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# Introduction

This document provides NTP configuration examples.

## Prerequisites

This document is not restricted to specific software or hardware versions.

The configuration examples in this document were created and verified in a lab environment, and all the devices were started with the factory default configuration. When you are working on a live network, make sure you understand the potential impact of every command on your network.

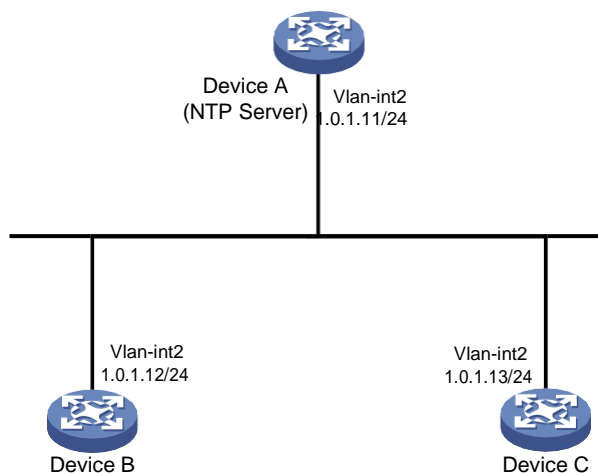
This document assumes that you have basic knowledge of NTP.

## Example: Configuring the NTP client/server mode

### Network configuration

As shown in [Figure 1](#), configure the NTP client/server mode so all devices can be synchronized to Device A, the NTP server.

**Figure 1 Network diagram**



### Applicable hardware and software versions

The following matrix shows the hardware and software versions to which this configuration example is applicable:

Hardware	Software version
SC 3570 switch series	Release 11xx

SC 5525 switch series	Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx
SC 5520 switch series	Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx
SC 3170 switch series	Release 11xx
SC 3130 switch series	Release 63xx

# Procedures

## Configuring Device A

**# Assign an IP address to VLAN-interface 2.**

```
<DeviceA> system-view
[DeviceA] interface Vlan-interface 2
[DeviceA-Vlan-interface2] ip address 1.0.1.11 24
[DeviceA-Vlan-interface2] quit
```

**# Enable the NTP service.**

```
[DeviceA] ntp-service enable
```

**# Specify the local clock as the reference source, with the stratum level 2.**

```
[DeviceA] ntp-service refclock-master 2
```

## Configuring Device B

# Assign an IP address to VLAN-interface 2. (Details not shown.)

# Enable the NTP service.

```
<DeviceB> system-view
```

```
[DeviceB] ntp-service enable
```

# Specify Device A as the NTP server of Device B so that Device B is synchronized to Device A.

```
[DeviceB] ntp-service unicast-server 1.0.1.11
```

## Configuring Device C

# Assign an IP address to VLAN-interface 2. (Details not shown.)

# Enable the NTP service.

```
<DeviceC> system-view
```

```
[DeviceC] ntp-service enable
```

# Specify Device A as the NTP server of Device C so that Device C is synchronized to Device A.

```
[DeviceC] ntp-service unicast-server 1.0.1.11
```

## Verifying the configuration

# Verify that Device B has synchronized to Device A, and the clock stratum level is 3 on Device B and 2 on Device A.

```
[DeviceB] display ntp-service status
```

```
  Clock status: synchronized
```

```
  Clock stratum: 3
```

```
  System peer: 1.0.1.11
```

```
  Local mode: client
```

```
  Reference clock ID: 1.0.1.11
```

```
  Leap indicator: 00
```

```
  Clock jitter: 0.003479 s
```

```
  Stability: 0.000 pps
```

```
  Clock precision: 2^-19
```

```
  Root delay: 1.95313 ms
```

```
  Root dispersion: 28.38135 ms
```

```
  Reference time: d5ed8cd5.577006ea  Wed, Sep 25 2019 16:24:53.341
```

```
  System poll interval: 64 s
```

# Verify that an IPv4 NTP association has been established between Device B and Device A.

```
[DeviceB] display ntp-service sessions
```

	source	reference	stra	reach	poll	now	offset	delay	disper
*****									
[12345]	1.0.1.11	127.127.1.0	2	255	64	38	-10.22	1.9531	3.3416

Notes: 1 source(master), 2 source(peer), 3 selected, 4 candidate, 5 configured.

```
  Total sessions: 1
```

---

**NOTE:**

---

- 
- For the SC 3170 switch series and SC 3570 switch series, the value is 2<sup>18</sup> for the **Clockprecision** field in the output from the `display ntp-service status` command.
- 

## Configuration files

- Device A:

```
#
interface Vlan-interface2
 ip address 1.0.1.11 255.255.255.0
#
ntp-service enable
ntp-service refclock-master 2
#
```

- Device B:

```
#
interface Vlan-interface2
 ip address 1.0.1.12 255.255.255.0
#
ntp-service enable
ntp-service unicast-server 1.0.1.11
#
```

- Device C:

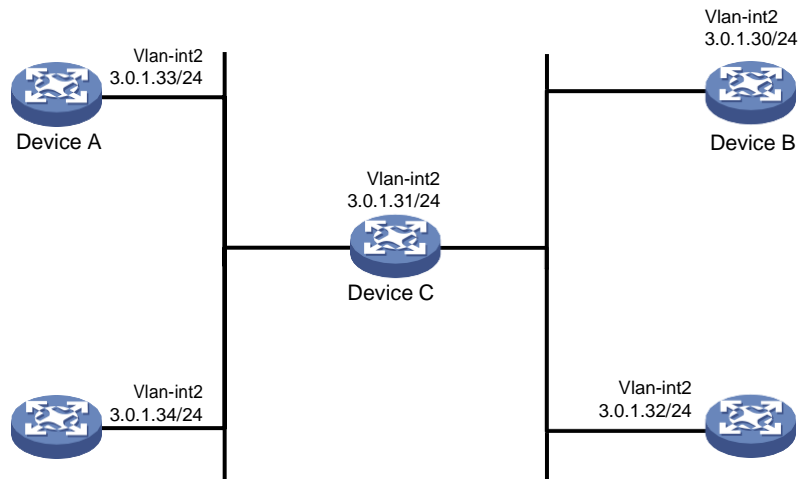
```
#
interface Vlan-interface2
 ip address 1.0.1.13 255.255.255.0
#
ntp-service enable
ntp-service unicast-server 1.0.1.11
#
```

## Example: Configuring the NTP broadcast mode

### Network configuration

As shown in [Figure 2](#), configure the NTP broadcast mode so all devices on the same network segment can be synchronized to Device C, the NTP server.

**Figure 2 Network diagram**



## Applicable hardware and software versions

The following matrix shows the hardware and software versions to which this configuration example is applicable:

Hardware	Software version
SC 3570 switch series	Release 11xx
SC 5525 switch series	Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx
SC 5520 switch series	Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx
SC 3170 switch series	Release 11xx
SC 3130 switch series	Release 63xx

## Procedures

### Configuring Device C

# Enable the NTP service.

```
<DeviceC> system-view
[DeviceC] ntp-service enable
```

# Specify the local clock as the reference source, with the stratum level 2.

```
[DeviceC] ntp-service refclock-master 2
```

# Assign an IP address to VLAN-interface 2.

```
[DeviceC] interface Vlan-interface 2
[DeviceC-Vlan-interface2] ip address 3.0.1.31 24
```

# Configure Device C to operate in broadcast server mode and send broadcast messages from VLAN-interface 2.

```
[DeviceC-Vlan-interface2] ntp-service broadcast-server
```

### Configuring Device A, Device B, Device D, and Device E

# Assign an IP address to VLAN-interface 2. (Details not shown.)

# Enable the NTP service.

```
<DeviceA> system-view
[DeviceA] ntp-service enable
```

# Configure Device A to operate in broadcast client mode and receive broadcast messages on VLAN-interface 2.

```
[DeviceA-Vlan-interface2] ntp-service broadcast-client
```

# Configure Device B, Device D, and Device E in the same way Device A is configured. (Details not shown.)



# Verifying the configuration

# Verify that Device A has synchronized to Device C, and the clock stratum level is 3 on Device A and 2 on Device C.

```
[DeviceA-Vlan-interface2] display ntp-service status
Clock status: synchronized
Clock stratum: 3
System peer: 3.0.1.31
Local mode: bclient
Reference clock ID: 3.0.1.31
Leap indicator: 00
Clock jitter: 0.000061 s
Stability: 0.000 pps
Clock precision: 2^-19
Root delay: 0.00000 ms
Root dispersion: 7951.43127 ms
Reference time: d5ee8d88.2faabed0 Thu, Sep 26 2019 10:40:08.186
System poll interval: 64 s
```

# Verify that an IPv4 NTP association has been established between Device A and Device C.

```
[DeviceA-Vlan-interface2] display ntp-service sessions
      source          reference      stra reach poll  now offset  delay disper
*****
[1234]3.0.1.31        127.127.1.0          2   254   64   82 -2.190 0.0000 7937.5
Notes: 1 source(master), 2 source(peer), 3 selected, 4 candidate, 5 configured.
Total sessions: 1
```

---

#### NOTE:

- For the SC 3170 switch series and SC 3570 switch series, the value is 2<sup>-18</sup> for the **Clockprecision** field in the output from the **display ntp-service status** command.
- 

## Configuration files

- Device C:
 

```
#
interface Vlan-interface2
 ip address 3.0.1.31 255.255.255.0
 ntp-service broadcast-server
#
ntp-service enable
ntp-service refclock-master 2
#
```
- Device A:
 

```
#
interface Vlan-interface2
 ip address 3.0.1.33 255.255.255.0
 ntp-service broadcast-client
#
```

- ```
ntp-service enable
#
```
- **Device B:**

```
#
interface Vlan-interface2
ip address 3.0.1.30 255.255.255.0
ntp-service broadcast-client
#
ntp-service enable
#
```
  - **Device D:**

```
#
interface Vlan-interface2
ip address 3.0.1.32 255.255.255.0
ntp-service broadcast-client
#
ntp-service enable
#
```
  - **Device E:**

