Tech Info Library

Open Transport 1.1.1 Technical Information (10/96)

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TOPIC -------------------------------------------------------

This article is the Open Transport 1.1.1 Technical Information file.

DISCUSSION --------------------------------------------------

Open Transport 1.1.1 Technical Information

This document contains technical information about Open Transport that may be
useful to network managers and administrators. You do not need to read this
document in order to use Open Transport.


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Introduction
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Open Transport is modern networking and communications system software for the
Mac OS. It is based on industry standards and brings a new level of networking
connectivity, control, and compatibility to Mac OS computers, while preserving
built-in support for easy-to-use networking. Open Transport 1.1.1 is compatible
with system software version 7.5.3, 7.5.5 and later, as well as versions 7.1,
7.1.1, and 7.1.2.

For more important information about system requirements, compatibility, and
known incompatibilities and limitations, read the Open Transport 1.1.1 Read Me
document.

Files added by the Open Transport installer
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Open Transport installs the AppleTalk and TCP/IP control panels into the Control
Panels folder inside the System Folder of your startup disk. The Open Transport
Installer also adds the following files to the Extensions folder inside the
System Folder:

Shared Library Manager
Shared Library Manager PPC
These extensions implement a shared library mechanism on 68K and PowerPC Mac OS
computers, respectively. Both extensions are required on PowerPC-based computers
in order to support both emulated and native shared libraries.

OpenTransportLib
Open Transport Library
These shared libraries implement core Open Transport services on PowerPC-based
computers. The first library contains the PowerPC implementation and an
interface for native PPC applications. The second library contains the built-in
Open Transport modules and an interface for emulated 68K applications.

OpenTptAppleTalkLib
Open Tpt AppleTalk Library
These shared libraries implement Open Transport AppleTalk services on
PowerPC-based computers. The first library contains the PowerPC implementation
and an interface for native PPC applications. The second library contains the
built-in Open Transport modules and an interface for emulated 68K applications.

OpenTptInternetLib
Open Tpt Internet Library
These shared libraries implement Open Transport TCP/IP services on PowerPC-based
computers. The first library contains the PowerPC implementation and an
interface for native PPC applications. The second library contains the built-in
Open Transport modules and an interface for emulated 68K applications.

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Open Transport 68K Library
This shared library implements core Open Transport services on 68030- and
68040-based computers.

Open Tpt ATalk 68K Library
This shared library implements Open Transport AppleTalk services on 68030- and
68040-based computers.

Open Tpt Inet 68K Library
This shared library implements Open Transport TCP/IP services on 68030- and
68040-based computers.


Open Transport AppleTalk Features
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Static and dynamic AppleTalk address allocation
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Open Transport AppleTalk supports static assigned (manually administered)
protocol addresses as well as the dynamic addressing provided by AppleTalk
Address Resolution Protocol (AARP). Static addressing allows AppleTalk nodes to
be managed using the protocol address as a unique and stable identifier.

It is important that all nodes on each individual AppleTalk subnet (a given
cable segment assigned a unique network number or network number range) be
administered consistently—either all with dynamic addressing or all with
pre-assigned static addresses. This avoids a potential conflict when a new
dynamic node acquires an address assigned to manually-addressed node that is not
connected or is off line. Administrators can enforce the addressing policy for a
subnet by locking the addressing mode. As a precaution, Open Transport AppleTalk
checks for duplicate protocol addresses on the LAN even when static addressing
is configured.

Use of parameter RAM
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Under classic AppleTalk, AppleTalk's on/off state, the selected network
interface, the previous network (protocol) address, and the previous AppleTalk
zone name are saved in persistent memory (parameter RAM) for reuse at startup.
To ensure backward compatibility, this information is still stored and retrieved
on systems using Open Transport AppleTalk. However, the following differences
are found with Open Transport:

• At startup, Open Transport reads the current AppleTalk configuration file to
determine if AppleTalk should be turned on or off. This value overrides the
value saved in parameter RAM. The user is not explicitly notified when this
occurs.

