

Leap Second in December 2016 May Disrupt Date and Time Processing

Leap Second Affects Date and Time Computations

UTC Leap Second Announced

The International Earth Rotation and Reference Systems Service (IERS) has announced that Coordinated Universal Time (UTC) will insert a sixty-first second into the last minute of 31 December 2016. Known as a “leap second”, the extra second is needed to compensate for the slowing rotation of the Earth. Leap seconds are added at irregular intervals on the basis of astronomical observations, since they are affected by climatic and geological events that cannot easily be predicted in advance.

Leap Second Impacts

Date-sensitive applications, communication systems, and realtime processing algorithms that neglect the possibility of a 61-second minute may not perform as expected when a leap second occurs.

For example, Linux kernel versions 2.2.26 to 3.3 deadlocked during the leap second event of 30 June 2012, causing computer and network outages for Qantas Airways and Reddit. The leap second event also triggered navigation errors in GPS receivers.

Last year, during the leap second event of 30 June 2015, many internet routers failed, some Linux servers hung, and service was interrupted for about 40 minutes on Amazon, Instagram, Netflix, Pinterest, Twitter, and Apple's Beats 1 music streaming service. Many GPS receivers implemented the leap second change incorrectly, as did some NTP (Network Time Protocol) servers. As a precaution, the Intercontinental Exchange — parent body to 7 financial clearinghouses and 11 stock exchanges, including the New York Stock Exchange — halted operations for 61 minutes at the time of the leap second to avoid legal exposure for trades not executed on the correct date.

Affected Systems and Resolution

DDN storage arrays, storage management utilities, and file system solutions that run under Linux could potentially misbehave when a leap second occurs. This risk applies primarily to **older** software and firmware releases, and it exists only if the DDN software or equipment is installed on a network **without** NTP time synchronization **configured to run in step mode**.

The table below lists DDN products potentially affected by this year's leap second event. If you are affected by the leap second issue, and are not using NTP synchronization in step mode, the recommended resolution is to upgrade to the current, recommended release before the leap second occurs.

PRODUCT	AFFECTED VERSIONS	FIX
Storage Arrays		
SFA OS (SFA14K, SFA12K, SFA7700)	2.3.1.2 and earlier	2.3.1.3 and later 3.1.0.1 is current, recommended release
SFA OS (SFA10K)	2.2.6 and earlier	2.2.7 2.2.7 is current, recommended release
SFA OS (S2A6620)	1.5.6 and earlier	1.5.7 1.5.7 is current, MANDATORY release
Storage Solutions		
DirectMon	2.2.1 and earlier	2.3.0 and higher 2.5.0 is current, recommended release
EXAScaler	All versions	Patch available on request 2.4.0 is current, recommended release
EXAScaler Bridge	1.0	Patch available on request 1.0 is current, technical preview release
GRIDScaler	All versions	Patch available on request for 3.x and 4.x 4.1.0 is current, recommended release
GRIDScaler Bridge	All versions	Patch available on request for 1.7.x and 1.8.x 1.8.1 is current, recommended release
WOS Access CIFS/SMB/NFS	1.4.4 and earlier	1.4.5 and later 1.6.1 is current, recommended release
WOS Access S3/Swift	2.0.3 and earlier	2.1.0 and later 2.2.1 is current, recommended release

The following DDN products are **not** affected by leap second events:

- IME (software or IME14K appliance)
- S2A DirectOS (for S2A9900)
- WOS Core (software or on WOS6000, WOS7000, WOS9660)

Workaround

If it is not desirable or feasible to upgrade before the December leap second event, the recommended workaround is to ensure that NTP is installed on the network to provide network time synchronization, and **configure it to run in step mode** (that is, **without** the `-x` parameter).

The NTP daemon synchronizes local timekeeping with an NTP server that automatically handles the injection of a leap second in a nondisruptive manner. This is done by converting the unique UTC label for the sixty-first second — in this case, 2016 December 31, 23:59:60 — to a *second occurrence* of a conventionally labeled 60th second (that is, to a repeat instance of 2016 December 31, 23:59:59). A leap second flag is also thrown for the 61st second. This time conversion is processed normally by most applications, although applications that ignore the leap second flag can generate one-second errors when calculating durations around the leap second.

ALERT! DDN does not recommend operating any storage network without a method of time synchronization such as NTP, PTP, or Chrony.

Environments Without NTP or Running NTP in Slew Mode

In the uncommon case when NTP is not used, some DDN products may not perform date processing as expected. In addition, some DDN products incorporate a workaround for leap second processing that involves running NTP in “slew mode” (that is, with the `-x` parameter). However, Red Hat Enterprise Linux version 6 (RHEL 6) removed leap second adjustments from NTP slew mode in a patch issued last year. Older DDN products that integrate RHEL 6 and use NTP slew mode will be affected by the leap second issue if the NTP patch to RHEL 6 is newly installed.

Contacting DDN Technical Support

Please contact DDN Technical Support at any time if you have questions or require assistance. Support can be reached by phone, by email, or on the web as listed below.

Web

DDN Community Support Portal
Portal Assistance

<https://community.ddn.com/login>
webportal.support@ddn.com

Telephone

DDN Support Worldwide Directory

<http://www.ddn.com/support/contact-support>

Email

Support Email

support@ddn.com

Bulletins

Support Bulletins
End-of-Life Notices
Bulletin Subscription Requests

<http://www.ddn.com/support/technical-support-bulletins>
<http://www.ddn.com/support/end-of-life-notices>
support-tsb@ddn.com