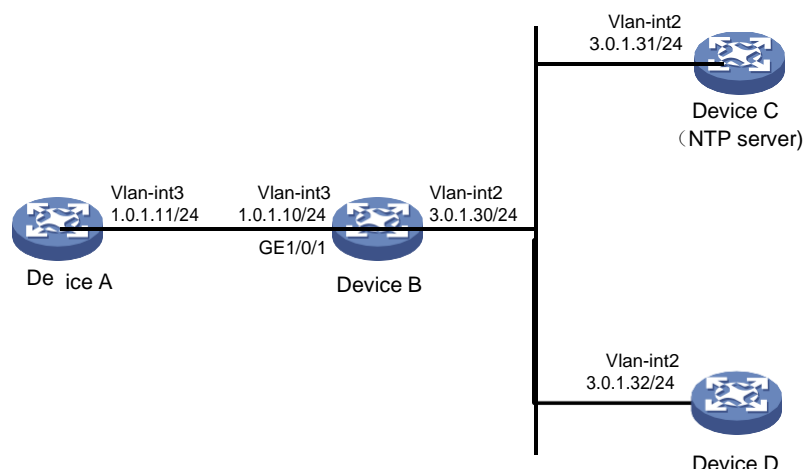
```
#
interface Vlan-interface2
ip address 3.0.1.34 255.255.255.0
ntp-service broadcast-client
#
ntp-service enable
#
```

## Example: Configuring the NTP multicast mode

### Network configuration

As shown in [Figure 3](#), configure the NTP multicast mode so all devices on different network segments can be synchronized to Device C, the NTP server.

**Figure 3 Network diagram**



## Applicable hardware and software versions

The following matrix shows the hardware and software versions to which this configuration example is applicable:

| Hardware              | Software version                                             |
|-----------------------|--------------------------------------------------------------|
| SC 3570 switch series | Release 11xx                                                 |
| SC 5525 switch series | Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx |
| SC 5520 switch series | Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx |
| SC 3170 switch series | Release 11xx                                                 |
| SC 3130 switch series | Release 63xx                                                 |

## Procedures

### Configuring Device C

# Enable the NTP service.

```
<DeviceC> system-view
[DeviceC] ntp-service enable
```

# Specify the local clock as the reference source, with the stratum level 2.

```
[DeviceC] ntp-service refclock-master 2
```

# Assign an IP address to VLAN-interface 2.

```
[DeviceC] interface Vlan-interface 2
[DeviceC-Vlan-interface2] ip address 3.0.1.31 24
```

# Configure Device C to operate in multicast server mode and send multicast messages from VLAN-interface 2.

```
[DeviceC-Vlan-interface2] ntp-service multicast-server
```

## Configuring Device D

# Enable the NTP service.

```
<DeviceD> system-view
```

```
[DeviceD] ntp-service enable
```

# Assign an IP address to VLAN-interface 2.

```
[DeviceD] interface Vlan-interface 2
```

```
[DeviceD-Vlan-interface2] ip address 3.0.1.32 24
```

# Configure Device D to operate in multicast client mode and receive multicast messages on VLAN-interface 2.

```
[DeviceD-Vlan-interface2] ntp-service multicast-client
```

## Configuring Device B

# Assign an IP address to VLAN-interface 2. (Details not shown.)

**# Enable the NTP service.**

```
<DeviceB> system-view
[DeviceB] ntp-service enable
```

**# Configure Device B to operate in multicast client mode and receive multicast messages on VLAN-interface 2.**

```
[DeviceB-Vlan-interface2] ntp-service multicast-client
[DeviceB-Vlan-interface2] quit
```

Because Device A and Device C are on different subnets, you must enable the multicast functions on Device B before Device A can receive multicast messages from Device C.

**# Enable IP multicast routing and IGMP.**

```
[DeviceB] multicast routing
[DeviceB] interface vlan-interface 2
[DeviceB-Vlan-interface2] pim dm
[DeviceB-Vlan-interface2] quit
[DeviceB] vlan 3
[DeviceB-vlan3] port GigabitEthernet 1/0/1
[DeviceB-vlan3] quit
[DeviceB] interface vlan-interface 3
[DeviceB-Vlan-interface3] ip address 1.0.1.10 24
[DeviceB-Vlan-interface3] igmp enable
[DeviceB-Vlan-interface3] igmp static-group 224.0.1.1
[DeviceB-Vlan-interface3] quit
[DeviceB] igmp-snooping
[DeviceB-igmp-snooping] quit
[DeviceB] interface GigabitEthernet 1/0/1
[DeviceB-GigabitEthernet1/0/1] igmp-snooping static-group 224.0.1.1 vlan 3
```

## Configuring Device A

**# Enable the NTP service.**

```
<DeviceA> system-view
[DeviceA] ntp-service enable
```

**# Assign an IP address to VLAN-interface 3.**

```
[DeviceA] interface Vlan-interface 3
[DeviceA-Vlan-interface3] ip address 1.0.1.11 24
```

**# Configure Device A to operate in multicast client mode and receive multicast messages on VLAN-interface 3.**

```
[DeviceA-Vlan-interface3] ntp-service multicast-client
```

## Verifying the configuration

**# Verify that Device A has synchronized to Device C, and the clock stratum level is 3 on Device A and 2 on Device C.**

```
[DeviceA-Vlan-interface3] display ntp-service status
Clock status: synchronized
Clock stratum: 3
System peer: 3.0.1.31
Local mode: bclient
```

```
Reference clock ID: 3.0.1.31
Leap indicator: 00
Clock jitter: 0.000061 s
Stability: 0.000 pps
Clock precision: 2^-19
Root delay: 1.69373 ms
Root dispersion: 1950.18005 ms
Reference time: d5ee9b15.2f3a684d Thu, Sep 26 2019 11:37:57.184
System poll interval: 64 s
```

