

N1™ Grid Technology — Just In Time Computing

An Executive Brief



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Chapter 1

Overview

The Endless Race

Business leaders understand that success boils down to a very simple equation — competitive advantage. In order to achieve and sustain competitive advantage, you need to stay ahead of the competition in innovation, responsiveness to customers' needs, and efficiency.

To help businesses achieve this goal, Sun offers a systems architecture — the N1™ Grid System — that redefines the way people think about managing and deploying complex computing resources.

Helping Make IT More Responsive

Watching a skilled craftsman work is fascinating. There is no wasted motion. The tools seem as extensions of the worker, with each step deliberate, calculated, and immediately delivering the desired result. It is this same kind of efficiency and responsiveness that managers seek from modern information systems.

The goals are ambitious, but essential:

- **IT must create efficiencies.** To many, efficiency and cost savings is what information technology is all about, yet it is ironic that IT itself has become bloated and costly. More and more managers are concluding that the established ways of managing and deploying computing services are simply outdated and need to be changed.
- **IT must be agile.** Responding to changing customer needs and markets means creating an IT infrastructure capable of turning on a dime. Today, instituting change is all too often sluggish and inefficient, giving the edge to those who can be more responsive.
- **IT must enable innovation.** Innovation is essential, not just in the things we build, but in how we work together and deliver products. The challenge is to find ways to create an IT infrastructure that fosters innovation in dynamic environments as well as with workforces, partners, and customers scattered around the globe.

Chapter 2

Just In Time Computing

Ask any IT manager and they will tell you the same thing. It takes too long to provision new resources. It is complex, costly, and time-consuming to add staffing. And managing infrastructure for new applications is a labor-intensive task, with costs continuing to skyrocket out of control.

This problem is not limited to just the largest enterprises. Businesses both large and small are increasingly dependent on computing technology to help them gain and retain a competitive edge. Even though the largest firms may rely heavily on their own resources while smaller companies most likely outsource for these resources, the problem is the same — complex, expensive, and ponderous IT architectures are slowing business down.

Solving this problem won't come from fine adjustments to the details of how we build systems, organize workforces, or write computer programs. We have to take a step back, look at the big picture, and ask ourselves if there are other, better models that IT could successfully emulate.

When asked, many managers say they would like the ability to access computing power just like they do telephones, electricity, or any other utility. Make a few calls and let the service flow. Pay for what you use and nothing more. Use more, pay more. Use less, pay less. This so-called “utility” model of computing represents an ideal that promises to solve many of the most pressing problems with IT.

Whether IT services are outsourced or provided in-house, every businessperson can appreciate the advantage of this approach — IT expenses reflect what is actually used rather than being just some arbitrary fixed cost. There are other advantages as well. According to a March, 2002 report by David Friedlander of the Giga Information Group Inc., the utility computing model has great appeal. Entitled “Utility Pricing Models for Technology Services Are on Their Way,” the report cited four advantages:

- Reduced complexity in creating infrastructure and business processes requiring IT services
- Shortened provisioning times
- Lower up-front costs
- Improved utilization of resources

Applying this type of thinking to other aspects of business is not new, which is why it's so compelling. Over a decade ago, manufacturers created a new kind of relationship with their suppliers that had many of the characteristics of a utility model. Enterprises who adopted “Just In Time Manufacturing” now let their vendors know exactly how much product is needed for the next manufacturing run. They buy only what they can use, without the burden of excess inventory and complicated negotiations. In the same way, the N1 Grid System will enable modern enterprises to exploit “Just In Time Computing” — all with the attendant simplicity and economies it suggests.

Chapter 3

Managing Complexity By Seeing the Big Picture

It's easy to agree that computing should be as simple as turning on a light switch or plugging in the coffee pot. But such a compelling vision is far from anything that resembles today's reality. Or is it?

In truth, many of the foundation technologies needed to create Just In Time Computing are already in place:

- Large amounts of network bandwidth are available both inside and outside the enterprise.
- Web infrastructure exists to both deliver and manage the delivery of computing services.
- Network-aware, redundant storage systems are commonplace, offering shared access to agile and secure shared storage.
- Highly expandable, networked computing systems offer very high performance, easy scalability, and tight integration with internal and external networks.
- Systems hardware and software that allows resources to be divided according to changing priorities is available for a wide range of computing platforms.

Having these components is like having all the pieces of a puzzle — they're essential, but pieces are not the final picture. The most important element still remains — a cohesive technique for delivering Just In Time Computing.

