

Time configuration and synchronization across Management modules, IOMs and iDRACs

This technical white paper explains how to configure time on the management module and synchronize the time across MMs, IOMs, iDRACs, and NTP servers using Network time Protocol. It also explains the time synchronization mechanism between these modules for trouble shooting.

Revisions

Date	Description
Jan 2019	Initial release

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Table of contents

Revisions.....	2
Acknowledgements.....	2
Table of contents	3
Executive summary.....	4
Introduction	4
Why NTP.....	4
Feature Methodology	4
Feature constraints	4
Date /Time settings and synchronization on MM.....	5
Configure date and time on Management module	5
Configure Management module to synchronize to NTP server.....	5
Configure iDRAC and SAS IOMs to synchronize to Management Module	7
Best practices for NTP configuration	8

Executive summary

In Modern computer networks time synchronization is critical because every aspect of managing, securing and debugging a network involves determining when events happen. Time synchronization failures between modules can lead to undesired behavior. Using this feature we can achieve time synchronization within different modules of MM. We can also achieve time synchronization across different modules like MMs, IOMs, iDRACs and NTP server.

Introduction

Maintaining same time across different devices manually is not practical. The Management module gives user the ability to synchronize it's time to external NTP server through its user interface. Likewise user can decide to not follow a time source and set the time on MM by himself/herself. User also has the ability to configure iDRAC to synchronize to the MM. Also SAS IOM by default synchronizes itself to management module with respect to time.

Why NTP

NTP or similar utility is a necessity in today's world. Reasons include

- Log file accuracy, auditing and monitoring.
- Network fault diagnosis and recovery
- Access security and authentication systems count on it.
- Distributed computing systems require all the systems to time synchronized
- Legal obligations which require systems to be synchronized

Feature Methodology

On a high-level, this feature is summarized in the following steps

- User can manually set the date/time on the management module using the MM user interface.
- User can configure the management module to synchronize it's time to external NTP server.
- SAS IOM by default synchronizes to MMs.
- iDRAC can be configured to synchronize to management module using iDRAC user interface.

Management module has internal modules which use either NTP or Chrony for time synchronization. When there is no external NTP configured, management module uses its own real time clock which keeps ticking even when the power is off. Different NTP modules talk to each other and decide whom they synchronize to using stratum numbers. Lower the stratum number, higher is their accuracy to real time.

Feature constraints

- This feature can cause failover when the time moves back due to any of the reasons below

- User manually configures time to go back in chassis by greater than 15 mins.
- User configures the management modules to synchronize to external servers and this causes the time to jump back greater than 15mins.
- If the MM is configured to synchronize to only one external NTP server and the server is inaccurate, it can cause MM time to be configured incorrectly. NTP documentation requires user to configure at least 3 sources for NTP clients to work as expected. NTP does have intelligence to some extent to detect false NTP servers.

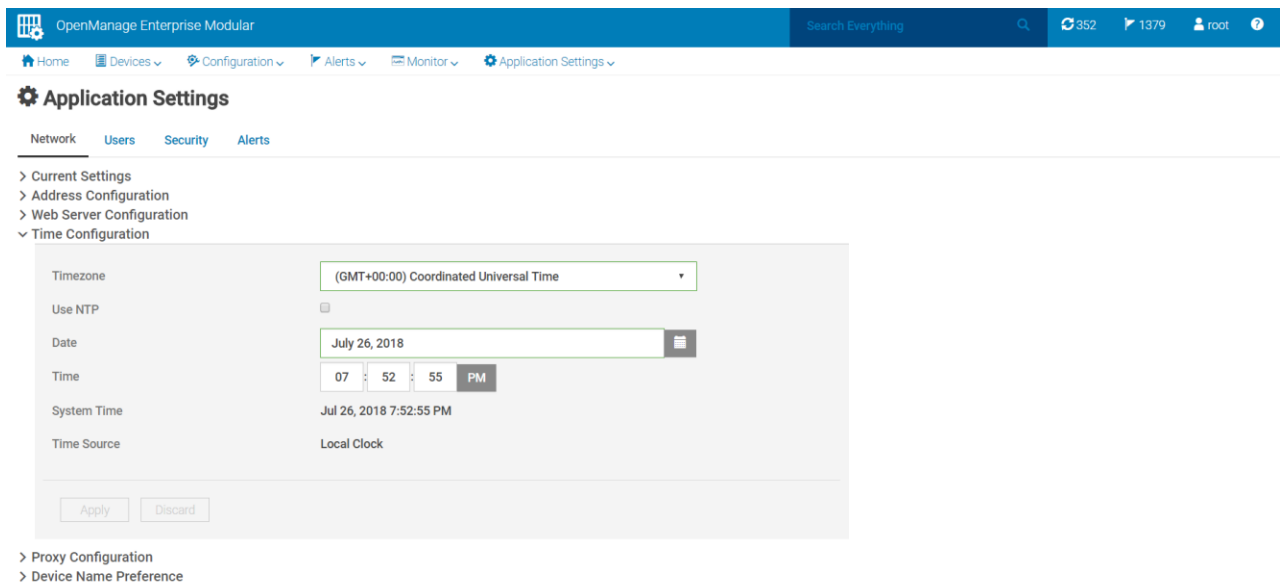
Date /Time settings and synchronization on MM