---

**NOTE:**

- For the SC 3170 switch series and SC 3570 switch series, the value is 2^-18 for the **Clockprecision** field in the output from the **display ntp-service status** command.
- 

## Configuration files

- **Device A:**

```
#
ntp-service enable
#
interface Vlan-interface3
ip address 1.0.1.11 255.255.255.0
ntp-service multicast-client
#
```
- **Device B:**

```
#
ntp-service enable
#
multicast routing
#
igmp-snooping
#
interface Vlan-interface2
ip address 3.0.1.30 255.255.255.0
pim dm
ntp-service multicast-client
#
interface Vlan-interface3
ip address 1.0.1.10 255.255.255.0
igmp enable
igmp static-group 224.0.1.1
#
interface GigabitEthernet1/0/1
port access vlan 3
```

- ```

    igmp-snooping static-group 224.0.1.1 vlan 3
#

```
- **Device C:**

```

#
ntp-service enable
ntp-service refclock-master 2
#
interface Vlan-interface2
ip address 3.0.1.31 255.255.255.0
ntp-service multicast-server
#

```
  - **Device D:**

```

#
ntp-service enable
#
interface Vlan-interface2
ip address 3.0.1.32 255.255.255.0
ntp-service multicast-client
#

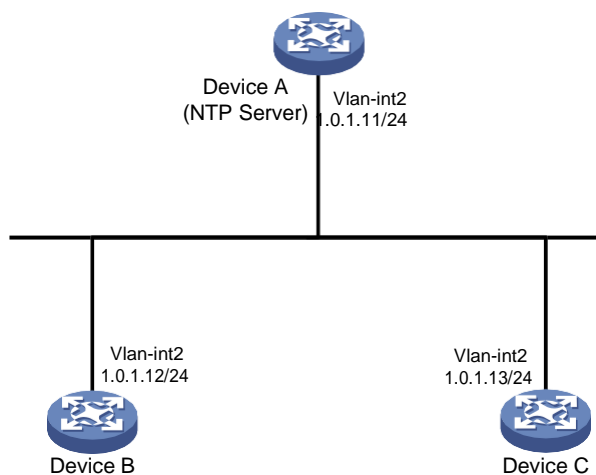
```

## Example: Configuring NTP client/server mode with authentication

### Network configuration

As shown in [Figure 4](#), configure the NTP client/server mode so all devices can be synchronized to Device A, the NTP server. Configure NTP authentication on Device A, Device B, and Device C.

**Figure 4 Network diagram**





# Applicable hardware and software versions

The following matrix shows the hardware and software versions to which this configuration example is applicable:

Hardware	Software version
SC 3570 switch series	Release 11xx
SC 5525 switch series	Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx
SC 5520 switch series	Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx
SC 3170 switch series	Release 11xx
SC 3130 switch series	Release 63xx

# Procedures

## Configuring Device A

```
# Assign an IP address to VLAN-interface 2.
<DeviceA> system-view
[DeviceA] interface Vlan-interface 2
[DeviceA-Vlan-interface2] ip address 1.0.1.11 24

# Enable the NTP service.
[DeviceA] ntp-service enable

# Specify the local clock as the reference source, with the stratum level 2.
[DeviceA] ntp-service refclock-master 2

# Enable NTP authentication on Device A.
[DeviceA] ntp-service authentication enable

# Set an authentication key, and input the key in plain text.
[DeviceA] ntp-service authentication-keyid 42 authentication-mode md5 simple aNiceKey

# Specify the key as a trusted key.
[DeviceA] ntp-service reliable authentication-keyid 42
```

## Configuring Device B

```
# Assign an IP address to VLAN-interface 2. (Details not shown.)

# Enable the NTP service.
<DeviceB> system-view
[DeviceB] ntp-service enable

# Enable NTP authentication on Device B.
[DeviceB] ntp-service authentication enable

# Set an authentication key, and input the key in plain text.
[DeviceB] ntp-service authentication-keyid 42 authentication-mode md5 simple aNiceKey

# Specify the key as a trusted key.
[DeviceB] ntp-service reliable authentication-keyid 42

# Specify Device A as the NTP server of Device B, and associate the server with key 42.
[DeviceB] ntp-service unicast-server 1.0.1.11 authentication-keyid 42
```

## Configuring Device C

```
# Assign an IP address to VLAN-interface 2. (Details not shown.)

# Enable the NTP service.
<DeviceC> system-view
[DeviceC] ntp-service enable

# Enable NTP authentication on Device C.
[DeviceC] ntp-service authentication enable

# Set an authentication key, and input the key in plain text.
[DeviceC] ntp-service authentication-keyid 42 authentication-mode md5 simple aNiceKey
```

# Specify the key as a trusted key.

```
[DeviceC] ntp-service reliable authentication-keyid 42
```

# Specify Device A as the NTP server of Device C, and associate the server with key 42.

```
[DeviceC] ntp-service unicast-server 1.0.1.11 authentication-keyid 42
```

## Verifying the configuration

# Verify that Device B has synchronized to Device A, and the clock stratum level is 3 on Device B and 2 on Device A.

```
[DeviceB] display ntp-service status
```

Clock status: synchronized

Clock stratum: 3

System peer: 1.0.1.11

Local mode: client

Reference clock ID: 1.0.1.11

Leap indicator: 00

Clock jitter: 0.005096 s

Stability: 0.000 pps

Clock precision: 2<sup>-19</sup>

Root delay: 0.00655 ms

Root dispersion: 1.15869 ms

Reference time: d0c62687.ab1bba7d Mon, Sep 30 2019 16:06:26.764

System poll interval: 64 s

# Verify that an IPv4 NTP association has been established between Device B and Device A.

```
[DeviceB] display ntp-service sessions
```

source	reference	stra	reach	poll	now	offset	delay	disper
*****								
[1245]1.0.1.11	127.127.1.0	2	1	64	519	-0.0	0.0065	0.0

Notes: 1 source(master), 2 source(peer), 3 selected, 4 candidate, 5 configured.