• If the network interface specified in the current AppleTalk configuration file
is locked and the specified port is not available or cannot be initialized, Open
Transport will not automatically switch the port back to LocalTalk. Instead,
AppleTalk will remain off. The user sees a dialog box with this information.
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Open Transport TCP/IP features
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Open Transport brings a workstation-class implementation of TCP/IP protocols to Mac OS. As with MacTCP, Open Transport TCP/IP is a full 32-bit stack. Open Transport TCP/IP adds support for:

• dynamic path MTU discovery, for more efficient network use in heterogeneous network topologies

• Dynamic Host Configuration Protocol (DHCP), for centralized IP address configuration management. DHCP is an Internet Engineering Task Force (IETF) standards-track protocol.

• IP multicast, for participation as an MBone client for applications written to the native Open Transport API

• simultaneous TCP connections for applications written to the native Open Transport API are limited only by installed memory and processor power, for increased functionality as an Internet or other TCP/IP network server

• a new, more robust and standards-compliant domain name resolver (a caching stub DNR)

• support for developer access to raw IP services, as well as TCP and UDP

• Ethernet Version 2.0 and IEEE 802.3 framing, for better interoperability with a wider range of TCP/IP hosts

• implicit and explicit domain name search paths, for increased control of domain name resolution

• use of multiple IP routers with fail-over, for increased robustness in mission-critical applications

• TCP wildcard source port assignments start at 2048, increasing from that point.

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DHCP server support
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Apple's implementation conforms to the current versions of the applicable specification documents (RFCs). To date, Open Transport TCP/IP has been tested with the following DHCP server implementations:

• Competitive Automation (URL: http://www.join.com)
• FTP Software (URL: http://www.ftp.com)
• Hewlett Packard HP-UX (URL: http://www.hp.com)
• Microsoft Windows NT Advanced Server (URL: http://www.microsoft.com)
• Silicon Graphics (URL: http://www.sgi.com)
• Sun Solaris and SunOS (URL: http://www.sun.com)
• TGV (URL: http://www.tgv.com)

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DHCP address lease support
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Open Transport TCP/IP supports DHCP address leases. Open Transport TCP/IP
automatically attempts to renew any address lease that reaches its renewal
interval (by default, the renewal interval is reached when the lease is halfway
completed). The renewal interval may be configured to a different value by
making changes to the configuring DHCP server. Renewal is attempted regardless
of how many times the lease has already been renewed. Lease rebinding is also
supported. Should an interface's IP address lease expire, the interface is
closed down. Open Transport TCP/IP does not currently support the DHCP Client ID
option or the DHCPINFORM message, nor will it currently try to use the remainder
of a previous but unexpired lease upon rebooting.

Windows NT advanced server support

With Open Transport 1.1 and later, Mac OS clients are interoperable with the
Windows NTAS DHCP server on LAN links. However, Mac OS clients cannot acquire
configuration information from an NT DHCP server across a dialup (PPP) link
because there is not yet an accepted industry standard for DHCP over dialup. The
NT implementation is based on proprietary Microsoft extensions. Mac OS clients
cannot acquire configuration information nor register with a Microsoft WINS
server. WINS is also dependent on Microsoft extensions to TCP/IP (requiring
NetBIOS support).

The Internet Engineering Task Force (IETF) is developing a cross-platform
industry standard technology for dynamic registration and look-up of IP names
through the Dynamic Service Location working group. Apple has no current plans
to implement the WINS extensions. Instead, we are fully committed to
implementation of the applicable IETF standards as they emerge

Macintosh clients running versions of Open Transport prior to 1.1 could
experience some interoperability problems due to other significant differences
between the Microsoft implementation and that of a typical UNIX-based server.

BootP support

Open Transport 1.1 and later fully supports Bootstrap Protocol (BootP). Versions
of Open Transport prior to 1.1 failed to accept a BootP Reply sent to the
unicast (subnet broadcast) address, (for example, xxx.xxx.xxx.255. Replies sent
to the all-nets broadcast address (for example, 255.255.255.255) were handled
properly. Also, earlier versions of Open Transport required that the BootP
gateway be zero hops away.

