Novell
NetWare

Network Time Management

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Synchronizing Network Time with NetWare Time Management

Synchronizing time across the NetWare® network lets you maintain consistent time stamps.

NetWare needs to maintain a common system time for keeping file date and time stamps correctly, for auditing and logging, and for managing users' login time restrictions. It is also important to maintain a common time for the entire network system of servers and workstations.

The NetWare server utility TIMESYNC.NLM ensures that all NetWare servers report the same time and order events correctly. In a multiple server environment, the functionality to maintain a common time for all NetWare servers in the network is referred to as *time synchronization*.

A common time across the network helps eDirectory, messaging service, the file system, and other similar services.

This documentation covers the following topics:

- Chapter 1, "How Timesync.NLM Works," on page 9
- Chapter 2, "Configuring Timesync on Servers," on page 15
- "Troubleshooting Timesync Problems" on page 23

Documentation Conventions

In this documentation, a greater-than symbol (>) is used to separate actions within a step and items in a cross-reference path.

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1 How Timesync.NLM Works

Time synchronization is accomplished by designating a server or a group of servers to provide time for all other servers and client workstations in the network.

The following sections help you to understand Timesync:

Timesync Terminology

This documentation uses the following terms:

- Time provider

  A NetWare® server that provides time to other NetWare servers so they can synchronize their time with the time provider.

- Time consumer

  A NetWare server that seeks time from other NetWare servers to synchronize its time. This server can also act as a time provider for other servers and client workstations on the network.

- NTP time provider

  A server that understands the Network Time Protocol (NTP) protocol and provides NTP time to other servers or to workstations on the network.

- NTP time consumer

  A server that understands the NTP protocol and seeks NTP time from other NTP time provider to synchronize its time.

- Time provider group

  A set of servers that are configured to ensure fault tolerance and optimal network usage.

  The time provider group helps to keep the network traffic at a minimum.

  A time provider group requires at least one server to be designated as a time provider in the group. Other servers in the group can help to minimize traffic by spreading across geographic locations, thereby minimizing traffic across routers and WANs. Additionally, other servers or workstations consume time from this time provider group.

  Timesync network can be configured using one of the following time provider groups:

  The following figure shows a time provider group with the Reference time server at one level. The Reference time server provides time to Primary time servers. At the next lower level, the