Total sessions : 1

---

### NOTE:

- For the SC 3170 switch series and SC 3570 switch series, the value is 2<sup>-18</sup> for the **Clockprecision** field in the output from the **display ntp-service status** command.
- 

## Configuration files

- Device A:

```
#
interface Vlan-interface2
 ip address 1.0.1.11 255.255.255.0
#
ntp-service enable
```

- ```

ntp-service authentication enable
ntp-service authentication-keyid 42 authentication-mode md5 cipher
$c$3$4j3SKCgQWBK3Un41B9U0JXzJX9i7IuNoSqi
ntp-service reliable authentication-keyid 42
ntp-service refclock-master 2
#

```
- **Device B:**

```

#
interface Vlan-interface2
ip address 1.0.1.12 255.255.255.0
#
ntp-service enable
ntp-service authentication enable
ntp-service authentication-keyid 42 authentication-mode md5 cipher
$c$3$22eIc81796cpudZqiaAZ2SLzIfrgzFTVYn8X
ntp-service reliable authentication-keyid 42
ntp-service unicast-server 1.0.1.11 authentication-keyid 42
#

```
  - **Device C:**

```

#
interface Vlan-interface2
ip address 1.0.1.13 255.255.255.0
#
ntp-service enable
ntp-service authentication enable
ntp-service authentication-keyid 42 authentication-mode md5 cipher
$c$3$XJzVmJ1TJbWyYAXpPXxF7JiEOZag8CehibM8
ntp-service reliable authentication-keyid 42
ntp-service unicast-server 1.0.1.11 authentication-keyid 42
#

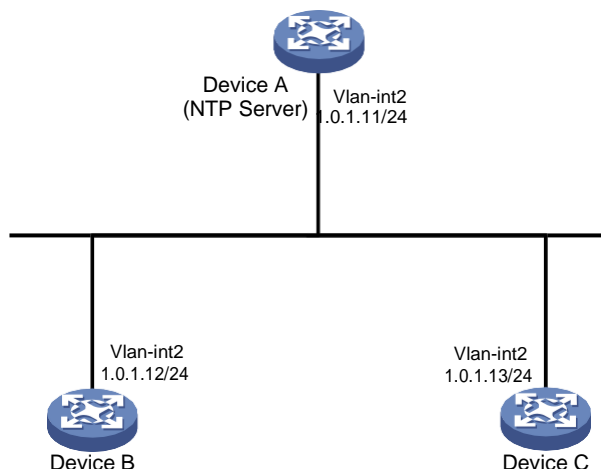
```

## Example: Configuring SNTP

### Network configuration

As shown in [Figure 5](#), configure SNTP so all devices can be synchronized to Device A, the NTP server.

**Figure 5 Network diagram**



## Applicable hardware and software versions

The following matrix shows the hardware and software versions to which this configuration example is applicable:

| Hardware              | Software version                                             |
|-----------------------|--------------------------------------------------------------|
| SC 3570 switch series | Release 11xx                                                 |
| SC 5525 switch series | Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx |
| SC 5520 switch series | Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx |
| SC 3170 switch series | Release 11xx                                                 |
| SC 3130 switch series | Release 63xx                                                 |

## Procedures

### Configuring Device A

# Assign an IP address to VLAN-interface 2.

```
<DeviceA> system-view
[DeviceA] interface Vlan-interface 2
[DeviceA-Vlan-interface2] ip address 1.0.1.11 24
```

# Enable the NTP service.

```
[DeviceA] ntp-service enable
```

# Specify the local clock as the reference source, with the stratum level 2.

```
[DeviceA] ntp-service refclock-master 2
```

### Configuring Device B

# Assign an IP address to VLAN-interface 2. (Details not shown.)

**# Enable the SNTP service.**

```
<DeviceB> system-view  
[DeviceB] sntp enable
```

**# Specify Device A as the NTP server for Device B.**

```
[DeviceB] sntp unicast-server 1.0.1.11
```

## Configuring Device C

**# Assign an IP address to VLAN-interface 2. (Details not shown.)**

**# Enable the SNTP service.**

```
<DeviceC> system-view  
[DeviceC] sntp enable
```

**# Specify Device A as the NTP server for Device C.**

```
[DeviceC] sntp unicast-server 1.0.1.11
```

# Verifying the configuration

# Verify that an SNTP association has been established between Device B and Device A, and Device B has synchronized to Device A.

```
[DeviceB] display sntp sessions
```

| SNTP server | Stratum | Version | Last receive time                      |
|-------------|---------|---------|----------------------------------------|
| 1.0.1.11    | 2       | 4       | Thu, Sep 26 2019 17:25:09.121 (Synced) |

