

NIST Physics Laboratory

Time & Frequency Division

NIST

Configuring Apple Macintoshes to use NIST Time Servers

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Section 1: Purpose

- This document provides step-by-step instructions for configuring Apple Macintosh computers to use the NIST Internet Time Service (ITS). Mac OS versions 8.5 and later have the built-in capability to use the NIST time servers to maintain the correct time on the Macintosh time-of-day clock.
- This document also provides background information and pointers that may be helpful for installing and running time synchronization software, in general, on a wider variety of computers.
- Comments and feedback on this document may be sent to timeinfo@boulder.nist.gov.



Section 2: Background Information

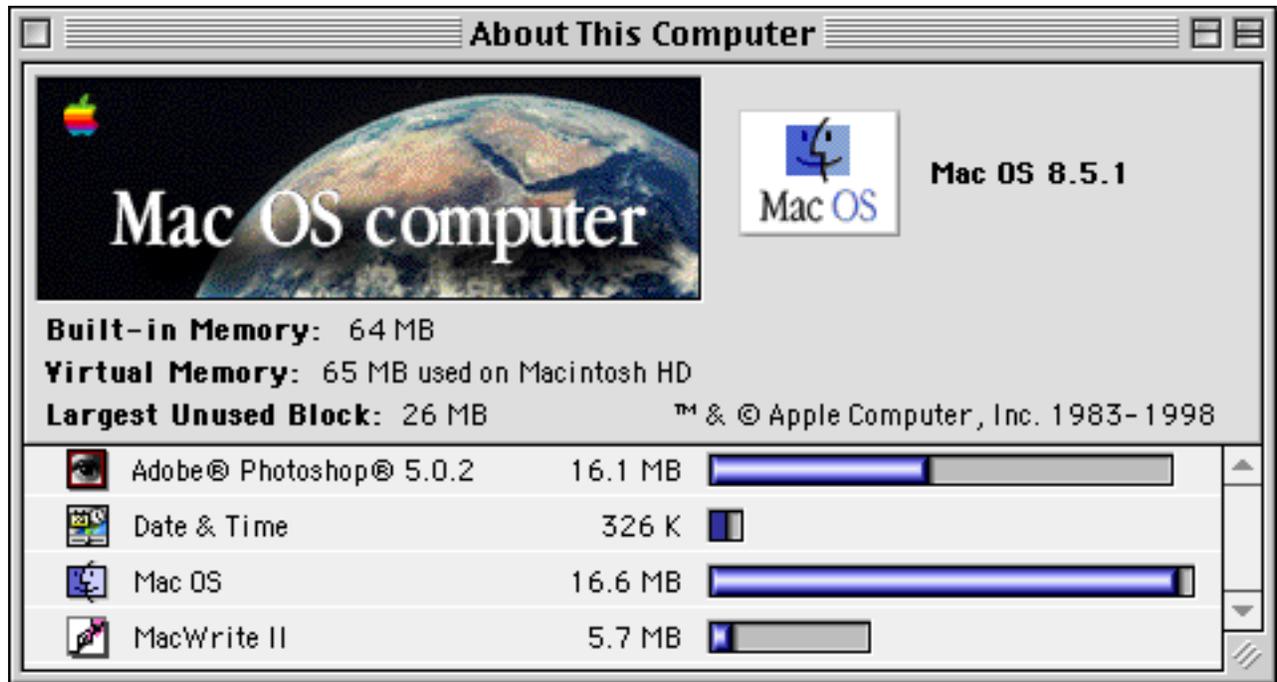
- Macintosh computers, along with almost all other modern computers, contain a time-of-day clock. This clock also keeps track of the day, month, and year. (A separate “clock” governs the speed of the computer and is commonly quoted in megahertz or gigahertz.)
- The time clock in the computer is used to keep track of when documents (files) are created and last changed, when electronic mail messages are sent and received, and when other time-sensitive events and transactions happen.
- In order to accurately compare files, messages, and other records residing on different computers, their time clocks must be set from a common standard. In the best case, their clocks should be set from an accurate national standard.
- It is particularly important that computers that are networked together use a common standard of time. Fortunately, the network also provides a means for setting all their clocks to the correct time, when all the computers are equipped with appropriate software.
- [The National Institute of Standards and Technology \(NIST\)](#) is a U. S. Government agency that maintains an [official time scale](#) for commerce in the United States. Certain regulations, for example those that affect the [securities industry](#), require time records to be traceable to NIST. NIST maintains the time scale using [atomic clocks](#), and they coordinate it with the time scales used by [other nations](#) and the [U.S. military](#).
- NIST disseminates the time using several methods. These include the long-standing time broadcasts over [short-wave](#) and [long-wave radio](#). In addition, two services are offered of particular benefit to computer users. They allow you to set your computer’s clock from the atomic clocks. For computers with modems attached, NIST provides a [telephone dial-in service \(ACTS\)](#). For computers on the Internet, NIST provides an [Internet Time Service \(ITS\)](#).
- ACTS does not require that you have an Internet Service Provider, but will require a long-distance telephone call through a modem to Boulder, Colorado. ITS does not require long-distance telephone calls, but does require that your computer be connected to the Internet.
- The Macintosh operating system (Mac OS), starting with Version 8.5, includes appropriate software to utilize the NIST Internet Time Service (ITS). However, in order to use this service, a Macintosh user has to configure the computer properly. This document provides the instructions for doing so.
- This document also provides additional pointers to Macintosh software for utilizing ACTS and ITS, even for Mac OS versions earlier than 8.5.

