

Network Multipathing in the Solaris™ 9 Operating Environment

Enabling multiple network connections to the same subnet.

Sun™ ONE
Open Net Environment



Key feature highlights

Manages network communication failures transparently.

Ensures uninterrupted network availability.

Improves throughput via load balancing.

Recovers from single-point failures with network adapters.

Today's explosive levels of growth — in terms of bandwidth, networks, and digital devices — are driving an even greater shift towards a services model of computing. The Services on Demand approach moves the burden of a computing infrastructure from end users and their PCs to the organizations that provide the services. Since its inception in 1982, Sun has been driven by a singular vision — The Network Is The Computer™ — and has helped businesses harness the transforming power of the network in order to create, deploy, and deliver reliable Services on Demand.

As the foundation for the Sun™ Open Net Environment (Sun ONE) — Sun's vision, architecture, platform, and expertise for delivering Services on Demand — the Solaris™ 9 Operating Environment provides an integrated yet open architecture for building and deploying Services on Demand. The Solaris 9 Operating Environment (OE) offers new levels of performance in scalability, availability, manageability, and security, and delivers a complete and highly refined environment designed to enable customers to increase service levels while decreasing costs and reducing IT risks.

Network Multipathing

In order to provide highly available network services, a system needs to be able to recover from the failure of a single network adapter. A host on a network assumes that there is one network connection per subnet. If the host finds multiple interfaces per subnet, then it uses one interface for all outbound packets and one of the other interfaces for inbound packets. If the outbound interface fails, then all network communications are broken.

Until recently, this problem was typically addressed by using scripts that would ping a device. If a failure occurred, the script would configure another interface on the same subnet. The new interface would then handle the network traffic. This solution, however, required the tedious task of debugging, supporting, and updating the scripts.

Solaris IP Multipathing

Solaris IP Multipathing (IPMP), Sun's Network Multipathing implementation for the Solaris 9 Operating Environment, is easy to use, and enables a server to have multiple network ports connected to the same subnet. Solaris IPMP software provides resilience from network adapter failure by detecting the failure or repair of a network adapter and switching the network address to and from the alternative adapter. Moreover, when more than one network adapter is functional, Solaris IPMP increases data throughput by spreading outbound packets across adapters.

Solaris IPMP addresses the following types of network communication failures:

- Transmit/receive path of the network adapter has stopped transmitting packets
- Attachment of the network adapter to the link is down

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- Port on the switch does not transmit/receive packets
- Physical interface in a group is not present at system boot

Solaris IPMP provides a solution for most failover scenarios, while requiring minimal system administrator intervention. It also works seamlessly with software likely to be used in conjunction with it, for example, Dynamic Reconfiguration (DR) software, and is managed using the existing network administration framework (e.g., the `ifconfig` command). With Solaris IPMP, there is no degradation in system or network performance when IPMP functions are not invoked, and failover functions are accomplished in a short timeframe.

Sun's Network Multipathing Implementation

Solaris IPMP is built right into the Solaris Operating Environment. In fact, it has been shipping with Solaris software since October 2000. Solaris IPMP provides capabilities such as:

- Transference of Network Attributes: Enables a failed network adapter to transfer network attributes, including IP addresses, logical interfaces, and multicast memberships, to another network adapter connected to the same link layer.
- Offlining of a Network Adapter: Invokes transference of network attributes to another interface without the first interface failing. This allows proactive maintenance of the first interface.
- Transference of Static IP Address: Provides retention of an IP address when an inter-

face fails due to an IPMP action and the failed interface has not been replaced before the reboot. This IP address is transferred to another network adapter in the IPMP interface group.

- Automated Dynamic Reconfiguration (ADR) Attachment of a Network Adapter: Enables the system to automatically handle newly added hardware (I/O, disks, memory, or CPUs) without requiring the system to be taken offline. When a network adapter is reattached through ADR, the original IP address is transferred to the replaced network adapter and it is joined to the original IPMP interface group. This capability is exclusive to the Solaris platform.

Solaris IPMP Features

The Network Multipathing implementation in Solaris 9 software performs three tasks:

1. Failure Detection: Detects when a network adapter has failed and automatically switches (failover) network access to an alternate adapter (assuming that the administrator has configured an alternate adapter).
2. Repair Detection: Detects when a failed network adapter has been repaired and automatically switches back (failback) network access to the repaired or new network adapter (assuming that failbacks have been enabled).
3. Outbound Load Spreading: Spread outbound network packets across multiple network adapters — without affecting the ordering of packets — in order to achieve higher throughput. Load spreading occurs

when the network traffic is flowing to multiple destinations using multiple connections.

About Sun ONE

The Sun Open Net Environment (Sun ONE) is Sun's vision, architecture, platform, and expertise for delivering Services on Demand today and in the future. Based on open standards such as Java™ and XML technology, Sun ONE provides a highly scalable and robust framework for building and deploying a variety of Services on Demand — from traditional Web-based applications to future context-aware Web services. By simplifying the way Web services are created, assembled, and deployed, the Sun ONE platform can enhance productivity, speed time to market, and increase business opportunities for enterprises worldwide.

System Requirements

Solaris IPMP is a feature of the Solaris Operating Environment and requires:

More than one physical interface connected to the same IP link

Unique MAC addresses on each network interface

A network adapter group name

Test addresses on every network interface

Data addresses on every network interface

For More Information

To learn more about network multipathing and the Solaris 9 Operating Environment, visit sun.com/solaris.

For additional information on Sun ONE, visit sun.com/sunone.

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