The time on Management module can either be configured in 2 ways.

- Setting Date, Time and Time zone on MM GUI.
- Configure NTP on the MM to synchronize to external NTP server

Configure date and time on Management module

1. Log in to MM GUI.
2. Navigate to **Application Settings** → **Network** → **Time Configuration**
3. Disable “**Use NTP**” checkbox if already enabled.
4. Set **date**, **time** and **Time zone** using the options provided and select **Apply**.



Configure Management module to synchronize to NTP server

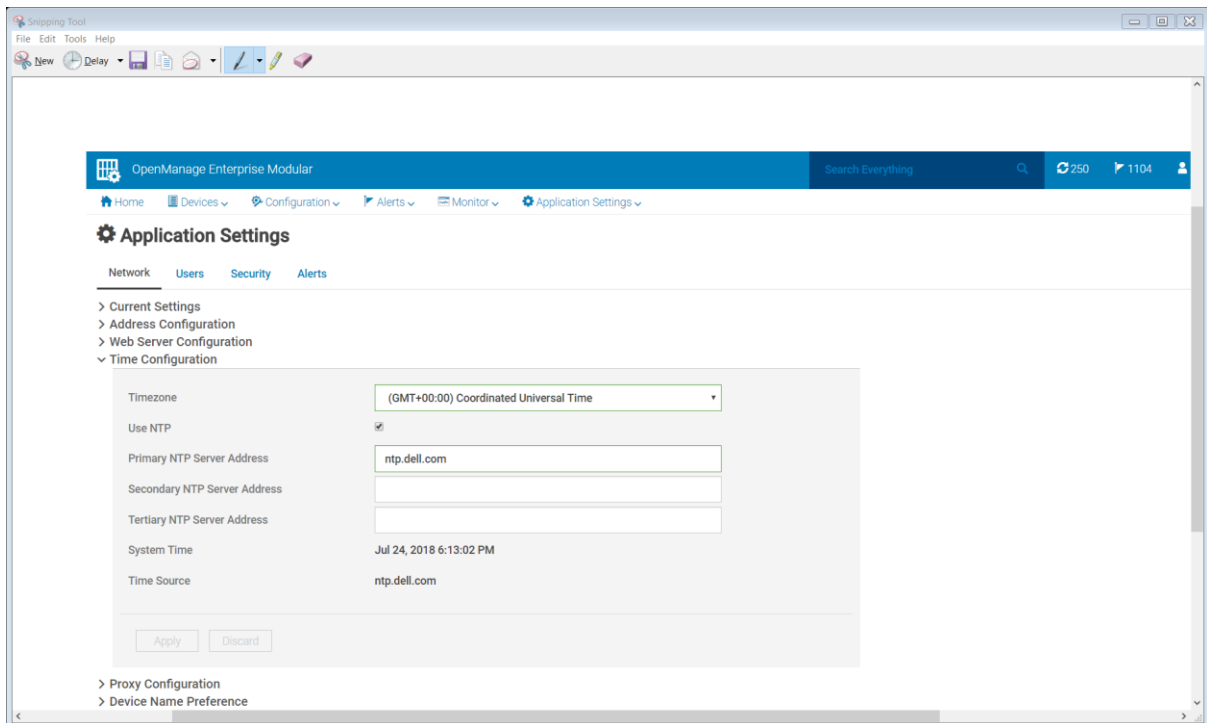
1. Log in to the MM GUI.
2. Navigate to **Application Settings** → **Network** → **Time Configuration**.
3. Enable “**Use NTP**” checkbox.

