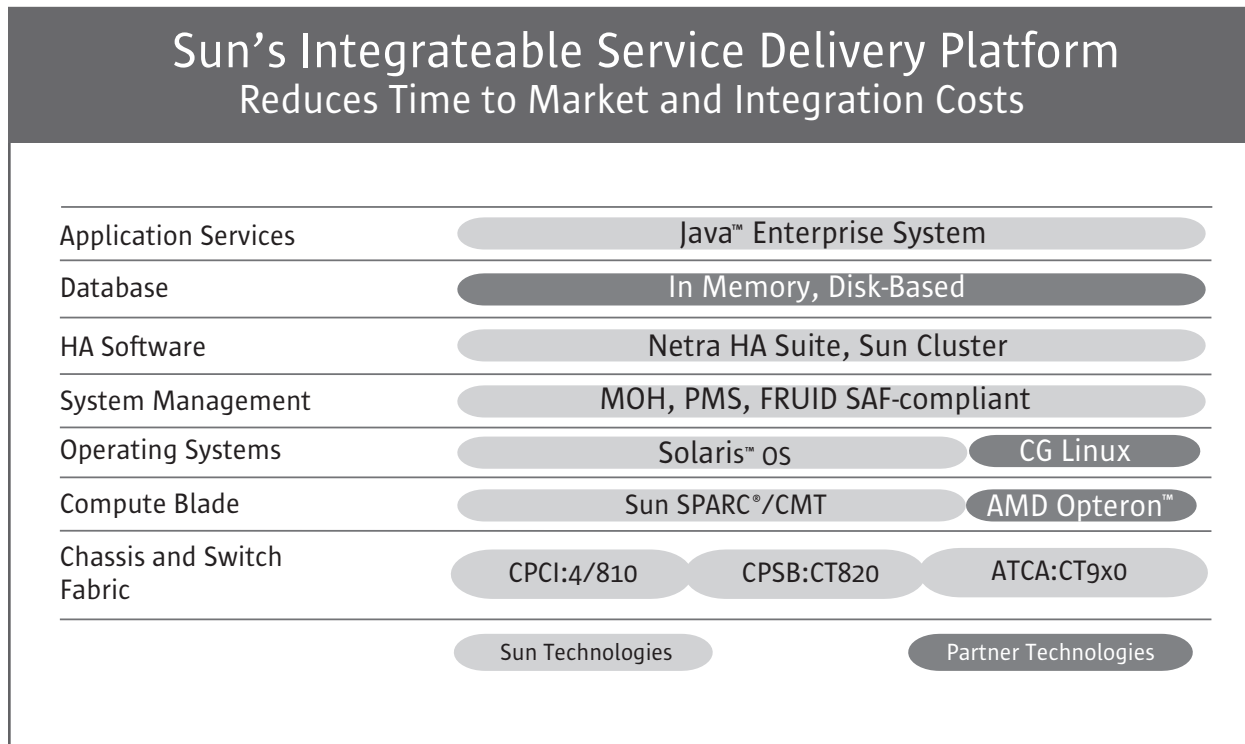
With the dramatic growth of next-generation mobile voice and data communication services, computing and data traffic demands expand as well. Competition, in turn, increasingly drives telecommunications companies to invest in third-generation (3G) wireless networks, even as they face increased pressure to accelerate time to market and reduce total cost of ownership (TCO). All of these requirements must be met with higher-quality services, the minimum possible service interruption, and increased capacities to meet growing demands. Network equipment providers (NEPs) are expected to quickly develop solutions that enable their customers to deliver new services in a cost-effective manner.

As a result of these formidable business challenges, NEPs are transitioning away from monolithic systems in which hardware and software are developed in-house, and toward a more efficient approach that leverages commercial off-the-shelf (COTS) components.

