Next Generation Network Series

The Global Grid

Introduction

The telecommunications network is now understood to be more than a passive data transport medium. It's recognized as the foundation for a new kind of computing, which is able to distribute processing across multiple servers in multiple locations, which could be at customer premises or resident in the network itself.

Generally known as "grid computing," this new way of architecting and leveraging distributed computing resources can enable a new generation of networked applications.

Network Evolution

Businesses face constant pressure to grow revenues while reducing capital outlays and operating expenses. The general trend has been to move away from a model in which companies own their own infrastructure, toward a variety of flexible service options. It's being driven by the obvious business advantage that comes from avoiding large up-front investments, especially in technology that's subject to constant change.

Recently, emerging information technology business models have moved past flat-rate leasing and owned depreciating capital assets toward managed utility services, where companies will only pay for server, storage and networking resources they actually use. The emergence of a utility model opens new possibilities, especially if the underlying network has sufficient power and reach. There are new architectural possibilities, too, given the emergence of both network-centric applications and distributed content and storage.

One of the emerging enablers of the global grid is an advanced management layer, which is a combination of business rules and dynamic routing logic for distributed resources, content, applications and services. It provides a level of orchestration and optimization that takes the network to a new level. By monitoring network traffic and general infrastructure performance, the overlay can support dynamic resource allocation and de-allocation at the individual processing nodes in the network. That means the network itself becomes a kind of intelligent, flexible, geographically-distributed computer, and is no longer a passive conduit for data transfer.

"As demand increases, the network will conduct intelligent load balancing across multiple geographically dispersed locations in the grid, all of which are running an instance of the same application."

Joe Weinman, Emerging Services VP, AT&T

One advantage of this kind of network intelligence is the enabling of intelligent load balancing, which can adjust demand across multiple locations by invoking multiple instances of the same application. Unlike traditional load balancing, which dynamically adjusts load across dedicated, fixed resources, this new approach to load balancing can flexibly and optimally provision resources almost instantaneously. It can also distribute transactions dynamically across these resources.

This approach can reduce latency and improve response time, by using intelligent DNS routing to send user traffic to the closest location that's running the desired application, or creating a new instance of the application at a node closer to the user. This kind of system distribution across an application-aware network enhances the user experience and enables new paradigms, such as thin-client computing. It also provides for business continuity – if there's a loss of resources at one site, another site can be switched in to take up the load. In the brave new world of utility computing, the same resources in different locations may also be charged at different rates, or even at rates that vary over time. In the same way that airfares change by time of day, or by proximity to flight time, servers in Shanghai may cost less than servers in Chicago. Or the servers in Chicago may be cheaper at 2:00 AM than at 2:00 PM.

Likely Impacts

The continued evolution of network intelligence – the fact that networks will continue to get "smarter" about what they're doing – has implications for service providers, customers and network architects.

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Service providers can create value in various ways by acting as intermediaries and aggregating demand with a common, facilities-based infrastructure. It's similar to the function of a taxi service, which acts as an intermediary between auto makers and people who need transportation. By creating a multi-tenant utility model (pay for distance/pay for time), it enhances the flexibility for users and also reduces the cost. That means people don't need to own a car at every location they might need the use of one.

"Grid computing gives you not just the scalability and utilization improvements inherent in pooling resources, but also enhances business continuity and reduces response time for interactive applications by bringing them closer to end-users."

Joe Weinman, Emerging Services VP, AT&T

Customers will have new options for managing IT. Some may decide they no longer need their own data centers, since their computing requirements can be met by the grid. Others may prefer to keep their own data centers, but will run them less expensively and rely on the grid for load balancing and for scalable, supplemental resources. Some will be cost-optimizers, searching out the least expensive CPU cycles at any given moment. In all cases, though, it will mean a general reduction in the cost of computing.

The emerging global grid is not just about computing cycles, but about distributed storage architectures as well. The evolution of business continuity options from single disks to local RAID (Redundant Array of Independent Disks) configurations to secondary site mirroring to three-site architectures will merge with content distribution networks to create a global utility storage grid. Data object copies will flow across sites in accordance with business rules and policies as well as customer demand.

System architects will be able to take advantage of these new kinds of storage, recognizing that not all information is of equal value. Information life cycle management will store high-value information in ways that provide fast, high quality access and archive low-value information into lower-cost options.

This will also require another new layer within the network, to control data movement. This would be an additional form of embedded intelligence and could handle cost- or value-driven data migrations dynamically, with no direct user intervention. A policy engine would manage the process, and decide when and where information would be stored, according to user-defined classification rules. That would allow for very cost-effective document archives, front-ended by a discovery process that would ensure compliance with any retention requirements. Moving beyond the current vision of Information Lifecycle Management, it would not only involve migration between storage classes (ranging from disk to tape), but also geographic distribution in accordance with business policy.

The Global Grid

Taking these concepts a step further, we can see the emergence of a global grid – a genuine networked computing and storage utility that can be priced in ways to meet the requirements of all kinds of business concerns.

Whether considered from a storage or processing perspective, there are really no boundaries in the next generation network. Its operation could be extended to include locations anywhere in the world. On a global level, information life cycle management will bring tremendous flexibility to business continuity planning. In fact, business continuity is a natural aspect of a geographically dispersed architecture. When a process is freed from the restrictions of physical space, it's also protected from most of the disasters that can threaten a single data center.

The global grid is the way of the future, with a network that provides inherent scalability and a new level of operational stability. Pooled utility resources will allow for better, faster content distribution, and rapid dynamic data movement will support better cost management. It will provide more efficient ways of doing business, and enable new architectures for distributed computing.

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