Troubleshoot ISE and NTP Server Synchronization Failures on Microsoft Windows

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Introduction

This document describes a problem that is encountered when the Cisco Identity Services Engine (ISE) and other Linux-based servers fail to synchronize with a Network Time Protocol (NTP) server that is installed on a Microsoft Windows Server. A solution to this problem is also provided.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- Cisco ISE CLI configuration

- Basic knowledge about NTP

Components Used

The information in this document is based on these software and hardware versions:

- Microsoft Windows Server Version 2012

- Cisco ISE software Versions 1.3 and later

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Problem

After you configure the ISE CLI in order to use the Microsoft Windows Server as NTP, it does not synchronize. The Microsoft Windows Server 2012 default domain controller configuration is used (default NTP configuration). The ISE reports that the local source is still used:

```
ise14/admin# show ntp
Configured NTP Servers:
 10.62.145.72

synchronised to local net at stratum 11
 time correct to within 11 ms
 polling server every 1024 s

 remote refid st t when poll reach delay offset jitter
==============================================================================
*127.127.1.0 .LOCL. 10 l 9 64 377 0.000 0.000 0.000
 10.62.145.72 .LOCL. 1 u 226 1024 377 0.896 -3.998 4.130

* Current time source, + Candidate , x False ticker

Warning: Output results may conflict during periods of changing synchronization.
```

All of the parameters (reachability, delay, offset, and jitter) appear to be correct, and there is no way to troubleshoot the issue from the CLI (NTP synchronization failure). For confirmation of the issue, you must go to the root level and use the NTPQ tool in order to query *ntpd daemon* for more details:

```
[root@ise14]# ntpq

ntpq> associations

ind assID status conf reach auth condition last_event cnt
=========================================================
 1 53519 9614 yes yes none sys.peer reachable 1
 2 53520 9014 yes yes none reject reachable 1
```

As shown, there are two associations presented. The **53520** association is marked as *rejected*. Here are some additional details for that association:

```
ntpq> mrv 53520 53520
assID=53520 status=9014 reach, conf, 1 event, event_reach,
srcadr=10.62.145.72, srcport=123, dstadr=10.62.145.42, dstport=123,
leap=00, stratum=1, precision=-6, rootdelay=0.000,
rootdispersion=10032.150, refid=LOCL, reach=377, unreach=0, hmode=3,
pmode=4, hpoll=10, ppoll=10, flash=400 peer_dist, keyid=0, ttl=0,
offset=-32.465, delay=0.898, dispersion=30.345, jitter=4.519,
reftime=d96b0358.fe7c815a Tue, Aug 4 2015 11:24:40.994,
org=d96b08ed.829514cf Tue, Aug 4 2015 11:48:29.510,
rec=d96b08ed.8b022d8d Tue, Aug 4 2015 11:48:29.543,
xmt=d96b08ed.8ac74cca Tue, Aug 4 2015 11:48:29.542,
filtdelay= 0.90 1.20 0.95 0.93 0.87 0.89 1.19 0.93,
filtoffset= -32.47 -27.95 -26.50 -34.32 -27.74 -18.14 -22.54 -23.79,
filtdisp= 15.63 30.97 46.32 61.68 77.05 92.44 107.82 115.48
```

It is possible to confirm that this is the previously configured NTP server (10.62.145.72) for which synchronization fails. Also, the root dispersion parameter is large (above 10,000 ms). Use this information in order to confirm this parameter from the Microsoft Windows Server:

```
C:\Users\Administrator> w32tm /query /status
Leap Indicator: 0(no warning)
Stratum: 1 (primary reference - syncd by radio clock)
```

```
Precision: -6 (15.625ms per tick)
Root Delay: 0.0000000s
Root Dispersion: 10.0000000s
ReferenceId: 0x4C4F434C (source name: "LOCL")
Last Successful Sync Time: 04/08/2015 11:15:32
Source: Local CMOS Clock
Poll Interval: 6 (64s)
```

The packet captures present the request that is sent from the ISE, with an acceptable root dispersion of one second:

```
▷ User Datagram Protocol, Src Port: ntp (123), Dst Port: ntp (123)
▽ Network Time Protocol (NTP Version 4, client)
  ▷ Flags: 0xe3
    Peer Clock Stratum: unspecified or invalid (0)
    Peer Polling Interval: invalid (3)
    Peer Clock Precision: 0,015625 sec
    Root Delay:    1,0000 sec
    Root Dispersion:    1,0000 sec
    Reference ID: NULL
    Reference Timestamp: Jan  1, 1970 00:00:00.000000000 UTC
    Origin Timestamp: Jan  1, 1970 00:00:00.000000000 UTC
    Receive Timestamp: Jan  1, 1970 00:00:00.000000000 UTC
    Transmit Timestamp: Aug  3, 2015 13:14:42.503653000 UTC
```

Here is the response from the server, which has a root dispersion that is greater than ten seconds:

```
▷ User Datagram Protocol, Src Port: ntp (123), Dst Port: ntp (123)
▽ Network Time Protocol (NTP Version 3, server)
  ▷ Flags: 0x1c
    Peer Clock Stratum: primary reference (1)
    Peer Polling Interval: invalid (3)
    Peer Clock Precision: 0,015625 sec
    Root Delay:    0,0000 sec
    Root Dispersion:    10,0695 sec
    Reference ID: uncalibrated local clock
    Reference Timestamp: Aug  3, 2015 11:57:02.308643000 UTC
    Origin Timestamp: Aug  3, 2015 13:14:42.503653000 UTC
    Receive Timestamp: Aug  3, 2015 13:14:42.511643000 UTC
    Transmit Timestamp: Aug  3, 2015 13:14:42.511643000 UTC
```

As a result, this is not accepted, which causes the ISE to drop the request and continue with the local time source.