time provider group consists of Primary time servers that provide time to Secondary time servers. Each of these servers can provide time to their workstations.
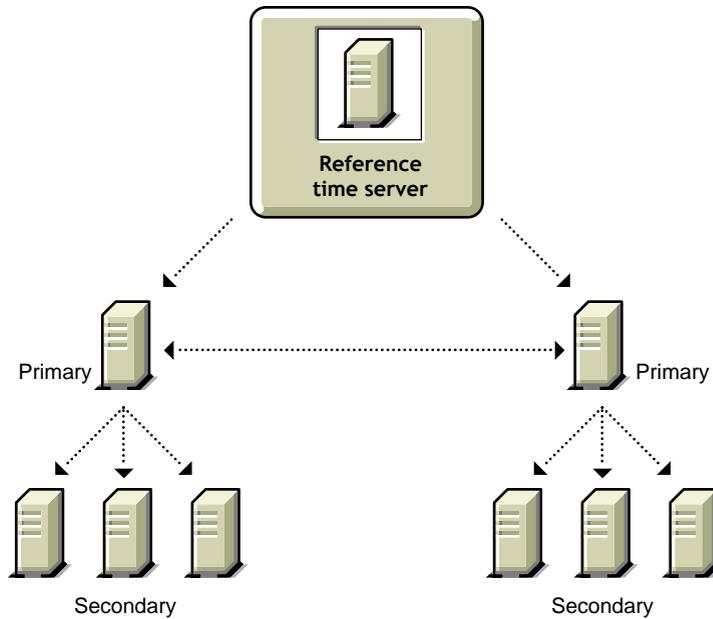
The following figure illustrates a network using an external time server that provides time to two Reference time servers, which are geographically distant.
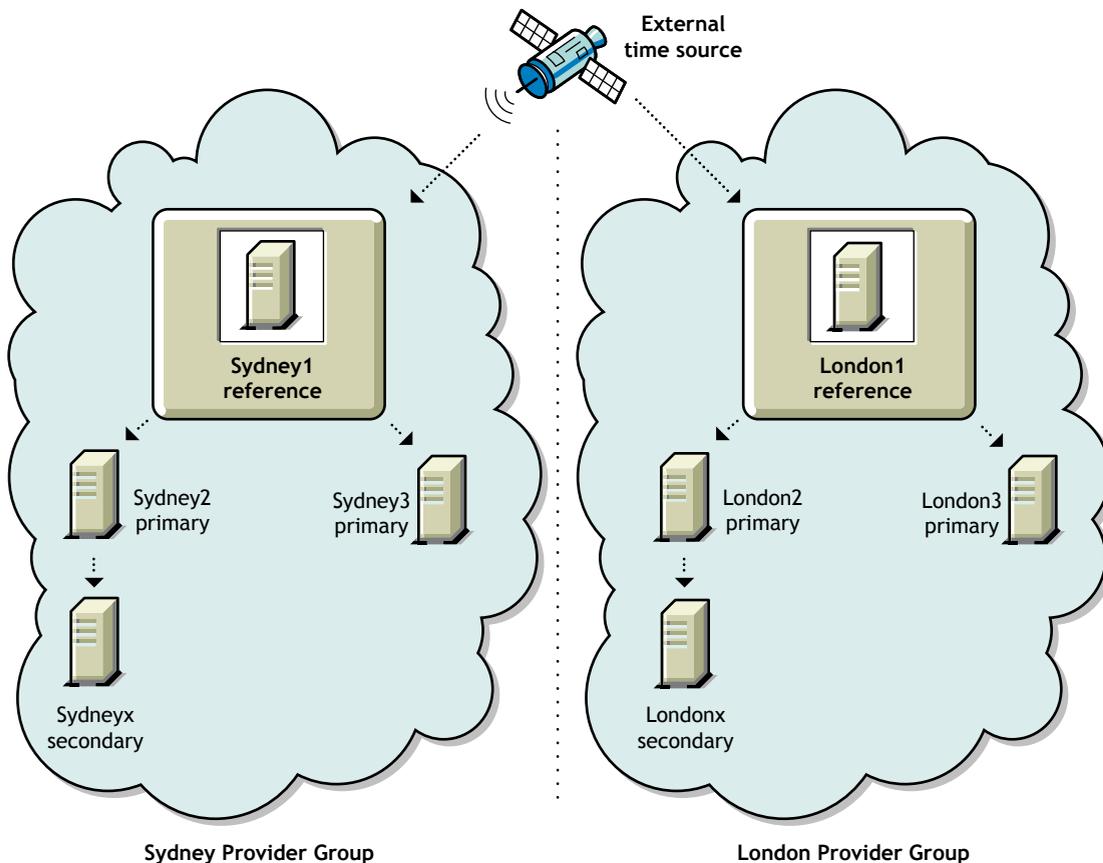
Identifying Timesync Server Types

To use Timesync, you must configure the NetWare servers. Timesync configuration allows some servers to be time providers and other servers to follow the time providers and become time consumers. Time consumers can provide time to the workstations and other servers in the network.

The following lists Timesync server types that you must use to configure Timesync.

NOTE: All Timesync servers can accept or provide time from and to NTP providers and consumers. There is a built-in NTP time consumer and NTP time provider in Timesync for this purpose. Timesync is not fully compliant with NTP.

For a quick reference on time server configuration, see .

Single Time Server

A Single time server provides time to Secondary servers and workstations.

A Single server can obtain time from a NTP time provider or from its own internal clock. This server acts as a master time provider to the Timesync network.

The Single time server falls back to the local clock if both of the following cases are true:

- If the NTP time provider is not contactable
- the Single time server has remained in synchronization with the NTP source for more than 10 minutes of polling delay

By default, the first server installed on a eDirectory tree is configured as a Single time server and other NetWare servers in the eDirectory tree are configured as Secondary time servers.

All other servers must be able to contact the Single time server to synchronize or change time on the network. The network administrator sets the time on the Single time server.