Section 3: Preinstallation Checklist

- This document is current as of May 22, 2002. In order for these instructions to apply to you, you must be running System Software (Mac OS) Version 8.5 or later. The instructions for the “classic” versions of Mac OS (8.5 through 9.2) will be found in Section 5. The instructions for Mac OS X will be found in Section 6.

(This document does not cover Mac OS X Server, as the author has never had his hands on one. Administrators of a Mac OS X Server should consult the documentation supplied by Apple within /System/Documentation/Administration/Services/ntp, starting with the index.html file.)

- To determine the version of classic Mac OS that you are currently running, make Finder the foreground application. (Click on the Desktop, or use the menu on the far right of the menu bar.) Under the Apple menu (on the far left of the menu bar), select “About This Mac” or “About This Computer.” The window that appears gives the version of System Software in use.



- In order for these instructions to apply to you, your Macintosh must be connected to the Internet. Either fixed or dial-up connections are acceptable. However, the Macintosh clock may be set less regularly if temporary dial-up connections are used.
- If these instructions do not apply to your situation (e.g., System 8.1 or earlier, or no Internet connection), you might be able to use other software. Examples include:

FreeTime (currently at version 1.2) is a free utility program for using ITS that can be found in collections of publicly-available software, including:

<http://hyperarchive.lcs.mit.edu/cgi-bin/NewSearch?key=freetime> .

Vremya (currently at version 2.0.1) is a free utility program for using ITS that can be found at <http://www.lava.net/~kirill/software/> .

NetChronometer (currently at version 1.4.8) is a shareware application for using ITS that can be found at <http://www.kezer.net/netchrono.html> .

Mac-NTP (currently at version 1.0.2) is a shareware application for using ITS that can be found in collections of publicly-available software, including:
<http://hyperarchive.lcs.mit.edu/cgi-bin/NewSearch?key=mac-ntp> .

Network Time (currently at version 2.0.1) is a shareware control panel for using ITS that can be found in collections of publicly-available software, including:
<http://hyperarchive.lcs.mit.edu/cgi-bin/NewSearch?key=network+time> .

AutoClock (currently at version 1.4.4) is a free application and extension combination for using the ACTS modem-based time service. It can be found in collections of publicly-available software, including: <http://hyperarchive.lcs.mit.edu/cgi-bin/NewSearch?key=autoclock> .

This list cannot be all inclusive—supported freeware and shareware appears and disappears frequently, and features of commercial software are continually improved. These lists may contain more up-to-date information:

<http://mac.tucows.com/timesyncmac.html>

<http://www.blrdoc.gov/timefreq/general/softwarelist.htm>

These examples are given solely for illustrative purposes. The list is most likely incomplete. NIST has not tested these programs and does not warrant that these or similar programs are necessarily the best available for the purpose. They may not operate as expected or correctly. Send corrections or additions to timeinfo@boulder.nist.gov.

Section 4: Choose a NIST Internet Time Service (ITS) Server

- Select a NIST ITS Server Address from the table below. Any of these servers should work, but the closer you are to the selected server the more accurate the time settings may be. The fluctuation in the time it takes for data to travel over the Internet will lead to slight errors (usually less than one second) in the time setting. The seven servers at the bottom of the table are the ones least used; they may give you the best results.