Root dispersion is a number that indicates the maximum error relative to the primary reference source at the root of the synchronization subnet. It is increased by every NTP server. By default, the Microsoft server sets the value to ten seconds only when its own local time source is used (in order to indicate that it is not a reliable source of time). When the Microsoft NTP server is configured with an external NTP, this value is derived from the server and the problem does not exist.

Solution

As per the Microsoft documentation, it is possible to configure the *LocalRootDispersion* value in the registry. Complete these steps in order to configure the registry value:

1. Stop the NTP service from PowerShell:

   ```
   PS C:\Users\Administrator> Stop-Service w32time
   ```
2. Set the registry value to **0**:

   ```
   HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\Config
   ```
3. Restart the service:

   ```
   PS C:\Users\Administrator> Start-Service w32time
   ```
4. Verify that the new value (0) is reported:

   ```
   C:\Users\Administrator> w32tm /query /status
   Leap Indicator: 0(no warning)
   Stratum: 1 (primary reference - syncd by radio clock)
   Precision: -6 (15.625ms per tick)
   Root Delay: 0.0000000s
   Root Dispersion: 0.0000000s
   ReferenceId: 0x4C4F434C (source name: "LOCL")
   Last Successful Sync Time: 04/08/2015 11:15:32
   Source: Local CMOS Clock
   Poll Interval: 6 (64s)
   ```

The ISE NTPQ tool should now report a low (48 ms) value:

```
ntpq> mrv 53520 53520
assID=8400 status=9614 reach, conf, sel_sys.peer, 1 event, event_reach,
srcadr=10.62.145.72, srcport=123, dstadr=10.62.145.42, dstport=123,
leap=00, stratum=1, precision=-6, rootdelay=0.000,
rootdispersion=48.431, refid=LOCL, reach=377, unreach=0, hmode=3,
pmode=4, hpoll=7, ppoll=7, flash=00 ok, keyid=0, ttl=0, offset=8.206,
delay=0.514, dispersion=21.595, jitter=3.456,
reftime=d96b0c49.2c834d26 Tue, Aug 4 2015 12:02:49.173,
org=d96b175c.d472ead9 Tue, Aug 4 2015 12:50:04.829,
rec=d96b175c.d2bf9803 Tue, Aug 4 2015 12:50:04.823,
xmt=d96b175c.d284b95f Tue, Aug 4 2015 12:50:04.822,
filtdelay= 0.90 0.86 0.51 0.87 0.80 0.82 0.85 0.88,
filtoffset= 7.09 5.23 8.21 6.78 2.73 8.43 1.93 9.67,
filtdisp= 15.63 17.56 19.48 21.39 23.32 25.24 27.18 29.08
```

This enables the synchronization to occur as expected:

```
ntpq> associations
ind assID status conf reach auth condition last_event cnt
============================================================
 1 53519 9014 yes yes none reject reachable 1
 2 53520 9614 yes yes none sys.peer reachable 1
```

You can also verify this information from the CLI:

```
ise14/admin# show ntp
Configured NTP Servers:
 10.62.145.72

synchronised to NTP server (10.62.145.72) at stratum 2
 time correct to within 80 ms
 polling server every 128 s
```

```
 remote refid st t when poll reach delay offset jitter
==============================================================================
 127.127.1.0 .LOCL. 10 l 15 64 377 0.000 0.000 0.000
*10.62.145.72 .LOCL. 1 u 26 128 377 0.514 8.206 3.456

* Current time source, + Candidate , x False ticker

Warning: Output results may conflict during periods of changing synchronization.
```

Additional Issues

Some of the older Microsoft Windows Server versions might have different default NTP settings. Cisco recommends that you verify whether these settings are correct and acceptable by the ISE. Verify these registry settings:

- Change the *Enabled* flag value to **1** in order to enable the NTP server:

  ```
  HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\TimeProviders
    \NTPServer\Enabled
  ```
- Set the *Type* registry entry to **NTP** in order to change the server type:

  ```
  HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\Parameters\Type
  ```
- Set the *Announce Flags* registry entry to **5** in order to indicate a reliable time source:

  ```
  HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\Config
    \AnnounceFlags
  ```

VMware Issues

The NTP synchronization issues might be caused by VMware bug ID 2075424 (*ESXi host does not synchronize time with NTP server*).

The issue is resolved in these patches:

- VMware ESXi 5.5 Update 1

- VMware ESXi 5.1 Patch 4

- VMware ESXi 5.0 Patch 8

Related Information

- **Cisco Identity Services Engine Administrator Guide, Release 1.4**

- **Technical Support & Documentation - Cisco Systems**