IMPORTANT: There can be only one Single time server in a eDirectory tree. There can be only one Single time server in a Timesync network.

The following figure illustrates a Single time server providing time to Secondary time servers. The Secondary time servers, in turn, provide time to their workstations.

**Single
time server**

**Secondary
time server**   **Secondary
time server**   **Secondary
time server**

Reference Time Server

A Reference time server provides time to Primary and Secondary servers, including workstations.

A Reference time server can obtain time from an NTP time provider.

The Reference time server falls back to the local clock if both of the following cases are true:

- If the NTP time provider is not contactable
- the Reference time server has remained in synchronization with the NTP source for more than 10 minutes of polling delay

Reference time servers do not adjust their internal clocks; instead, the Primary time servers' internal clocks are adjusted to synchronize with the Reference time server. A Reference time server acts as a central point to set network time. At server startup, the hardware clock is set to the time obtained from its external time source.

More than one Reference time server can coexist in one Timesync network.

The following figure shows a Reference time server synchronized to an external clock. The Reference time server, in turn, provides time to its own secondary servers and workstations, as well as to the Reference time server at another location.
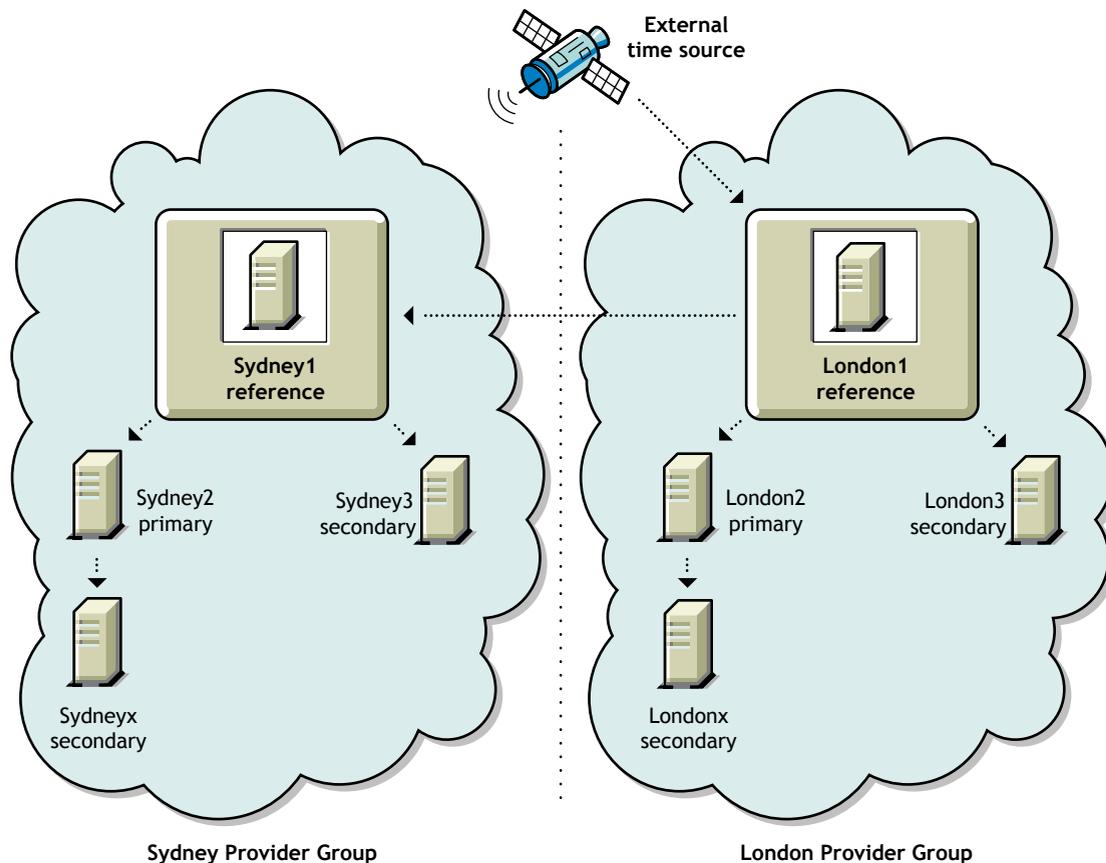
Primary Time Server

A Primary time server synchronizes the time with a Reference time server or an external NTP source.