The market conditions driving this transition, and the need for products adhering to Advanced Telecom Computing Architecture (ATCA) specifications and emerging Service Availability Forum (SAF) standards, are defined in previously published papers⁽¹⁾. This white paper is a brief overview of Sun Microsystems' involvement in the development of these standards: It describes their impact on various market players, and details how currently available Sun technologies can help reduce the costs of managing multivendor hardware in this rapidly evolving marketplace. It also details how Netra™ High Availability Suite (NHAS) Foundation Services software may be used to accelerate deployment of highly available services while lowering costs by reducing the need for custom software development.

1. "Bridging the Management and Availability Standards Gap to Increase COTS Value for NEPs," a Technical Brief by Sun Microsystems Inc., June, 2005.

Figures 1a-b: Sun offers a comprehensive, integrated line of software products for telecom, including high-availability middleware and APIs.



Chapter 2

Sun and the development of open standards

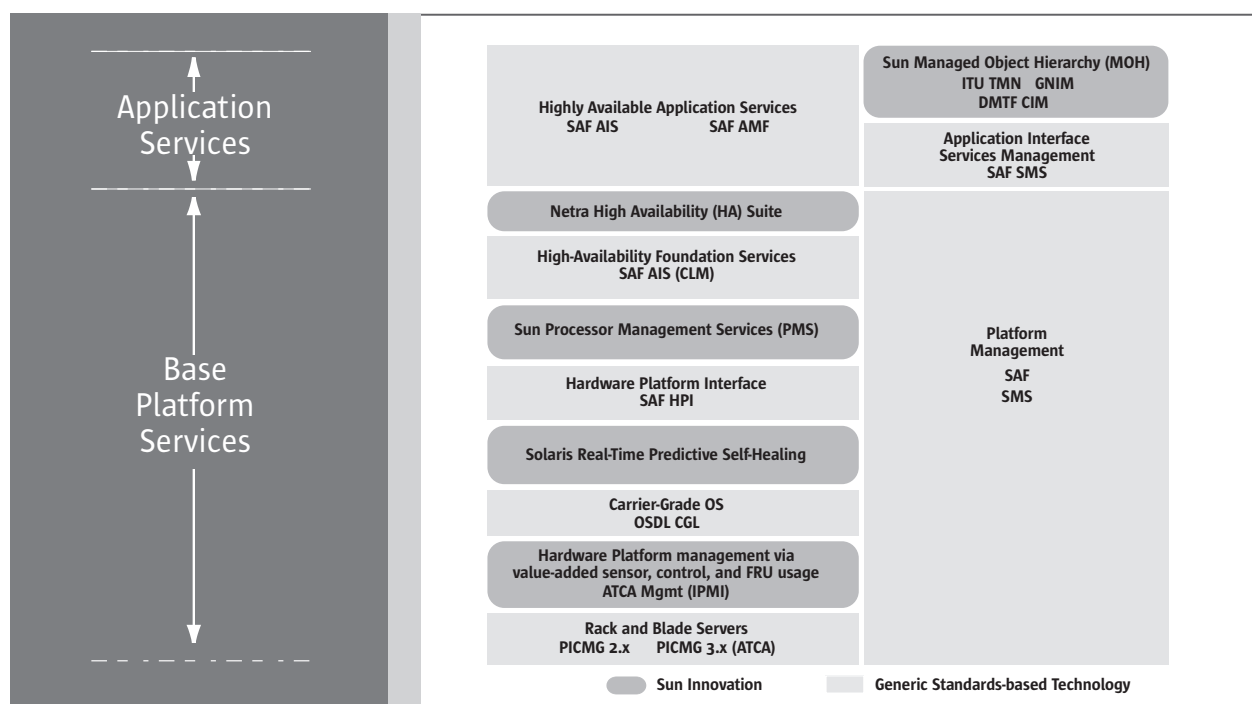
Sun Microsystems is a pioneer and industry leader in standards-based computing, with decades of experience in the telecommunications industry. Sun is actively involved in sharing its experience and innovation with standards bodies to help define new specifications and increase the value of COTS components in NEPs' next-generation solutions.