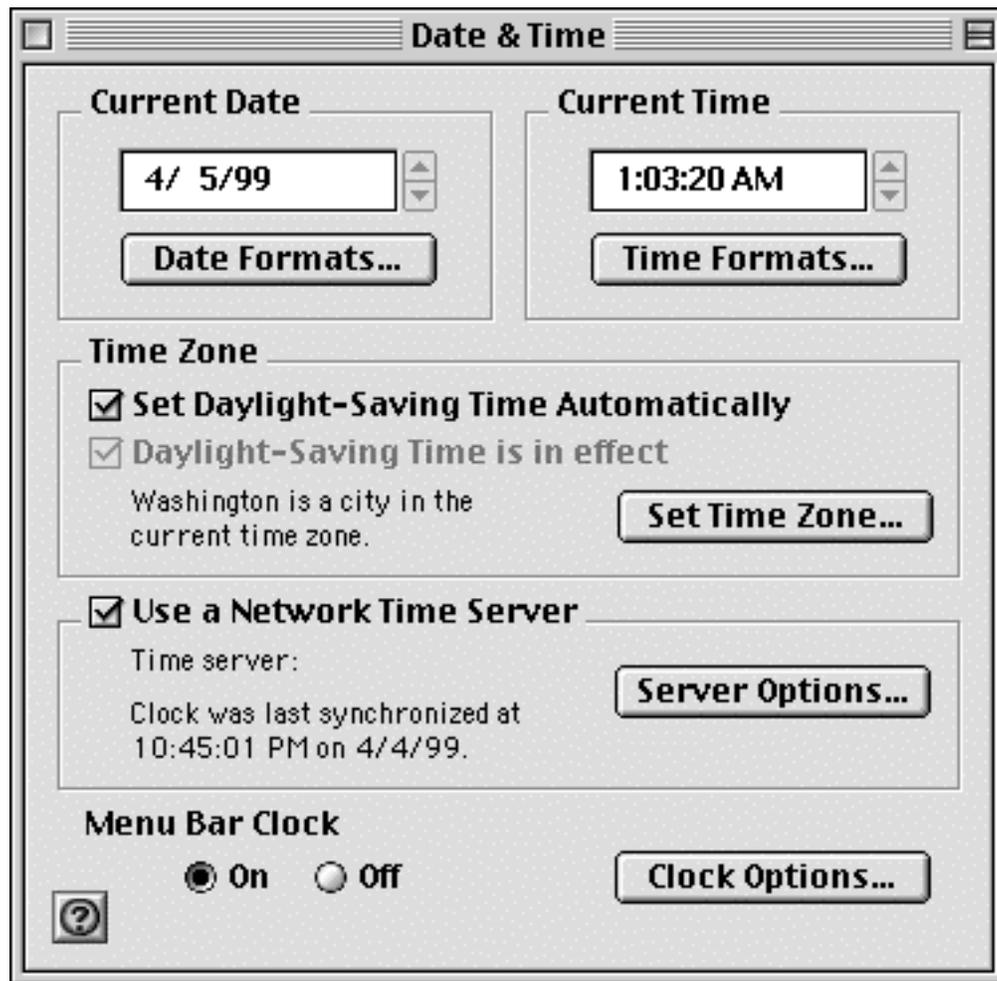
<u>Server Address</u>	<u>Location</u>	<u>(IP Address)</u>
time-a.nist.gov	NIST, Gaithersburg, Maryland	129.6.15.28
time-b.nist.gov	NIST, Gaithersburg, Maryland	129.6.15.29
time-a.timefreq.bldrdoc.gov	NIST, Boulder, Colorado	132.163.4.101
time-b.timefreq.bldrdoc.gov	NIST, Boulder, Colorado	132.163.4.102
time-c.timefreq.bldrdoc.gov	NIST, Boulder, Colorado	132.163.4.103
utcnist.colorado.edu	University of Colorado, Boulder	128.138.140.44
time.nist.gov	NCAR, Boulder, Colorado	192.43.244.18
time-nw.nist.gov	Microsoft, Redmond, Washington	131.107.1.10
nist1.datum.com	Datum, San Jose, California	63.149.208.50
nist1.dc.glassey.com	Abovenet, Virginia	216.200.93.8
nist1.ny.glassey.com	Abovenet, New York City	208.184.49.9
nist1.sj.glassey.com	Abovenet, San Jose, California	207.126.103.204
nist1.aol-ca.truetime.com	TrueTime, AOL facility, Sunnyvale, CA	207.200.81.113
nist1.aol-va.truetime.com	TrueTime, AOL facility, Virginia	205.188.185.33