Local Hosts file support

Open Transport TCP/IP supports a Hosts file that may be used to supplement
and/or customize the Domain Name Resolver's initial cache of information. The
Hosts file is normally stored in the Preferences folder in the active System
Folder. When Open Transport TCP/IP is initialized, it reads the Hosts file (if
any). As in MacTCP, the supported Hosts file features follow a subset of the
Domain Name System Master File Format (RFC 1035).

Open Transport TCP/IP is more stringent regarding the content and format of the
Hosts file than was MacTCP, which permitted violation of the FQDN requirement

for <domain-name>. For instance, the format:

```
charlie              A        128.1.1.1
```

which was acceptable to the MacTCP DNR, is no longer permitted because of the
use of domain search lists in Open Transport/TCP ("charlie" could potentially
exist in any or all of the configured domains). To accomplish the same effect,
use this format instead:

```
charlie              CNAME  myhost.mydomain.edu
myhost.mydomain.edu  A        128.1.1.1
```

This associates the local alias charlie with the fully qualified domain name
myhost.mydomain.edu, and resolves it to the address 128.1.1.1. Use of local
aliases is limited to CNAME entries; NS and A entries must use fully qualified
domain names.

You can create a Hosts file with any text editor or word processor (the Hosts
file must be stored in text format). If you use a Hosts file, keep it as short
as possible, and include only entries that will be accessed frequently. This
reduces the memory required to cache the DNS information and minimizes the need
to maintain and update Hosts files as system information changes.

Open Transport TCP/IP automatically uses a Hosts file stored the Preferences
folder of the active System Folder. If no Hosts file is found in the Preferences
folder, Open Transport TCP/IP searches the active System Folder for a Hosts
file. You can specify a particular Hosts file to use with a specific
configuration. For example, one Hosts file might be set up for a user connecting
via Ethernet, and another set up for when that user connects via modem.

For additional information about the Hosts file design of the Open Transport
Domain Name Resolver, see the document "Apple Open Transport Reference Q&A." The
latest version of the Q&A is on the Open Transport 1.1 Installation CD, and is
available on the Internet at ftp://seeding.apple.com/ess/public/opentransport/.

MacTCP "server" addressing support

Open Transport TCP/IP supports both Bootstrap Protocol (BootP) and Reverse
Address Resolution Protocol (RARP) configuration methods. MacTCP Server mode
addressing was a combination of BootP and RARP. When Server mode was selected,
MacTCP used BootP to attempt to acquire an IP address. If that failed, MacTCP
tried RARP. Whichever protocol was successful was stored as a preference, and
was used first the next time the computer started up. In Open Transport, you
must choose BootP or RARP explicitly.

MacTCP "dynamic" addressing

Open Transport does not support MacTCP "dynamic" addressing. MacTCP dynamic mode
addressing was based on an Apple-proprietary extension to TCP/IP protocols. It
applied the address negotiation and assignment rules used by the AppleTalk
protocols to TCP/IP networks, making it very easy to set up a Macintosh-only
standalone TCP/IP network. Use of this dynamic addressing method in other
scenarios, however, could create additional work for a network administrator.

The Internet community (IETF) has since developed a multivendor standard for the dynamic assignment of IP addresses, known as Dynamic Host Configuration Protocol (DHCP). Open Transport TCP/IP supports the industry standard DHCP.

MacIP support

MacIP is a protocol specification developed for carrying TCP/IP traffic on AppleTalk-only networks, originally LocalTalk networks. MacIP is today frequently used with AppleTalk Remote Access Protocol (ARAP) to provide mobile users access to TCP/IP network services.

Use of MacIP typically requires a gateway, which strips off the AppleTalk encapsulation and places the IP packet on the TCP/IP LAN. When packets are sent back to the MacIP end-node, the gateway replaces the AppleTalk encapsulation. MacIP gateway support is most frequently offered as an integrated service within a multiprotocol router. The gateway (router) attaches to both an AppleTalk and a TCP/IP network.

Open Transport supports MacIP in the TCP/IP control panel. Once selected, TCP/IP data is encapsulated in AppleTalk packets, and is sent through the selected network interface.