## Configuration files

- Device A:

```
#
interface Vlan-interface2
 ip address 1.0.1.11 255.255.255.0
#
ntp-service enable
ntp-service refclock-master 2
#
```

- Device B:

```
#
interface Vlan-interface2
 ip address 1.0.1.12 255.255.255.0
#
sntp enable
sntp unicast-server 1.0.1.11
#
```

- Device C:

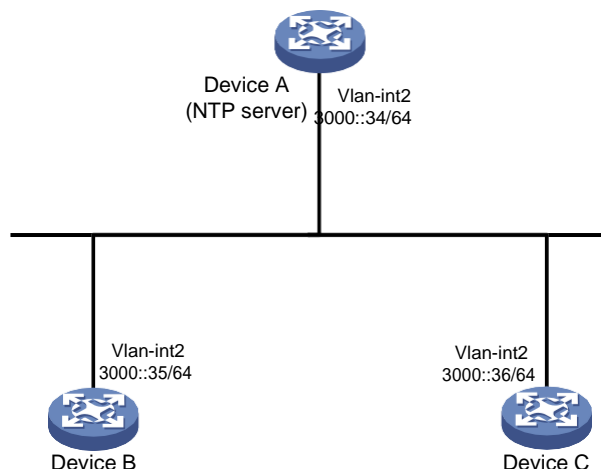
```
#
interface Vlan-interface2
 ip address 1.0.1.13 255.255.255.0
#
sntp enable
sntp unicast-server 1.0.1.11
#
```

## Example: Configuring the IPv6 NTP client/server mode

## Network configuration

As shown in [Figure 1](#), configure the IPv6 NTP client/server mode so all devices can synchronize to Device A, the NTP server.

**Figure 6 Network diagram**



## Applicable hardware and software versions

The following matrix shows the hardware and software versions to which this configuration example is applicable:

| Hardware              | Software version                                             |
|-----------------------|--------------------------------------------------------------|
| SC 3570 switch series | Release 11xx                                                 |
| SC 5525 switch series | Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx |
| SC 5520 switch series | Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx |
| SC 3170 switch series | Release 11xx                                                 |
| SC 3130 switch series | Release 63xx                                                 |

## Procedures

### Configuring Device A

# Assign an IPv6 address to VLAN-interface 2.

```
<DeviceA> system-view
[DeviceA] interface vlan-interface 2
[DeviceA-Vlan-interface2] ipv6 address 3000::34 64
[DeviceA-Vlan-interface2] quit
```

# Enable the NTP service.

```
[DeviceA] ntp-service enable
```

# Specify the local clock as the reference source, with the stratum level 2.

```
[DeviceA] ntp-service refclock-master 2
```

### Configuring Device B

# Assign an IPv6 address to each interface. (Details not shown.)

# Enable the NTP service.



```
<DeviceB> system-view
[DeviceB] ntp-service enable
```

**# Specify Device A as the NTP server of Device B so that Device B is synchronized to Device A.**

```
[DeviceB] ntp-service unicast-server 3000::34
```

## Configuring Device C

**# Assign an IPv6 address to each interface. (Details not shown.)**

**# Enable the NTP service.**

```
<DeviceC> system-view
[DeviceC] ntp-service enable
```

**# Specify Device A as the NTP server of Device C so that Device C is synchronized to Device A.**

```
[DeviceC] ntp-service unicast-server 3000::34
```

# Verifying the configuration

# Verify that Device B has synchronized to Device A, and the clock stratum level is 3 on Device B and 2 on Device A.

```
[DeviceB] display ntp-service status
```

```
Clock status: synchronized
```

```
Clock stratum: 3
```

```
System peer: 3000::34
```

```
Local mode: client
```

```
Reference clock ID: 95.197.17.40
```

```
Leap indicator: 00
```

```
Clock jitter: 0.003479 s
```

```
Stability: 0.000 pps
```

```
Clock precision: 2-19
```

```
Root delay: 1.95313 ms
```

```
Root dispersion: 28.38135 ms
```

```
Reference time: d5ed8cd5.577006ea Wed, Sep 25 2019 16:24:53.341
```

```
System poll interval: 64 s
```

# Verify that an IPv6 NTP association has been established between Device B and Device A.

```
[DeviceB] display ntp-service ipv6 sessions
```

Notes: 1 source(master), 2 source(peer), 3 selected, 4 candidate, 5 configured.

```
Source: [12345] 3000::34
```

```
Reference: 127.127.1.0
```

```
Clock stratum: 2
```

```
Reachabilities: 3
```

```
Poll interval: 64
```

```
Last receive time: 62
```

```
Offset: 0.1272
```

```
Roundtrip delay: 1.8158
```

```
Dispersion: 188.47
```

```
Total sessions: 1
```

---

## NOTE:

- For the SC 3170 switch series and SC 3570 switch series, the value is 2<sup>-18</sup> for the **Clockprecision** field in the output from the **display ntp-service status** command.
- 

# Configuration files

- Device A:

```
#
```

```
interface Vlan-interface2
```

```
ipv6 address 3000::34/64
```

```
#
```

```
ntp-service enable
```

```
ntp-service refclock-master 2
```

- ```
#
```
- Device B:
 

```
#
interface Vlan-interface2
  ipv6 address 3000::35/64
#
ntp-service enable
ntp-service ipv6 unicast-server 3000::34
#
```
  - Device C:
 