4. Provide **Primary NTP server address** and/or **Secondary NTP server address** and/or **Tertiary NTP server address** and select **Apply**.

Case 1: Only Primary NTP server address provided.

NTP takes the available sources of time and submits their timing data to intersection and clustering algorithms, looking for the best idea of the correct time.

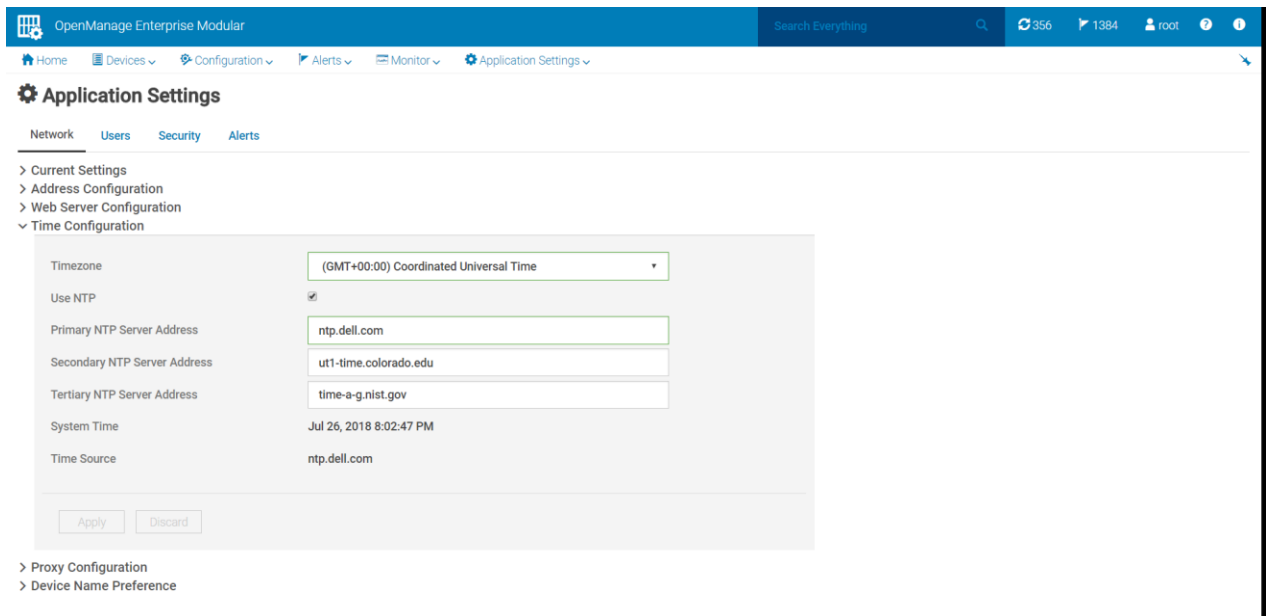
While providing only primary NTP server address could work most of the times, it is a good practice to provide 3 servers at minimum. Faulty primary NTP server address could cause the management module to work at incorrect time, or cause failovers.



Case 2: NTP server pool (Primary, Secondary, and Tertiary server)

It is recommended to use a pool of three NTP servers rather than using one or two standalone servers. Using pool of servers means that all the servers are syncing their time to each other via a primary time source so in case of connectivity loss with one of the server, the chassis may accurately maintain the time by switching to the other server in the pool. It will also help the NTP client on the chassis to manage the time drift due to network traffic.