As an active member of the PCI Industrial Computer Manufacturers' Group (PICMG), Sun helps define the evolving ATCA standard, which gives Sun the insight and expertise necessary to rapidly deliver compelling products that adhere to these new specifications. Sun is also an active participant in the Service Availability Forum (SAF), and has been active in SAF since its inception. Sun helps SAF develop higher standards for implementing system management and high availability services for telecom, leading the SAF application interface services (AIS) working group. And—as an active Network Processor Forum (NPF) member—Sun helps accelerate and facilitate the development of next-generation networking and telecommunications products based on network processing technologies.

Sun is also a member of the Open Source Development Lab (OSDL), participating in the Carrier-Grade Linux and Data Center Linux working groups to help advance the use of the Linux OS and its functionality in telecommunications and enterprise environments. Finally, Sun is a founding member and active participant in the Distributed Management Task Force (DMTF), which develops integration technology and management standards for Internet and enterprise environments.

As new standards emerge, Sun is a driving force in their development, offering products that meet or exceed these requirements. Moreover, where Sun finds gaps in these standards—areas of technology in which new standards have not yet been set to maximize new efficiencies and innovations—Sun applies its ingenuity to bridge these gaps.

Figure 2: Sun products meet existing standards and bridge standards gaps.



Chapter 3

Effects of adopting standardized COTS-based solutions

Although the net effect of adopting open standards in computing is generally understood, the impact to specific entities in the NEP and telecom fields is varied. One example of this is the differing impact that the SAF AIS standard has on different elements of the NEP/telecom market:

End-users of carrier-grade systems

End-users such as telecommunications companies and carriers generally find that SAF AIS standards reduce their TCO for every element of carrier-grade system infrastructures, including applications developed in-house.

Independent software vendors (ISVs) and independent hardware vendors (IHVs)

For ISVs such as providers of non-middleware database products and IHVs—such as providers of SS7 termination modules—the SAF AIS standards make it easier to provide products on a large number of platforms from a large number of vendors, supporting a larger market at lower cost.

NEPs and system integrators

NEPs' motivations for adopting SAF standards overlap with IHVs, ISVs, and end-users, because NEPs are moving away from proprietary, vertically integrated systems and becoming increasingly involved in unifying IHVs, ISVs, and system integrators.

Independent high-availability (HA) middleware vendors

HA middleware vendors have a more complex involvement with SAF standards, as they consider whether or not to provide SAF-compliant extensions to their current product portfolios. Some vendors might be less receptive to SAF standards, as standardization allows customers more choice among suppliers—however, vendors that add value by supplying high-quality management infrastructures and superior basic middleware can benefit from a larger potential market, a broader portfolio of IHVs and ISVs, and more end-user applications.

Integrated platform and system vendors

The motivations for platform/system vendors to adopt SAF standards largely overlap with those of NEPs and HA middleware providers: Well-defined standards make it possible for system vendors and integrators to make efficient and flexible purchasing and manufacturing decisions to add value or reduce cost where needed.

As these examples illustrate, any new standard will have a ripple of different effects on varied parts of a given industry. The new ATCA standard has an even more pronounced effect on every facet of the telecom market, ushering in a new era of interoperability and efficiency. Sun, with experience in both standards-based computing and telecommunications technology, is ideally positioned to maximize the benefits of the ATCA standard.

Chapter 4

Sun standards-based technologies and COTS components

Sun offers numerous integrated management and availability technologies that comply with emerging standards. Sun has recently demonstrated the strength of its commitment to innovation and emerging standards with the introduction of ATCA-based blade systems that combine SPARC-, x64-, and x86-based compute blades (both Sun and third-party). And Sun's Netra line of products—consisting of both NEBS-compliant versions of standard rack servers as well as various NEP-focused blade systems with single-board blades—have established Sun as a leader in the NEP market space. Overall, NEPs can reduce costs considerably by using Sun's complete base platform offering including a carrier-grade OS, Predictive Self-Healing technology, processor management services, and SAF-, HPI-, and IPMI-compliant ATCA hardware. Their costs can be further minimized by using the HA and system management middleware stack available from Sun.