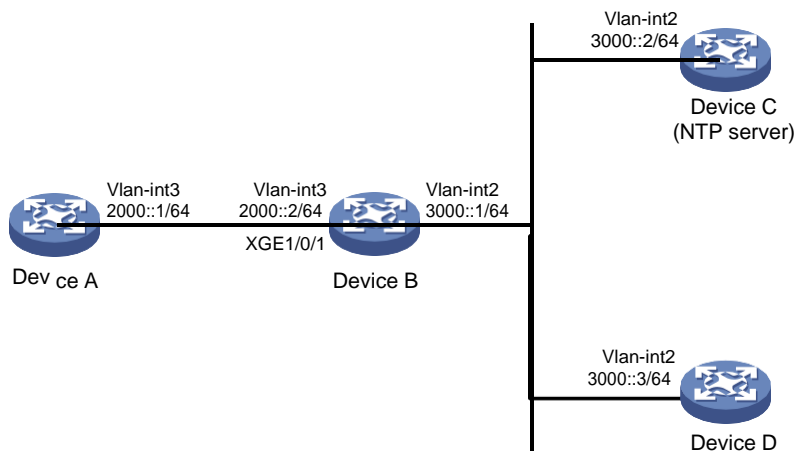
```
#
interface Vlan-interface2
  ipv6 address 3000::36/64
#
ntp-service enable
ntp-service ipv6 unicast-server 3000::34
#
```

## Example: Configuring the IPv6 NTP multicast mode

### Network configuration

As shown in [Figure 3](#), configure the IPv6 NTP multicast mode so all devices on different network segments can synchronize to Device C, the NTP server.

**Figure 7 Network diagram**



### Applicable hardware and software versions

The following matrix shows the hardware and software versions to which this configuration example is applicable:

Hardware	Software version
SC 3570 switch series	Release 11xx
SC 5525 switch series	Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx
SC 5520 switch series	Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx
SC 3170 switch series	Release 11xx
SC 3130 switch series	Release 63xx

# Procedures

## Configuring Device C

# Configure routing protocols so that all devices can reach each other. (Details not shown.)

# Enable the NTP service.

```
<DeviceC> system-view
```

```
[DeviceC] ntp-service enable
```

**# Specify the local clock as the reference source, with the stratum level 2.**

```
[DeviceC] ntp-service refclock-master 2
```

**# Assign an IPv6 address to VLAN-interface 2.**

```
[DeviceC] interface Vlan-interface 2
```

```
[DeviceC-Vlan-interface2] ipv6 address 3000::2 64
```

**# Configure Device C to operate in IPv6 multicast server mode and send multicast messages from VLAN-interface 2.**

```
[DeviceC-Vlan-interface2] ntp-service ipv6 multicast-server ff24::1
```

```
[DeviceC-Vlan-interface2] quit
```

## Configuring Device D

**# Configure routing protocols and assign an IP address to each interface so that all devices can reach each other. (Details not shown.)**

**# Enable the NTP service.**

```
<DeviceD> system-view
```

```
[DeviceD] ntp-service enable
```

**# Configure Device D to operate in IPv6 multicast client mode and receive multicast messages on VLAN-interface 2.**

```
[DeviceD-Vlan-interface2] ntp-service ipv6 multicast-client ff24::1
```

```
[DeviceD-Vlan-interface2] quit
```

## Configuring Device B

**# Configure routing protocols and assign an IP address to each interface so that all devices can reach each other. (Details not shown.)**

**# Enable the NTP service.**

```
<DeviceB> system-view
```

```
[DeviceB] ntp-service enable
```

**# Configure Device B to operate in IPv6 multicast client mode and receive multicast messages on VLAN-interface 2.**

```
[DeviceB-Vlan-interface2] ntp-service ipv6 multicast-client ff24::1
```

```
[DeviceB-Vlan-interface2] quit
```

**Because Device A and Device C are on different subnets, you must enable IPv6 multicast functions on Device B before Device A can receive multicast messages from Device C.**

**# Enable IPv6 multicast functions.**

```
[DeviceB] ipv6 multicast routing
```

```
[DeviceB-mrib6] quit
```

```
[DeviceB] interface vlan-interface 2
```

```
[DeviceB-Vlan-interface2] ipv6 pim dm
```

```
[DeviceB-Vlan-interface2] quit
```

```
[DeviceB] vlan 3
```

```
[DeviceB-vlan3] port GigabitEthernet 1/0/1
```

```
[DeviceB-vlan3] quit
```

```
[DeviceB] interface vlan-interface 3
```

```
[DeviceB-Vlan-interface3] mld enable
```

```
[DeviceB-Vlan-interface3] mld static-group ff24::1
[DeviceB-Vlan-interface3] quit
[DeviceB] mld-snooping
[DeviceB-mld-snooping] quit
[DeviceB] interface GigabitEthernet 1/0/1
[DeviceB-GigabitEthernet1/0/1] mld-snooping static-group ff24::1 vlan 3
[DeviceB-mld-snooping] quit
```

## Configuring Device A

# Configure routing protocols and assign an IP address to each interface so that all devices can reach each other. (Details not shown.)