Configure iDRAC and SAS IOMs to synchronize to Management Module

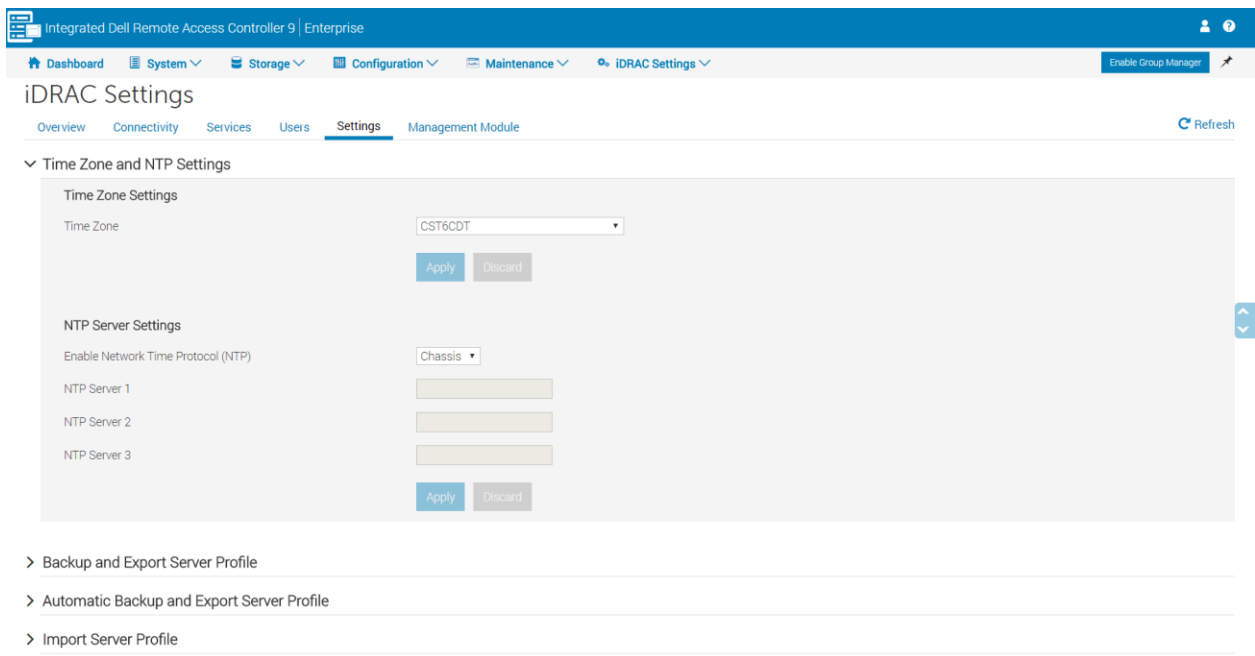


Note: Either one or more NTP servers are provided, if Management Module is not able to reach any of them or the servers are not valid NTP servers, or their time is not in-sync to each other, the Management Module may still syncing to the local clock. The time source value will show local clock in that case. Also, the Management Module will generate a log entry in the audit logs that none of the provided servers has been selected as an NTP time source.

Configure iDRAC and SAS IOMs to synchronize to Management Module

By default the time on SAS IOMs is synchronized to Management Chassis whereas iDRACs have multiple options and do not synchronize to the Management Chassis by default. Following steps can be taken in order for iDRACs to synchronize the time to the chassis

1. Log in to iDRAC GUI.
2. Navigate to **iDRAC settings** → **settings** → **Time Zone Settings**
3. Select **Chassis** in **Enable Network Time Protocol (NTP)** drop box option and select **Apply**.



Best practices for NTP configuration

- Use enough time sources: NTP takes the available sources of time and submits their timing data to intersection and clustering algorithms, looking for the best idea of the correct time. If there is only 1 source of time, the answer is obvious. It may not be a good source of time, but it's the only one. If there are 2 sources of time and they agree well enough, that's good. But if they don't, then ntpd has no way to know which source to believe. This gets easier if there are 3 sources of time. But if one of those 3 sources becomes unreachable or unusable, we're back to only having 2 time sources.
- Use a diversity of reference clocks: If you are using reference clocks, it is recommended that you use several different types. Having a diversity of sources means that any one issue is less likely to cause a service interruption.
- Using pool servers
- Standardize to UTC time: Within an enterprise, standardize all systems to coordinated universal time (UTC). Standardizing to UTC simplifies log correlation within the organization and with external parties no matter what time zone the device being synchronized is located in.
- Consider the business need for cryptography: Many administrators try to secure their networks with encrypted communications and encrypted authentication. I would introduce a note of caution here because although there are cryptographic services associated with NTP for securing NTP communications, the use of encryption introduces more sources for problems, such as requiring key management, and it also requires a higher computational overhead.
- Remember Segal's Law. Ideally, it would work to have three or more Stratum 0 or Stratum 1 servers and use those servers as primary masters. Remember Segal's Law: having two NTP servers makes it hard to know which one is accurate. Two Stratum 0 servers would provide a more accurate timestamp because they are using a time source that is considered definitive.