WHITE PAPER

Solution-Soft

White Paper: Using Time Machine
on an IBM SP System

> Note: It is expected that the reader of this document is familiar with both the RS/6000 and the IBM SP. The document is written for developers, testers, analyst and system administrators. Detailed technical knowledge of either the RS/6000 or the SP is not necessary to configure and establish Time Machine's virtual clocks.

1. Definitions

The use of the words "*system(s)*" or "*SP system(s)*" will refer to a single SP computer.

The use of the word "*node(s)*" will refer to the individual RS/6000(s) which make up a single *SP system*.

The use of the words "*system clock(s)*" will refer to the single clock on a *node*, which typically is used to answer all requests for date or time. This document does not distinguish between the hardware clock and the software clock.

The use of the words "*SP system clock(s)*" will refer to the controlling, master clock of the *SP system*.

2. Introduction

Time Machine™ is a powerful tool, which allows users to be more productive with their Year 2000 (Y2K) projects. Effectively, Time Machines allows up to 200 virtual *system clocks* on a single computer. One of the many benefits of Time Machine is the ability to run application tests on a production computer without interfering with production applications, or corrupting important information, including log files and file update stamps.

The IBM *SP system* is a grouping of one or more IBM RS/6000s. Within an SP, each RS/6000 is referenced as a *node*. Regardless of the number of *nodes*, the *system* enforces a matching of the *system clocks* with the *SP system clock*. Therefore, it is impossible to execute an application test with a need for a different date/time as is necessary for all Y2K testing unless **all** production is halted. Since these *system*s are specifically provided for 24x7 uptime, it is inconceivable to halt all production. This means an *SP system* generally cannot be used for date/time application testing unless it is defined as a non-production *system*.

Because Time Machine is available for many different platforms, including the RS/6000, date/time application testing can occur on an *SP system* **while** production applications continue to run. Additionally, because of the design of Time Machine, date/time testing can occur with production applications on the same *node*. Therefore, there is no requirement to modify the *node* configuration, or grouping, on an *SP system* to use Time Machine.

As with any UNIX environment, Time Machine's functions and commands are only available to the `root` user by default. However, some functions and commands can be allowed to specific non-`root` users in the typical UNIX manner. Therefore, if a non-`root` user wishes to utilize any of the following functionality without the direct involvement of the `root` user, appropriate permissions must be made.

3. *Getting Started*

The first step in using Time Machine is the installation of the product. The *SP system* allows administrators to shutdown single *nodes* at a time. This allows the other *nodes* in the *system* to continue processing. Therefore, Time Machine is installed one *node* at a time, allowing the administrator to schedule installs at different times and intervals. Likewise, Time Machine must be installed on all the *nodes* on which a Time Machine user will execute date/time testing.

The installation of Time Machine on a *node* is exactly the same as installing Time Machine on a normal RS/6000. Please refer to the User Manual for the specific instructions and steps.

4. *Nodes*

Each *node* is assigned a *node* number and name, and can be grouped with other *nodes* in the *system*. Following is an example of finding the *node* groups on the *system* and finding the *nodes* contained in a group.

```
root @ v03n07 => nglist -G
NodeGroup1
root @ v03n07 => ngresolve -G NodeGroup1
1
2
root @ v03n07 => ngresolve -G -w NodeGroup1
v03n01.spc.ibm.com
v03n02.spc.ibm.com
```

There is one *node* group on this *system*, `NodeGroup1`, which includes the first and second *nodes*. These two *nodes* are named `v03n01.spc.ibm.com` and `v03n02.spc.ibm.com`.