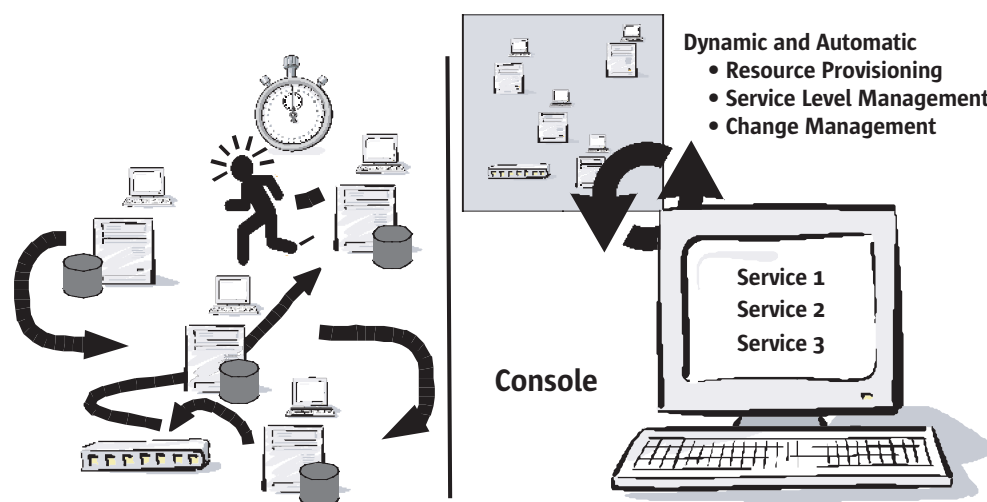
Among the unsolved problems, one of the most important is how to manage the individual components of an IT infrastructure as a smoothly integrated whole, making them behave and be managed as a single, unified system. Thinking about individual servers and storage systems won't do. We have to abstract the problem to a higher level and let automation take care of the details. Just like the phone or electric system automatically deploys and redeploys resources with changing demand, IT must be able to do the same.

Chapter 4

The N1 Grid System — Building the Computer Out of the Network

To address this problem, Sun has developed N1 Grid technology — an architecture that creates a new way of looking at computer systems. The N1 Grid System will help reduce the management complexity in the data center caused by the explosion of new applications and server sprawl.

By unifying all of the resources in a compute fabric, the N1 Grid System will help enterprises to create massively scalable computing systems that also offer continuous availability. Key to this is enabling data center personnel to manage services at a higher level than is possible today — to create systems that offer a tighter, more direct alignment between servicing business needs and managing IT infrastructure and services. N1 Grid technology does this by creating a virtual system out of the underlying compute, network, and storage resources. In doing so, the N1 Grid System will reduce the system configuration and management burden on IT staff, help shrink costs, and increase the agility of enterprises that adopt it.



Before N1 Grid Technology — Change Many Components

After N1 Grid Technology — Operate One System

N1 Grid technology will be implemented through new system software that straddles the entire software and hardware stack. This software will be responsible for lifecycle management of services, virtualization and abstraction of resources, and the algorithms needed to help ensure performance and security. In addition, N1 Grid technology will also include a set of changes to existing Sun products like the Solaris™ Operating System, management tools such as Sun™ Management Center, and in integrated products that include both SunPlex™ and Sun StorEdge™ systems. When finished, N1 Grid enhancements will be found throughout Sun's product line — from operating system and file systems to servers and development tools.

The impact of N1 Grid technology will be profound because it addresses many of the major stumbling blocks in creating a computing infrastructure that resembles a utility. Among those is its ability to completely account for all activity and resources used, allowing more accurate billing. In addition, senior staff gains better visibility into data center operations, helping them to ensure a consistent level of service as demand changes.

In short, N1 Grid technology has the potential to transform the role of IT, with profound consequences for the efficiency of business, such as:

- Radical advances in efficiency by freeing IT operations staff from the need to manage individual components, consolidation of resources and shared access to excess capacity, and the ability to define service requirements in a way that more closely corresponds to business need
- Greatly improved flexibility that permits the rapid reconfiguration of IT services in response to changes in demand and transparent integration of outside resources when required or desired
- Reduced business risk by allowing enterprises to adopt a strategy of paying only for the resources used or reserved
- A more intuitive alignment between management decisions and business requirements through N1 Grid technology's focus on managing whole services

Chapter 5

Creating New Business Models

N1 Grid technology delivers exciting opportunities for enterprises to craft new, more efficient business models that better meet the demands of customers and a competitive marketplace:

- Because the cost and logistics of management will be less of an issue, N1 Grid technology helps give managers greater freedom in designing IT architectures. System management will be more automated, able to control facilities both large and small, near and far. With N1 Grid technology, adding resources won't mean adding complexity. Similarly, the control that N1 Grid technology provides will enable firms looking for greater cost savings to more readily exploit the economies of scale available through the consolidation of services into fewer locations. N1 Grid technology will help managers to scale resources without increasing staffing levels.
- Consider that N1 Grid technology might allow enterprises to span both in-house and outside computing resources with a single management infrastructure, permitting both leased and owned systems to be dealt with as an integrated whole. On one day, the net flow of compute services might be inward, towards the enterprise, while on another day, excess capacity might be sold at a profit. N1 Grid technology has the potential to make this view of computing that simple.
- Alternatively, N1 Grid technology might allow an enterprise to provide for their own computing needs as well as those of their business partners and customers, and to accurately charge for services used by third parties.