Sun's support of UltraSPARC and AMD Opteron processor technologies, as well as its support of Carrier-Grade Linux and the Solaris Operating System, enables NEPs to reduce complexity and cost by mixing and matching blades within the same system. It is possible to run x64-based and SPARC®-based blades within the same chassis, or to run CGL and the Solaris OS in the same system.

Sun's next-generation Netra servers will improve on these benefits even further, offering compliance with ATCA specifications and emerging SAF standards. The inclusion of open source-based hardware platform interface (HPI) support with the Netra ATCA platform will enable third-party HA middleware providers to make their systems available on the Sun platform with no inherent need to provide special-case integration solutions.

Chapter 5

Sun middleware and software solutions for NEPs

The Solaris Operating System, running on SPARC-based systems, has served for some time as a carrier-grade COTS platform for carriers and NEPs that are migrating toward a COTS-based standard. NHAS software has served as a cluster foundation for these carriers and NEPs, extending the carrier-grade features of the Solaris OS in a distributed and clustered system environment. NHAS provides cluster membership handling, and a set of highly available I/O and communications services and Solaris OS carrier-grade feature sets on every node in the cluster. NHAS is a COTS cluster platform on which NEPs can integrate their own HA software frameworks and applications.

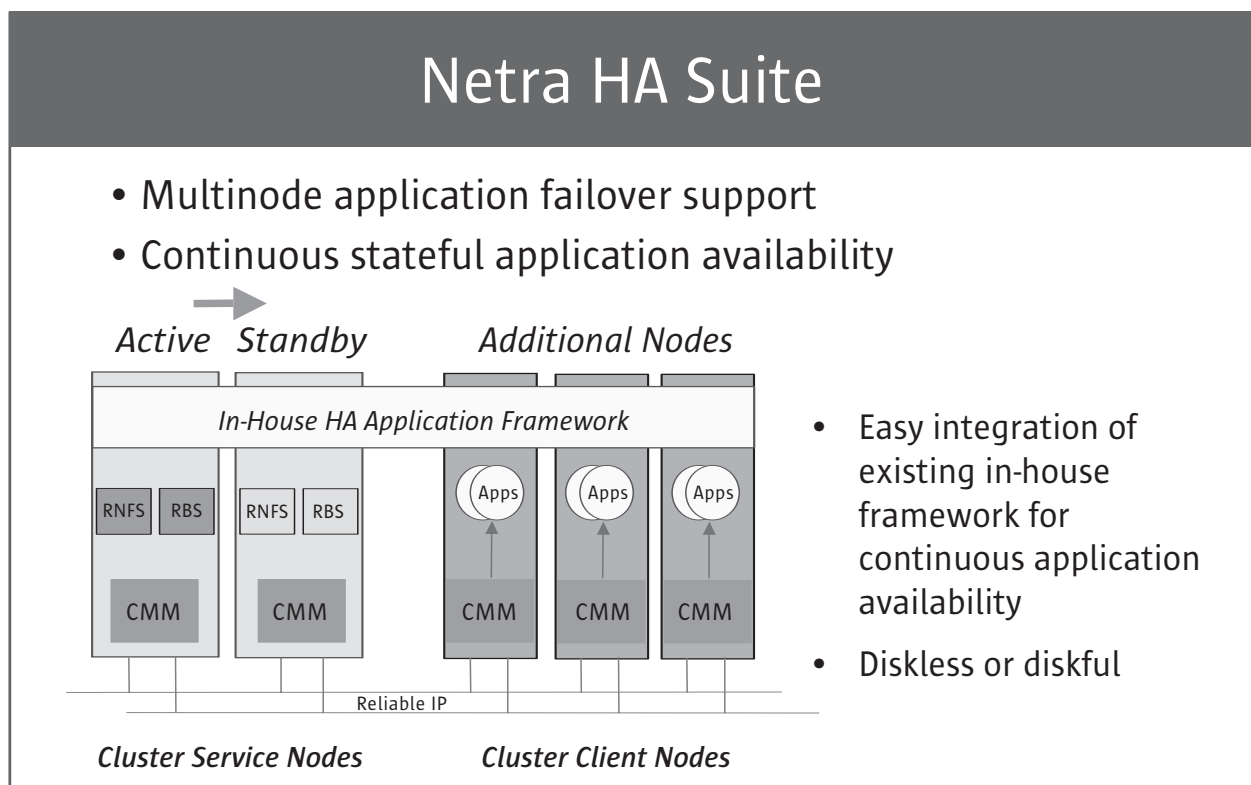
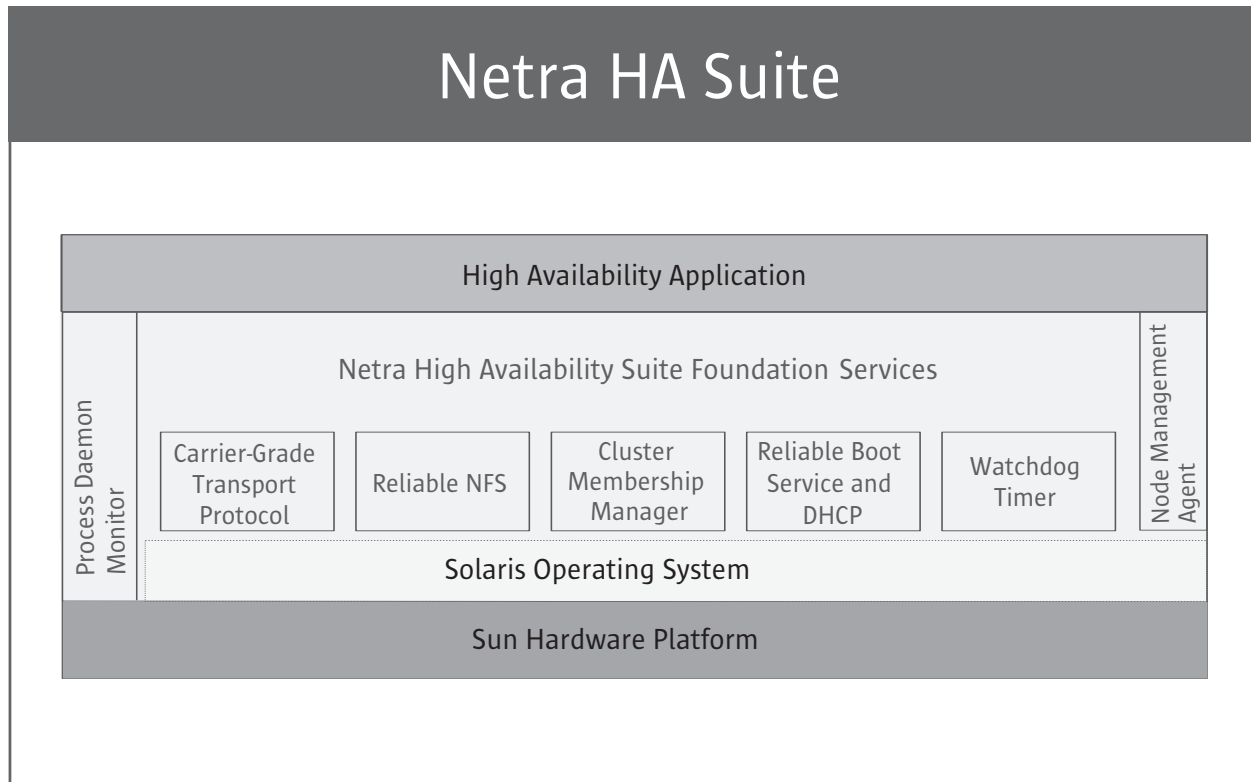
With the emergence of open source Carrier-Grade Linux (CGL) on x86 hardware platforms, the Solaris OS on SPARC technology platform faces a welcome competitive challenge for NEPs' COTS carrier-grade needs. Because Sun understands that open competition benefits not only IT users, but also the IT industry, and that open systems based on open standards encourage innovation, Sun has embraced the introduction of CGL.