5. *Users and Auto-synchronization*

Auto-synchronization is important in the configuration and management of the *SP system*. Therefore, it is also important in the configuration and management of users and Time Machine. When auto-synchronization is enabled on the *system*, certain rules apply to users. One of these rules is a user that is added to more than one *node* would be assigned the same `uid` on all of the *nodes*. However, if auto-synchronization is disabled it is possible for two users with the same name to have different `uids`.

```
root @ v03n07 => dsh -a lsuser -a id test1

v03n01.spc.ibm.com: test1 id=201
v03n02.spc.ibm.com: test1 id=201
v03n03.spc.ibm.com: test1 id=201
v03n04.spc.ibm.com: test1 id=201
v03n05.spc.ibm.com: test1 id=201
v03n06.spc.ibm.com: test1 id=201
v03n07.spc.ibm.com: test1 id=201
v03n08.spc.ibm.com: test1 id=201
v03n09.spc.ibm.com: test1 id=201
v03n13.spc.ibm.com: test1 id=201
root @ v03n07 => dsh -a lsuser -a id fred
v03n01.spc.ibm.com: fred id=213
v03n02.spc.ibm.com: 3004-687 User "fred" does not exist.
v03n03.spc.ibm.com: 3004-687 User "fred" does not exist.
```

```
v03n04.spc.ibm.com: 3004-687 User "fred" does not exist.
v03n05.spc.ibm.com: 3004-687 User "fred" does not exist.
v03n06.spc.ibm.com: 3004-687 User "fred" does not exist.
v03n07.spc.ibm.com: fred id=214
v03n08.spc.ibm.com: fred id=215
v03n09.spc.ibm.com: 3004-687 User "fred" does not exist.
v03n13.spc.ibm.com: 3004-687 User "fred" does not exist.
```

In this example, one can assume that the user, `test1`, was added when auto-synchronization was enabled. When `test1` was added to the *system*, each user on the *nodes* were automatically assigned the same uid, 201. When `fred` was added, auto-synchronization was disabled. Therefore, `fred` was given three different uids, 213 on *node* 1, 214 on *node* 7 and 215 on *node* 8.

This can result in problems when using Time Machine, since the virtual clocks are assigned by uid, not user name. If `fred` incorrectly believed that setting a virtual clock for uid 213 on *node* 1, *node* 7 and *node* 8 would provide a simulated date/time for him, unwanted outcomes would occur. Therefore, users must be very careful when assigning virtual clocks when auto-synchronization is disabled.

There is good news! First, in all but the most non-typical *SP system*, auto-synchronization will be enabled, which would not allow `fred` to be created in this manner. Second, if auto-synchronization was disabled, once enabled, the user `fred` would be deleted from the *nodes* along with the uids. When `fred` is re-added, the uids will match. Additionally, the old uids, 213-215 in this example, would not be available for new users.

NOTE: While it is possible to test using Time Machine with production user names, SolutionSoft recommends that new user names be added specifically for testing. Because user names, and their uid, often span multiple nodes, using existing production user names can become confusing. Adding, and using, new test user names will help alleviate this confusion.

6. Setting a Time Machine virtual clock on a single node

Because of the typical *SP system*, it is not likely that a virtual clock is necessary for a uid on a single *node*. On the other hand, there are some cases where a uid might require a virtual clock for testing purposes. For example, an individual responsible for testing applications may exist on all *nodes*, as `test1` does. For a particular test, this individual may only be running an application on *node* 1, `v03n01`. Setting a virtual clock for all the *nodes* could cause unforeseen problems, so it may be necessary to set the virtual clock only on the one *node*.

```
root @ v03n07 => dsh -w v03n01 /etc/ssstm/tmuser -a -u 201 -x 030204002001

v03n01: Copyright (c) 1997, 1998 SolutionSoft Systems, Inc.  All Rights Reserved
v03n01: Tmuser for IBM AIX 3.x and 4.x.  Version 1.02
v03n01: Utility for setting TM kernel module configuration.
v03n01:
v03n01: This software is licensed to:Solution
v03n01: Your demo version software expiration date is:Thu Dec 17 14:40:22 1998
v03n01:
v03n01: Uid 201 has been added with a running virtual clock: Fri Mar  2 04:00:00 2001
```