Primary servers can provide time to Secondary time servers and workstations. Primary time servers are also designed to share time with other primary servers. Primary servers are used to vote (calculate a common offset) amongst each other and arrive at a common network time. Here, the time from Reference time server will have more weight age than the primaries.

Use the Primary time server on larger networks to increase fault tolerance by providing redundant paths for Secondary time servers. If a Primary time server goes down, the Secondary time server can get the time from an alternate Primary time server.

Primary server should have at least one primary and one reference time source to be synchronized properly. Otherwise, though the server is synchronized, it will be in suspected or non fault tolerant state.

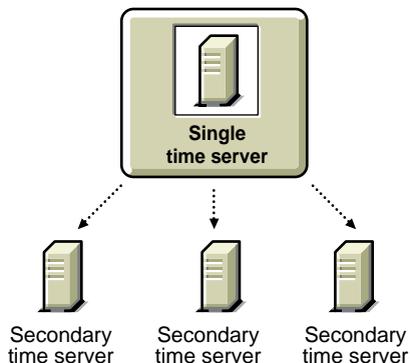The Primary time server falls back to the local clock if both of the following cases are true:

◆ If the NTP time provider is not contactable

◆ the Priamary time server has remained in synchronization with the NTP source for more than 10 minutes of polling delay

Secondary Time Server

A Secondary time server obtains the time from a Single, Primary, or Reference time server. It provides time to other Secondary time servers and workstations on the network. It adjusts its internal clock to synchronize with the network time. It provides the time to workstations, but it does not participate in determining the correct network time.

If you designate a server on the network as a Single time server, designate all other servers on the network as a Secondary time servers.

If you designate several servers on the network as Primary or Reference time servers, designate all other servers on the network as Secondary time servers.

Configuration Checklist for Time Servers

The following table lists the time providers and time consumers that can be connected to each other.

Time Provider	Time Consumer	Is this configuration allowed?
Single time server	Single time server	Not allowed
	Reference time server	Not allowed
	Primary time server	Not allowed
	Secondary time server	Allowed
	NTP Client Time Consumer	Allowed
Reference time server	Single time server	Not allowed
	Reference time server	Allowed
	Primary time server	Allowed

Time Provider	Time Consumer	Is this configuration allowed?
	Secondary time server	Allowed
	NTP Client Time Consumer	Allowed
Primary time server	Single time server	Not allowed
	Reference time server	Allowed
	Primary time server	Allowed
	Secondary time server	Allowed
	NTP Client Time Consumer	Allowed
Secondary time server	Single time server	Not allowed
	Reference time server	Not allowed
	Primary time server	Not allowed
	Secondary time server	Allowed
	NTP Client Time Consumer	Allowed
NTP Server Time Provider	Single time server	Allowed
	Reference time server	Allowed
	Primary time server	Allowed
	Secondary time server	Allowed
	NTP Client Time Consumer	Not applicable

2 Configuring Timesync on Servers

The following sections explain how to plan, set up and configure Timesync on the network:

Configuring a Time Provider Group in a Forced Scenario

Forced scenario is the default configuration that is set up during the installation. This configuration is set if all time consumers are in the same tree as the time provider.

In a forced scenario, Timesync uses one time provider and other servers synchronize their time with it. The time provider is a Single time server and other servers are Secondary time servers.

Configuration has the following advantages:

- Simple and easy configuration.
- Fewer than 30 NetWare servers. This limitation ensures that the Single time server is not overloaded with time requests.
- If all servers that need synchronization are in one tree, this is the default configuration after installation.
- Since the synchronization hierarchy is at two levels only, synchronization errors are minimized.

The disadvantages of this configuration are the following:

- This server configuration lacks fault tolerance. If the time server loses connection for an extended period of time, Secondary time servers will not sync with the network time. With only one time source, there is only one point of failure.
- This server configuration has a fan-out of around 30 servers only. The Single time server must be contacted by every server on the network. This leads to heavy loading of the Single time server and communication problems on networks with slow or over utilized LAN/WAN links.