In addition to enabling customer choice by providing both SPARC-based and x64-based versions of ATCA blades and rack servers, Sun also provides an open source-based carrier-grade version of the Solaris 10 OS on SPARC-, x64-, and x86-based platforms — and supports MontaVista's Carrier-Grade Linux on x64-based and x86-based platforms.

In accordance with Sun's focus on supporting evolving standards, as well as providing open source-based products when this provides benefits to customers, Sun will consider open-sourcing parts of the NHAS foundation and also provide support for more SAF-standard interfaces based on open source.

Sun's support of an open source-based version of AIS provides a simple way for NEP partners to integrate existing proprietary environments with new SAF standards-based applications, while enabling them to customize a solution as needed. It also creates a smooth and flexible migration path for NEPs wishing to migrate to SAF standards-based systems in a gradual fashion that might involve various prototypes and "design of experience" applications. Sun is also considering higher levels of integration for third-party, high-availability middleware products utilizing NHAS software.

Figures 3a-b: Sun's Netra High Availability Suite (NHAS) Foundation Services software and its positioning within the telecom system architecture.



Chapter 6: NHAS Foundation Services software

Netra High Availability Suite Foundation Services software is an open standards-based suite of services with a complete, preintegrated hardware and software platform, and can simply and easily be deployed into new or existing HA environments. Highly reliable and extremely scalable, NHAS enables users to cost-effectively build carrier-grade HA solutions for embedded environments, blade computing, and network infrastructures. In addition to serving as a COTS clustering platform, Netra HA Suite software enables NEPs to simplify the management of COTS carrier-grade platforms.

NHAS is quickly and easily deployed with automated software installation and configuration, and because it is based on open industry standards and robust Solaris OS-compatible APIs, the software is easy to integrate into multivendor environments and legacy infrastructures. Designed to be embedded within customer solutions, NHAS obviates the need to develop a specific HA platform; and because NHAS can be integrated into other products, some existing non-HA-aware software can benefit from improved availability without further development. NHAS is fully compatible with the Solaris OS and is being prepared to support Carrier-Grade Linux as well.

The core Foundation Services of NHAS ensure continuous availability in the system. Reliable NFS provides dependable file system access, leveraging hardware redundancy and enabling failover of NFS data and services for dataless or diskless clients. Reliable DHCP and Boot services enable diskless nodes to boot properly despite software or hardware failures.

NHAS duplicates cluster communication over two high-speed links; in the event of an error on either link, vital communication continues to its destination on the second link without need for retransmission—thereby eliminating latency in communication. Redundant software and hardware components and communication links ensure that Netra HA Suite cluster provides a reliable core platform and does not present a single point of failure. Cluster management statistics are assured to be always available.

The reliable Java Management Extension (JMX) API-compliant node management agents in NHAS monitor core services. As a result, cluster-wide management statistics are accessible on the primary node, and these statistics failover to the secondary node if the primary fails. Access to statistics for cluster management and IP services is made available via SNMP (v1, v2, v3), HTTP, and HTML. NHAS also includes a SNMP personality for the management agent, which can be integrated into existing SNMP-based management infrastructures.

NHAS enables users to replace or add nodes on a running cluster, with a high degree of both robustness and horizontal scalability. A system managed with NHAS software eliminates the need to plan for system outages during hardware replacements and upgrades. “Rolling upgrades” of NHAS are enabled without service interruption.

With fault management capabilities provided via a Cluster Membership Management (CMM) service—including fault detection, reporting, isolation, and recovery—the system is continuously available. NHAS also supports SAF Cluster Membership Service (CLM), and provides external connectivity to the NHAS cluster for monitoring and software management purposes. This provides easy access to cluster information and management and administration tasks from outside of the cluster.

Chapter 7

Conclusion

The demand for more and better next-generation services grows with each year, and carriers and NEPs must prepare themselves to meet these demands in an increasingly competitive marketplace. The migration to standards-based COTS technology is the most efficient and economical strategy to thrive in the current market. NEPs and carriers know and trust the innovation and reliability of Sun Microsystems, and can depend on Sun's new ATCA products and services. NHAS is a valuable element in the complete Sun ATCA line — a proven solution.

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