Caution: The Server Addresses (and IP Addresses) in this list are subject to change without notice. While operational stability of the Internet Time Service is an important goal, changes cannot be avoided as NIST and the third-party hosts improve their networks. For the most up-to-date information on the NIST Internet Time Service, please see <http://boulder.nist.gov/timefreq/service/its.htm> and <ftp://time-b.nist.gov/pub/nist-srv.lst> .

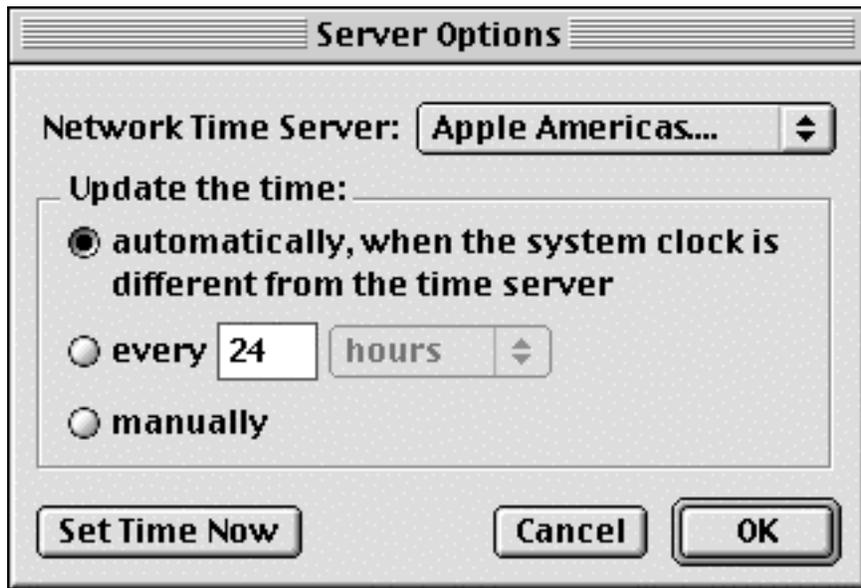
The [University of Delaware](http://www.eecis.udel.edu/~ntp/) hosts a World Wide Web site (<http://www.eecis.udel.edu/~ntp/>) that provides additional information on the [Network Time Protocol \(NTP\)](#), its variant, the [Simple Network Time Protocol \(SNTP\)](#), and [other NTP servers](#) that are publicly available around the world. In many cases, Internet service providers, universities, and other institutions also provide NTP servers for their own communities. NTP servers other than the NIST ITS servers may or may not be of comparable accuracy, and may or may not satisfy traceability requirements.

Section 5: Configuring the Date & Time Control Panel (Classic Mac OS)

- Open the “Date & Time” Control Panel. To do this, click on the Apple Menu, move the pointer to “Control Panels,” move the pointer to “Date & Time,” and then click again. Once opened, the control panel will look similar to this:



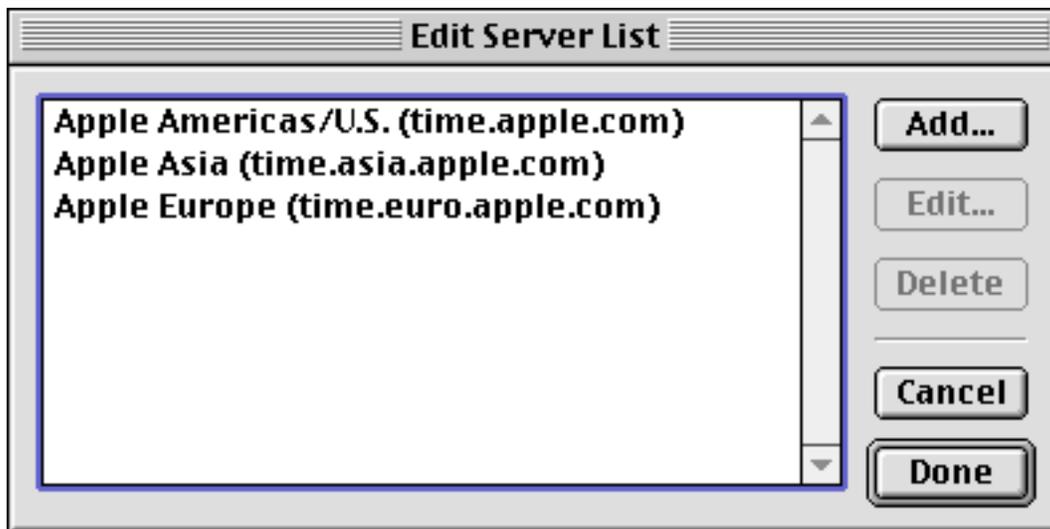
- Click in the small check box to the left of “Use a Network Time Server” in order to make the check mark appear, as in the illustration above. Then, click on the “Server Options...” button to reveal the dialog shown below:



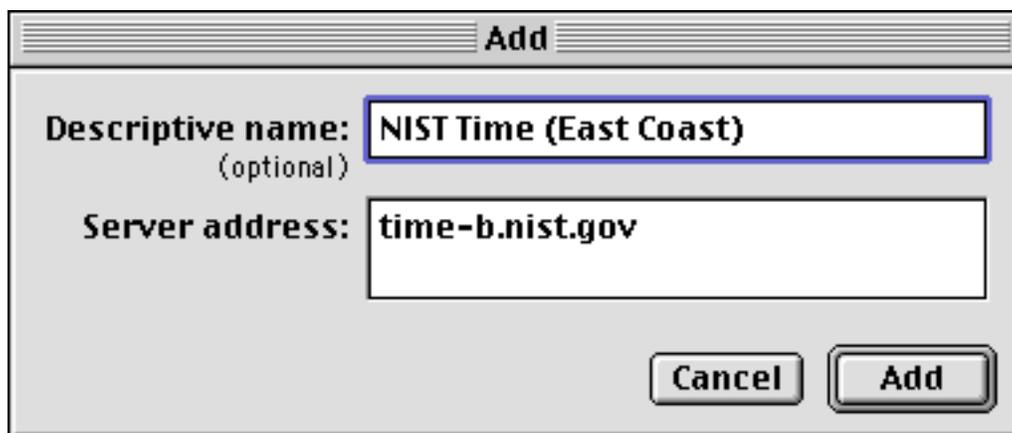
- Select one of the three options under “Update the time.” “Automatically” is recommended. Next, click on the pop-up menu to the right of “Network Time Server” to reveal the “Edit List...” command:



- Move the pointer to “Edit list...” and click to get the Edit Server List dialog:



- Click on the “Add...” button to reveal the dialog box shown below:



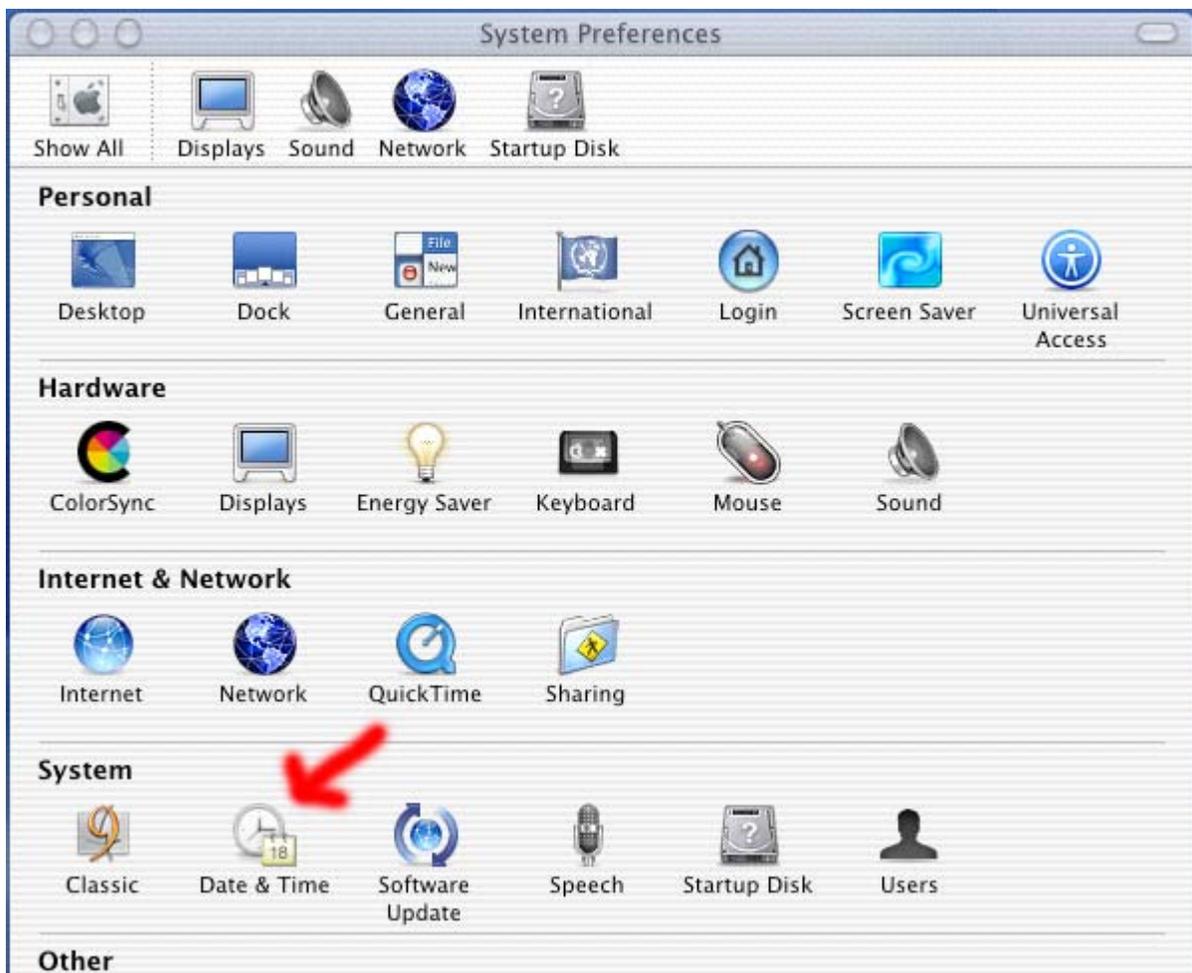
- The dialog box above shows an example already filled in. Enter a Server Address from the list in [Section 4](#), enter a descriptive name, and then click on the “Add” button.
- Repeat the two preceding steps for as many additional servers as you wish to add.
- Click on the server name in the list that you wish to use now, then click on the “Done” button.
- You may test the server by clicking on the “Set Time Now” button. When you are satisfied with the setup, click on the “OK” button.
- Conclude by either “Close”ing or “Quit”ing the Date & Time Control Panel. (Both operations are equivalent.)

Section 6: Configuring the Date & Time System Preference (Mac OS X)