The first server installed in the tree is configured by default as the Single time server. Subsequent servers are configured as Secondary time servers that seek time from the Single time server.

Single time servers cannot coexist with Primary and Reference time servers. This also implies that the Single time server does not exchange time information with Primary and Reference time servers. Single time servers advertise their existence through SLP/SAP in TCP/IPX™. Therefore, other servers installed in the same tree subsequently will not be configured as Single time server.

These servers will be configured as Secondary time servers with the Single time server as the time source.

To set up Timesync in a forced scenario, complete these steps:

1 Configure one server as the Single time server.

2 Configure all other servers as Secondary time servers and specify the Single time server as the time source for these servers.

For more information about Timesync SET parameters, see "Using Set Parameters to Configure Timesync" on page 17.

Configuring a Time Provider Group in a Voted Scenario

In a *Voted scenario* configuration, you plan and customize the time synchronization on the servers. In this configuration, identify the servers on the network that will be time sources and the servers that will follow the identified time source.

This server configuration is adequate for networks with the following conditions:

* More than 30 NetWare servers

* Needs to be customized and is not configured by default, during installation.

To customize time synchronization, follow this approach:

* Create a hierarchical structure for the servers.

* The time servers at the topmost-level are closely synchronized.

* The servers at each lower level are synchronized to servers at the next-level up.

The voted configuration for time synchronization:

* Allows complete control of the time synchronization hierarchy

* Optimizes the network traffic and distribute time sources around the network

* Adds robustness to the synchronization hierarchy by adding alternate time sources that servers should use in case of network failures

* More than one Reference time server can coexist on a Timesync network, but both the servers must be synchronized with each other. An external time source may be used for this purpose.

Voted configuration requires careful planning, especially on a large network.You should also consider that adding new time sources requires that the configuration files on several other servers should be updated.

Checklist for Voted Time Synchronization: Follow this checklist for a custom configuration.

❑ If more than one eDirectory™ tree is on the same network, will the trees be time synchronized independently or together?

❑ Which servers will be time sources (Primary and Reference time servers) and which servers will be Secondary time servers?

❑ Will time synchronization rely on SAP/SLP, a configured sources list, or a combination of the two?

In a custom configuration, eliminate the use of SAP/SLP by using the following parameters in the configuration file:

```
service advertising = off

configured sources = on
```

❑ If the servers will use a configured sources list, which servers will contact which time sources?

❑ Will more than one Reference time server be required? If so, what external time sources will be used to synchronize these servers?

Guidelines for Time Synchronization

The following guidelines can help you to organize the hierarchy structure for the servers:

◆ Whenever possible, specify Secondary time servers to synchronize with time sources. In this case, the time sources are Primary, Single, or Reference time source.

◆ Keep to a minimal number of time sources to reduce the network traffic. The number of packet exchanges between two servers doubles during each polling interval.

◆ Use time sources to provide local access throughout the network. On a large network, the use of multiple time sources can reduce the overall traffic across routers.

◆ Avoid using Primary time servers across WAN. This will minimize the traffic across WANs for time synchronization that may occur due to voting.

◆ If you are configuring for a multiple network, distribute Primary time servers strategically across the WAN infrastructure. This will reduce the WAN traffic by providing a time source for Secondary time servers and client workstations at each location.

◆ If the WAN infrastructure requires more than seven Primary time servers in the time provider group, implement additional time provider groups as necessary. Ensure that each Reference time server is synchronized to the same time source.

◆ All other servers in the network should be designated as Secondary time servers.

Using Set Parameters to Configure Timesync

Timesync uses the following parameters:

Parameter	Explanation
`start of daylight savings time = date and time`	Local date and time when the switch onto daylight savings time should occur. Formats include a simple date and time or rules introduced by an parentheses '('.
	For example: April 4 1993 2:0:0 am, (April 4 2:0:0 am), (April Sunday >= 1 2:0:0 am), or (April Sunday First 2:0:0 am).
	Only rules can reschedule for the next year. You must set both the start and end dates before either will be scheduled.
	For more information, see SET in NetWare 5.1 Utilities Reference.