PPP connectivity

With the exception of OT/PPP 1.0f1c9 or later, PPP (Point to Point Protocol) connectivity for Open Transport is currently based on the use of third-party software extensions known as "MDEVs." Early versions of these MDEV extensions may not be compatible with Open Transport. For information about MDEV compatibility, see the Open Transport 1.1 Read Me document.

OT/PPP is implemented using the Open Transport native STREAMS environment.

Memory requirements
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Open Transport provides many new features and capabilities to Mac OS customers and, in general, will require more system memory (RAM) than does classic networking. However, the actual memory requirements of Open Transport vary depending upon the networking services in use at a given time. This is different from classic networking, which allocates memory to networking services and keeps it allocated even after networking services are no longer in use.

Factors contributing to differences in memory requirements include:

• Open Transport provides implementations of networking as both 680x0 and native PowerPC code. PowerPC code is typically larger (but also faster).

• Open Transport provides "mixed-mode" applications support, making it possible for both PowerPC native and 680x0 applications to use native networking on PowerPC-based computers.

• Open Transport includes both the new implementations of networking and the libraries required to provide backward compatibility support for the older AppleTalk and MacTCP programming interfaces.

• Open Transport requires less memory on systems with virtual memory enabled. Classic networking has about the same memory requirements regardless of the VM setting.

• Open Transport is based on the cross-platform standard STREAMs environment, which requires more memory than classic networking.

The difference in memory requirements depend upon the configuration of your computer. Some examples of base memory requirements include:

Begin_Table

Computer System	Virtual Memory	Classic AppleTalk & MacTCP	Open Transport
PowerPC-based	On	350K to 450K	200KB
PowerPC-based	Off	350K to 450K	up to 1.2MB
608x0-based	Off	350K to 450K	700KB to 800KB

End_Table

Application compatibility guidelines
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Apple has defined three levels of interoperability with Open Transport. The first, "Open Transport Compatible," is used to describe network applications originally developed for "classic" AppleTalk or MacTCP programming interfaces that now take advantage of Open Transport Compatibility Services. These applications automatically gain the benefits associated with the Open Transport control panels. However, they will not realize a significant performance increase on Power Macintosh systems, nor can they take advantage of Open Transport's transport-independence capabilities.

"Open Transport Ready" applications have adopted the new Open Transport APIs. They are PowerPC native, in addition to running on 680x0-based Macintosh systems. Open Transport-ready applications benefit from the new control panels and may also realize a significant performance boost when running on PowerPC-based computers.

The highest category of interoperability is "Open Transport Enhanced." In addition to adopting the new Open Transport APIs and being Power PC native, these applications can be dynamically configured to support AppleTalk, TCP/IP, or serial communication.

Applications that rely on undocumented APIs or examine private data structures in AppleTalk or MacTCP may not be fully compatible with Open Transport. Updated versions of these software products will be required for full compatibility.

Performance
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Open Transport is designed to take advantage of the PowerPC processor. For
maximum performance, however, networking applications must also take advantage
of the PowerPC processor, and should adopt the new Open Transport programming
interfaces.

In general, current Mac OS networking applications are written for the 680x0
processor and use the "classic" (680x0-based) networking programming interfaces.
These applications can still be used with Open Transport, and may perform
somewhat better. Networking applications that are PowerPC-native but not Open
Transport-ready may yield better performance, but still fall short of the
maximum potential performance because they make use of Open Transport backward
compatibility rather than its full capabilities.

Performance improvements will be greater with protocols that use larger datagram
sizes. For example, TCP/IP users will see greater improvements than AppleTalk
users, because AppleTalk has a fixed and limited datagram size. On high-speed
datalinks such as fast Ethernet, FDDI, and ATM, the performance of the network
interface card (NIC) driver code is also a significant factor.

Overall performance also depends on the amount of RAM available. Larger packet
sizes and higher throughput place increased demand on the buffering system of
Open Transport. If Open Transport becomes low on memory, throughput decreases to
accommodate the limitation.

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