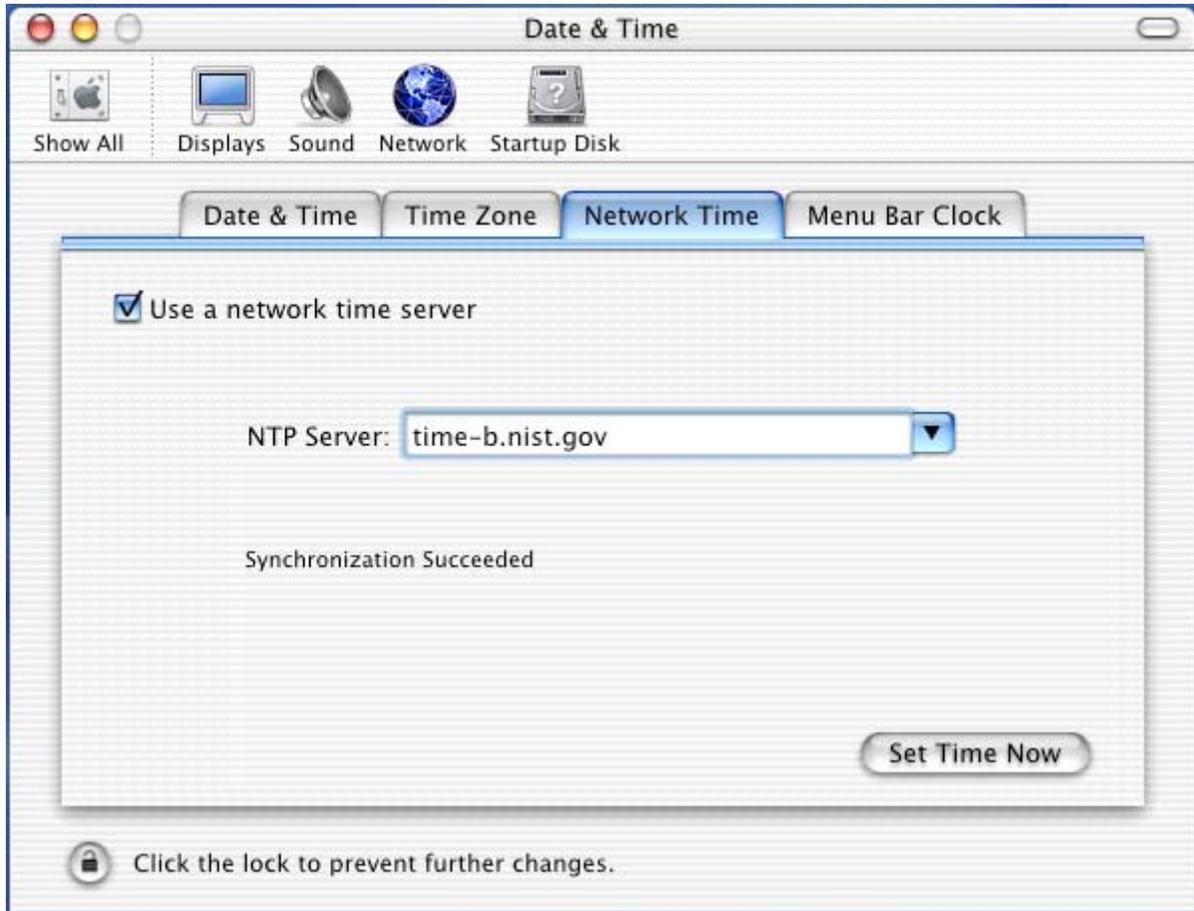
- Open the “Date & Time” System Preference Panel. To do this, click on the System Preferences icon in the dock:



Then click on the Date & Time icon:



- Click on the “Network Time” tab:



- Check the box “Use a network time server.”
- There is a pop-up list that offers you a choice of Apple-provided NTP Servers. If you wish to use an NTP Server other than Apple’s, you should type the Server Address in the box provided. (Unlike in Mac OS Classic, you cannot edit the pop-up list or add multiple additional servers. You may only type in the Address of one NTP Server at a time.) The list of NTP Servers provided by NIST (the Internet Time Service) is found in [Section 4](#). (Please note the Caution that follows the table.)
- Click on the “Set Time Now” button to confirm that you entered the Server Address correctly.
- Under the **System Prefs** menu, choose “Quit System Prefs.”

Section 7: Troubleshooting Hints

- The overall accuracy of the NTP protocol is affected by many things, including the distance between you and the NTP server, the load on the network, and any firewalls or proxy servers that your site or Internet provider might have.
- If you receive messages on the Macintosh such as “The network time server did not respond,” or “The server selected is not a network time server,” your first course of action should be to try another server. However, if the problem is the same for all servers, the source of the problem might be a firewall or proxy server.

Network time synchronization in the classic Mac OS uses NTP symmetric mode, which sends the request out on UDP port 123 and also receives the response on UDP port 123. If there is a firewall or proxy server on your network, outgoing and/or incoming traffic on port 123 may be blocked.

You will need to contact your network administrator to determine if this is what is happening on your network. There are two solutions to the problem, either of which needs to be done by the network administrator:

- 1) Reconfigure the firewall to allow both incoming and outgoing traffic on UDP port 123.
 - 2) Set up a local network time server inside of the firewall.
- The accuracy of NTP may be significantly degraded as a result of asymmetric delays between the incoming and outgoing traffic in a proxy system.
 - A low-tech but effective diagnostic is to listen to the NIST [WWV](#) broadcast over the telephone while watching the clock in the Date & Time Control Panel.

You can listen to [WWV](#) over the telephone by calling 303-499-7111. (Long distance charges to Boulder, Colorado may apply.) [Please note that other time-of-day telephone services are often not accurate. If possible, use an ordinary “land line” telephone—digital cordless and cellular telephones introduce noticeable time delays. Telephone calls from outside the contiguous United States may go by satellite, which also introduces noticeable time delays.]

Differences of less than half a second are typical; differences up to one second are common.