Parameter	Explanation
`end of daylight savings time = date and time`	Local date and time when the switch off of daylight savings time should occur. Formats include a simple date and time or rules introduced by an open parentheses '('.
	For example: October 31 1993 2:0:0 am, (October 31 2:0:0 am), (October Sunday <= 31 2:0:0 am), or (October Sunday last 2:0:0 am).
	Only rules can reschedule for the next year. You must set both the start and end dates before either will be scheduled.
	For more information, see SET in NetWare 5.1 Utilities Reference.
`daylight savings time offset = [+|-] hour:minute:second`	The offset applied in time calculations when daylight savings time is in effect.
	The default is +1:00:00 (one hour).
	Issuing this command causes UTC time to be recalculated from local time.
	For more information, see SET in NetWare 5.1 Utilities Reference.
	Default: +1:00:00
`daylight savings time status = on|off`	Indicates whether daylight savings time is in effect (On) and the daylight savings time offset should be used in time calculations.
	Changing the status does not change the local time.
	Default: Off
`timesync configured sources = on|off`	When On, this server does not listen to advertising time sources. Instead it only contacts sources explicitly configured with the Time Sources parameter.
	Default: Off
`timesync polling count = number`	Specifies the number of time packets to exchange while polling with the time provider.
	Default: 3
`timesync polling interval = number`	Specifies when the next polling is scheduled.
	Default: 600
`timesync reset = on/off`	When set to On, Timesync resets the selected internal values and clears the configured server list.
	The flag automatically sets to Off.
	Default: Off
`timesync restart flag`	When set to On, Timesync will restart. The flag automatically resets to Off.
	Default: Off

Parameter	Explanation
`timesync service advertising = on|off`	When On, this time source advertises itself using SAP/SLP. Secondary time servers never advertise. **Default: On**
`timesync synchronization radius = value in seconds`	Specifies the maximum tolerance. Timesync remains in synchronization while the offset is lesser than this value. **Default: 2000**
`timesync time adjustment =[+|-]hour:minute:second [`at month/day/year hour:minute:second [AM or PM]	Schedule a time adjustment. Can only be issued from a Single, Reference, or Primary type server. The format is [+|-]hh:mm:ss [AT [date and time]]. Default date and time is six polling intervals or one hour (whichever is longer) from now. Using the word CANCEL instead of a date to cancel a previously scheduled adjustment. Single and Reference time servers do not accept adjustments from Primary time servers. **Default: None scheduled**
`timesync time source: IP address`	This server contacts the servers in this list as time providers. Each time server (IP address, DNS Name) in this list is separated by a semicolon ';'. For example: a semicolon ';' clears the list *MyServer* and specifies that MyServer is the NetWare time source. *MyServer:123*; specifies that *MyServer* is a NTP time source. **Default: Empty list**
`timesync type = primary|single|reference|se condary`	Specifies the Timesync server type: Single, Reference, Primary, or Secondary. **Default: Single**

`standard time offset`
`time zone = IST [Time offset`
`from IST]`
	Enter the offset in hours from Universal Time Coordinated (UTC).
	
	Time zone string indicates the abbreviated name of the time zone, the offset from UTC, and the alternate abbreviated time zone name to be used when daylight savings time is in effect.
	
	The default is <>. Issuing this command causes UTC time to be recalculated from local time.
	
	Default: Selected during installation

Parameter	Explanation
`default time server type = primary|single|secondary|re ference`	Specifies the default time synchronization server type.
	Choose from Secondary, Primary, Reference, or Single.
	This parameter can be overridden by separate time synchronization parameters.
	Default: Secondary
`debug flag = 0|7|15`	This parameter specifies whether Timesync opens a debug screen to view debug information.
	To enable the debug screen and log it to timesync.log (located in SYS:\SYSTEM):
	`set timesync debug=15`
	To enable the debug screen, specify: `set timesync debug=7`.
	`set timesync debug=7`
	To disable the debug screen, specify: .
	`set timesync debug=0`
	For more information about advanced usage of debug flag, see "Advanced Usage for Debug Flag" on page 21.
`immediate synchronization = on|off`	Activates the synchronization process immediately and starts a polling loop.
	This trigger is useful after the debug flag has been set to cause some screen output, rather than waiting for the process to awaken normally.
	This parameters resets to Off automatically.
	Default: On

Advanced Usage for Debug Flag

This parameter has three types of debug messages. Each type of debug message is enabled by setting a corresponding bit.