In this `dsh` command, a Time Machine virtual clock was assigned to uid 201 on *node* `v03n01` using the `-w` option. The date and time were set to Friday, March 2, 2001. Subsequent application date/time calls on *node* `v03n01` by uid 201, such as made with the UNIX commands `cal` or `date`, will see the date as March 2, 2001. Application date/time calls on the other *nodes* will continue to see the *SP system clock* time.

```
root @ v03n07 => telnet v03n01
Trying...
Connected to v03n01.
Escape character is '^]'.

telnet (v03n01)
AIX Version 4
(C) Copyrights by IBM and by others 1982, 1996.
```

```
login: test1
test1's Password:
******************************************************************************
*                                                                            *
*                                                                            *
*   Welcome to AIX Version 4.3!                                              *
*                                                                            *
*                                                                            *
*   Please see the README file in /usr/lpp/bos for information pertinent to  *
*   this release of the AIX Operating System.                               *
*                                                                            *
*                                                                            *
*                                                                            *
******************************************************************************
Last login: Wed Dec  2 15:04:24 CST 1998 on /dev/pts/0 from v03n07
$ cal
        March 2001
Sun Mon Tue Wed Thu Fri Sat
                  1   2   3
 4   5   6   7   8   9  10
11      12  13  14  15  16  17
18  19  20  21  22  23  24
25      26  27  28  29  30  31
$ date
Fri Mar  2 04:04:05 CST 2001
```

```
root @ v03n07 => telnet v03n02
Trying...
Connected to v03n02.
Escape character is '^]'.

telnet (v03n02)
AIX Version 4
(C) Copyrights by IBM and by others 1982, 1996.
login: test1
test1's Password:
******************************************************************************
*                                                                            *
*                                                                            *
*   Welcome to AIX Version 4.3!                                              *
*                                                                            *
*                                                                            *
*   Please see the README file in /usr/lpp/bos for information pertinent to  *
*   this release of the AIX Operating System.                               *
*                                                                            *
*                                                                            *
******************************************************************************
Last login: Wed Dec  2 15:04:24 CST 1998 on /dev/pts/0 from v03n07

$ cal
      December 1998
Sun Mon Tue Wed Thu Fri Sat
          1   2   3   4   5
 6   7   8   9  10  11  12
13  14  15  16  17  18  19
20  21  22  23  24  25  26
27  28  29  30  31

$ date
Wed Dec  2 20:04:05 CST 1998
```

7. Setting a Time Machine virtual clock on more than one node

As can be seen from the previous example, setting a Time Machine virtual clock is completed with standard `dsh` options. Following are examples for specifying multiple *nodes*:

To set Time Machine for two specific *nodes*:

```
root @ v03n07 => dsh -w v03n01,v03n08 /etc/ssstm/tmuser -a -u 201 -x 030204002001
```

To set Time Machine for the *node* group:

```
root @ v03n07 => dsh -G -N NodeGroup1 /etc/ssstm/tmuser -a -u 201 -x 030204002001
```

8. *Summary*

When using Time Machine on an *SP system*, there are few things to remember:

    a)   Auto-synchronization should be enabled at all times, or you must be very careful with the use of user names and `uids`.

    b)   New user names and uids should be added specifically for testing. Utilizing existing user names can become confusing.

    c)   If a user exists on more than one *node*, consideration must be made as to which *nodes* you wish to set a Time Machine virtual clock.

    d)   If setting a Time Machine virtual clock for a user on more than one *node*, the appropriate `dsh` command options must be used. This ensures that the Time Machine virtual clocks are synchronized.

    e)   Time Machine virtual clocks are "remembered" between log ons. If you do not manually delete a virtual clock for a user, when the user logs on again the existing virtual clock will continue to be used, unless there was a shutdown of the *node* (See the Time Machine User Manual for more information).

    f)   Time Machine must be installed on all the *nodes* on which a Time Machine user will execute date/time testing.