Chapter 6

Revolution Through Evolution

Change creates opportunities that are rapidly filled by those who can quickly adapt and dominate. This is no less true in business, with change driven by new ideas, economics, consumer demand, fluctuating markets, and public policy, just to name a few. The result for business has been greater complexity, sophistication, and specialization.

For over 40 years, computing has been instrumental in managing the growing complexity of business processes. And in those four decades, computing itself has had to create tools for dealing with its own increasing sophistication. For instance, in 1960 programmers wrote applications using languages that were reflections of the fundamental instructions used by computers themselves. Today, fourth generation-languages and products like Java™ technology abstract millions of such instructions into a single statement.

N1 Grid technology builds on this model of increased productivity through greater abstraction. By enabling administrators to pull back from managing resources individually, N1 Grid technology lets them see computing as a collection of higher-level services that can be delivered, modified, and managed as a whole. By eliminating the need to focus on the details, it will be easier to craft computing solutions in terms of business rather than as a myriad of detailed technical steps that are totally removed from the problem. That's what we mean when we call for IT to be more aligned with business needs.

Most CEOs would agree that they don't need the risk of a "revolution" in IT. Nevertheless, they badly need revolutionary change to help them cope with the burgeoning complexity of information systems. N1 Grid technology promises a "quiet" revolution by taking the next logical step in the evolution of IT — making computers manage their own complexity.

Chapter 7

Sun — Committed to the Vision of N1 Grid Technology

A resolution to the issues customers face requires a transformation in the way we think about systems and their design. Sun's answer is unique because the system and networking skills needed to create technologies like N1 Grid technology are in our DNA. Most people are already familiar with our statement "The Network Is The Computer", a vision that was long ago validated by our customers. But our capabilities go well beyond great ideas — we've done the work, creating innovations that make computers function together seamlessly in every hardware and software product we build. From the foundations of computing upward, managers will find that Sun has the most comprehensive server family, a sophisticated and secure operating system optimized to work with our computing platforms, a rich offering of middleware to power network services, and the architectures needed to make them all work together. We even pioneered the use of Dynamic System Domains and integrated resource management in UNIX® software — foundation technologies essential to making Just In Time Computing a reality.

N1 Grid technology is a long-term vision and architectural blueprint for Sun Microsystems that coincides with our core values of aligning ourselves with the needs of enterprises everywhere. N1 Grid technology will deliver value to companies of all sizes and in every industry. For executives, the case should be clear — do you want to be competing against a company with N1 Grid technology in its arsenal, or do you want it working for you?

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Sun Microsystems, Inc. 4150 Network Circle, Santa Clara, CA 95054 USA Phone 1-650-960-1300 or 1-800-555-9SUN Web sun.com



Sun Worldwide Sales Offices: Argentina +5411-4317-5600, Australia +61-2-9844-5000, Austria +43-1-60563-0, Belgium +32-2-704-8000, Brazil +55-11-5187-2100, Canada +905-477-6745, Chile +56-2-3724500, Colombia +571-629-2323, Commonwealth of Independent States +7-502-935-8411, Czech Republic +420-2-3300-9311, Denmark +45-4556-5000, Egypt +202-570-9442, Estonia +372-6-308-900, Finland +358-9-525-561, France +33-134-03-00-00, Germany +49-89-46008-0, Greece +30-1-618-8111, Hungary +36-1-489-8900, Iceland +354-563-3010, India-Bangalore +91-80-2298989/2295454; New Delhi +91-11-6106000; Mumbai +91-22-697-8111, Ireland +353-1-8055-666, Israel +972-9-67105-00, Italy +39-02-641511, Japan +81-3-5717-5000, Kazakhstan +7-3272-466774, Korea +82-2-193-5114, Latvia +371-750-3700, Lithuania +370-729-8468, Luxembourg +352-49 11 33 1, Malaysia +603-21161888, Mexico +52-5-258-6100, The Netherlands +00-31-33-45-15-000, New Zealand-Auckland +64-9-976-6800; Wellington +64-4-462-0780, Norway +47-23-36-96-00, People's Republic of China-Beijing +86-10-6803-5588; Chengdu +86-28-619-9333, Guangzhou +86-20-8755-5900; Shanghai +86-21-6466-1228; Hong Kong +852-2202-6688, Poland +48-22-8747800, Portugal +351-21-4134000, Russia +7-502-935-8411, Saudi Arabia +9661-273-4567, Singapore +65-6438-1888, Slovak Republic +421-2-4342-9485, South Africa +27-11-256-6300, Spain +34-91-767-6000, Sweden +46-8-631-10-00, Switzerland-German 41-1-908-90-00; French 41-22-999-0444, Taiwan +886-2-8732-9933, Thailand +662-344-6888, Turkey +90-212-335-22-00, United Arab Emirates +9714-3366333, United Kingdom +44 0 1252 420000, United States +1-800-555-9SUN or +1-650-960-1300, Venezuela +58-2-905-3800, or online at sun.com/store

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