1. `TIMESYNC: Polled server` *`Corp_com`* `OFFSET.H=`*`FFFFFFFF`* `OFFSET.L =` *`F1F06723.`*

    This message provides the following details:

    ◆ Name of the server.

    ◆ The values for OFFSET.H and OFFSET.L are the calculated deviation of this server's time from the target server's time. The values form a 64-bit signed number with an implied hexadecimal point separating the whole and fractional parts.

    For example, *FFFFFFFF.F1F06723* indicates that this server is a fraction of a second ahead of *Corp_ Com*. Another possibility is that this is a weight of zero with non-zero offset values. This indicates that the synchronization data is out of range.

2. `Uniform adjustment requested=-400 milliseconds. This server is configured as a Secondary.`

This message provides the following details:

- The actual adjustment applied to the clock in milliseconds
- The time server type

    For example, when the adjustment is +0.00000000, the servers are in exact synchronization. This implies that no error can be detected by the algorithm. This value stabilizes at a very small negative value such as −200 milliseconds.

3. `Adjustment smaller than correction floor was ignored.`

    This message states that the clock adjustment is so small that it will be ignored. The parameter which determines the cutoff point is set to 1 millisecond by default.

    Change this parameter with the following command (undocumented): **`set timesync correction=x`**, where *x* is a value in milliseconds. This value must be always less than the synchronization radius; otherwise, synchronization is not possible.

Setting Time Backwards

Setting the time backwards is not recommended for the following reasons:

- Impacts eDirectory drastically, as synchronizing of objects across eDirectory is dependent on timestamps.
- eDirectory considers this as synthetic time.
- To ensure consistent timestamps across eDirectory, DSREPAIR.NLM provides an interface to declare a new epoch. This results in very high traffic to restamp all eDirectory objects.

The standard practice, before starting a Netware server, is to ensure that the time is as close as 10 minutes to the network time. This prevents many time synchronization issues.

Setting Timesync SET Parameters Consistently

Configure the SET Timesync parameters consistently on the network to avoid time synchronization conflicts on large networks.

The following parameters are interdependent across the servers:

- `set timesync service advertising = on|off`

    All servers should be configured the same (On or Off) for this parameter to be effective.

    This parameter has no effect on time consumers (Secondary time servers).

- `set timesync configured sources = on|off`

    When On, this server does not listen to SAP/SLP Timesync services. The time source for this server will be taken from the timesync configuration file.

- `set timesync time sources`

    This parameter identifies a time provider by server name or IP address. To use a NTP time source, prefix the server name or IP address with **`:123`**. Here, **`123`** indicates the standard NTP port. For Timesync to use this parameter, set `timesync configured sources` SET parameters to On. The time servers specified in the configured sources overrides servers discovered by any SAP/SLP, if configured sources Timesync SET parameters is set to On.

- `set default time server type`

    The SET Timesync Type parameter always overrides this parameter.

Troubleshooting Timesync Problems

This section covers the following:

Time Zone Problem

Problem: Users are logged out at incorrect times or time restrictions are shown incorrectly or LASTLOGIN displays an incorrect time.

Possible Cause: The time zone is not set correctly.

Action: Use one of the following commands to set the time zone:

- **`set tz=timezone in AUTOEXEC.BAT`**

- **`DOS SET TZ=timezone in login script`**

Synthetic Time Problem

Problem: The NetWare® server reports the following error:

```
Synthetic time is being issued on partition.
```

Possible Cause: In NetWare 4 and later versions, synthetic time is issued at a server with the error `DS- 4.63-12` if the server time is set backwards. The synthetic time is cycled every two minutes until the server time is later than the last modified time stamp.

Action: Run DSREPAIR.

Click Advanced Options > Replica and Partition Operations, and then select the partition you want to update.