the Availability Digest

Testing for Y2038 and Y2028
May 2017

In our article posted in our March 2017 issue, "Future Dates Spell Problems for IT," and in our article in this issue, "Not Only the Y2038 Problem – There's a Y2028 Problem," we explained future date problems that may cause applications to crash.

The Y2038 problem comes about because in many systems date/time is kept as a signed 32-bit integer. Most 32-bit Unix systems store and manipulate time in this format. Typically, in these systems, time is interpreted as the number of seconds since January 1, 1970. Using this technique, times cannot be encoded past 03:14:07 UTC on January 19, 2038. Times beyond this time will wrap around and be stored as a negative number. Systems will interpret the wraparound time as December 13, 1901, rather than January 19, 2038.

The Y2028 problem comes from an attempt to sidestep the Y2K problem. This problem originated as the year 2000 approached. To save memory (in the old days when memory in IT systems was very limited), years were stored as a two-digit number. '86' was interpreted as 1986. However, as the year 2000 approached, applications were going to have to be modified to accommodate a four-digit year field. The worst consequence of this was that all data records were going to have to be reformatted to use a four-digit year field instead of a two-digit year field. However, some clever technicians realized that the calendar repeats every 28 years. So they simply subtracted 28 from the current year (2017 became 1989) and modified their applications to add 28 to the two-digit year. This works fine until the year 2028, when the two-digit year rolls over to 00. This will be interpreted by applications to be the year 1900. Adding 28 to it will give the year 1928. Surely, applications so affected will likely crash.

There is also a Y2042 problem in IBM z/OS systems. This is due to the fact that time is represented as a 64-bit integer showing the number of microseconds since January 1, 1900. This integer rolls over on September 17, 2042. IBM has defined a new 128-bit time format that is available on its new hardware. However, many applications and computer languages continue to rely on the 64-bit format.

It is therefore very important to test applications, especially legacy applications that have been around for a long time and for which the code may be lost, to determine if they will face a Y2028 or a Y2038 problem. Fortunately, there are good test tools to do this.

With over thirty time zones across the globe, some with 15, 30, or 45 minute differences, testing your applications for proper date/time functionality can be complex. Add to that Standard Time and Daylight Savings Time.

In this article, we review two of these tools. One is Softdate from DDV Technologies that can be used to test dates for IBM z/OS, Linux/Unix, and Windows systems. The other is OPTA2000 from TANDsoft for testing HPE NonStop systems.

The Softdate Date and Time Simulation Data Protection Suite

It is essential that application behavior on significant future dates and times be tested to ensure application quality and reliability. Date and Time Simulation (DTS) software lets you certify your applications for correct date and time logic by allowing you to test them on apparent future dates and times.

DTS software helps you do this by letting you set 'virtual system clocks' for the applications to be tested. To these applications, it appears that the simulated date and time is the true system date and time, though the actual system dates and times are not altered.

The Softdate suite provides date and time simulation that supports many major enterprise platforms including:

- Softdate/z for IBM mainframe z/OS.
- Softdate/x for all Linux/Unix varieties
- Softdate/w for Microsoft Windows

Softdate/z functions as a virtual time machine across IBM's Parallel Sysplex, z/OS batch, TSO, CICS, IMS, DB2, SAP, and WebSphere.

Softdate/x provides support of all Linux/Unix variations and associated databases, 3rd party applications and more.

Softdate/w provides full support for all Microsoft Windows operating systems, Oracle DB, SQL Server, SAP, WAS, and more.

The Softdate suite can be used to check systems and applications for proper operation around the years 2028, 2038, and 2042 (for z/OS systems) by setting the simulated system date and time to just before the rollover time. The applications can be allowed to execute in the simulated time to determine if they will function properly. Faulty applications can then be corrected or replaced.

Softdate is a product of DDV Technologies. The Softdate website URL is
http://dateandtimesimulationsoftware.com.

DDV Technologies' website URL is
http://ddvtechnologies.com.

TANDsoft's OPTA2000 Virtual Clock and Time-Zone Simulator

A major enterprise system not supported by Softdate is HPE's fault-tolerant NonStop system (originally the Tandem system). The OPTA2000 Virtual Clock and Time-Zone Simulator from TANDsoft fills this need. It is the only NonStop solution available for critical date/time simulation. It eliminates the need to change system clocks for time-sensitive testing. OPTA2000 was used in many Y2K testing projects to ensure proper program operation as Midnight, December 31, 1999 passed.

There are two operating systems that can be used on a NonStop system – Guardian and OSS. Guardian is the original operating system developed for NonStop and does not have a year problem. Its date/time integers are all 48 bits or greater.

However, the OSS operating system is a Unix-like operating system. Many applications running under OSS may well be using 32-bit date/time integers and will fail in year 2038. Furthermore, many OSS services use 32-bit date/time integers including Ctime, Difftime, Gmtime, gmtime_r, Localtime, Mktime and Time.

There have already been problems with OSS applications that use forward dates such as long-term mortgages and life-insurance policies.

OPTA2000 can be used to time-test the performance of NonStop OSS applications to 2038 and beyond. OPTA2000 provides date/time simulation and time-zone simulation for all HPE NonStop systems and databases. It allows organizations to 'time-travel' their applications in the future or past to test all date and time-sensitive logic. Applications can operate in any virtual time zone.

OPTA2000 allows existing backup, test, development, and production systems to support worldwide consolidated applications. A single system can host thousands of applications, each with its own virtual system clock. It has been used to consolidate entire data centers, allowing applications within a single data center to operate in their own virtual time zones. All of this is accomplished without changing the system clock of the host system.

The URL for TANDsoft's website is http://www.tandsoft.com.

Summary

Though the year 2038 may seem a long way off, time passes quickly. Now is the time to ensure that your applications will perform properly when they have to deal with critical dates like 2038, 2028, and 2042.

Fortunately, there are quality date/time simulators on the market that let you test your applications with future dates without having to reset your system's clock. Now is the time to use these utilities to make sure that you are prepared for these critical upcoming dates.