# Enable the NTP service.

```
<DeviceA> system-view
[DeviceA] ntp-service enable
```

# Configure Device A to operate in IPv6 multicast client mode and receive multicast messages on VLAN-interface 3.

```
[DeviceA-Vlan-interface3] ntp-service ipv6 multicast-client ff24::1
[DeviceA-Vlan-interface3] quit
```

## Verifying the configuration

# Verify that Device A has synchronized to Device C, and the clock stratum level is 3 on Device A and 2 on Device C.

```
[DeviceA] display ntp-service status
Clock status: synchronized
Clock stratum: 3
System peer: 3000::2
Local mode: bclient
Reference clock ID: 165.84.121.65
Leap indicator: 00
Clock jitter: 0.000061 s
Stability: 0.000 pps
Clock precision: 2^-19
Root delay: 1.69373 ms
Root dispersion: 1950.18005 ms
Reference time: d5ee9b15.2f3a684d Thu, Sep 26 2019 11:37:57.184
System poll interval: 64 s
```

---

### NOTE:

- For the SC 3170 switch series and SC 3570 switch series, the value is 2<sup>-18</sup> for the **Clockprecision** field in the output from the **display ntp-service status** command.
-

# Configuration files

- **Device A:**

```
#
ntp-service enable
#
interface Vlan-interface3
  ipv6 address 2000::1/64
  ntp-service ipv6 multicast-client ff24::1
#
```

- **Device B:**

```
#
ntp-service enable
#
ipv6 multicast routing
#
mld-snooping
#
interface Vlan-interface2
  ipv6 address 3000::1/64
  ipv6 pim dm
  ntp-service ipv6 multicast-client ff24::1
#
interface Vlan-interface3
  ipv6 address 2000::2/64
  mld enable
  mld static-group ff24::1
#
interface GigabitEthernet1/0/1
  port access vlan 3
  mld-snooping static-group ff24::1 vlan 3
#
```

- **Device C:**

```
#
ntp-service enable
ntp-service refclock-master 2
#
interface Vlan-interface2
  ipv6 address 3000::2/64
  ntp-service ipv6 multicast-server ff24::1
#
```

- **Device D:**

```
#
ntp-service enable
#
interface Vlan-interface2
  ipv6 address 3000::3/64
```

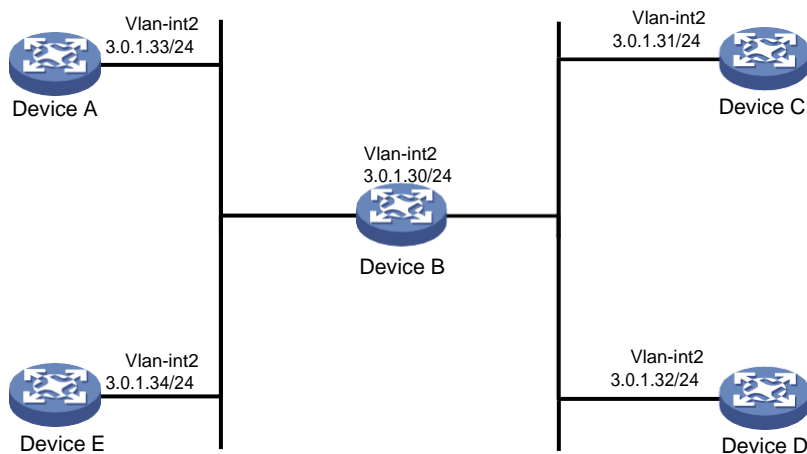
```
ntp-service ipv6 multicast-client ff24::1
#
```

# Example: Configuring NTP broadcast mode with authentication

## Network configuration

As shown in [Figure 4](#), configure NTP broadcast mode so all devices can synchronize to Device A, the NTP server. Configure NTP authentication on Device A, Device B, and Device C.

**Figure 8 Network diagram**



## Applicable hardware and software versions

The following matrix shows the hardware and software versions to which this configuration example is applicable:

Hardware	Software version
SC 3570 switch series	Release 11xx
SC 5525 switch series	Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx
SC 5520 switch series	Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx
SC 3170 switch series	Release 11xx
SC 3130 switch series	Release 63xx

## Procedures

### Configure Device C

```
# Enable the NTP service.
<DeviceC> system-view
```



```
[DeviceC] ntp-service enable
```

# Specify the local clock as the reference source, with the stratum level 2 on Device C.

```
[DeviceC] ntp-service refclock-master 2
```

# Enable NTP authentication on Device C. Configure an NTP authentication key, with the key ID of **88** and key value of **123456**. Input the key in plain text, and specify it as a trusted key.

```
[DeviceC] ntp-service authentication enable
```

```
[DeviceC] ntp-service authentication-keyid 88 authentication-mode md5 simple 123456
```

```
[DeviceC] ntp-service reliable authentication-keyid 88
```

# Specify Device C as an NTP broadcast server, and associate key **88** with Device C.

```
[DeviceC] interface vlan-interface 2
```

```
[DeviceC-Vlan-interface2] ip address 3.0.1.31 24
```

```
[DeviceC-Vlan-interface2] ntp-service broadcast-server authentication-keyid 88
```

```
[DeviceC-Vlan-interface2] quit
```

## Configure Device A

# Enable the NTP service.

```
<DeviceA> system-view
[DeviceA] ntp-service enable
```

# Enable NTP authentication on Device A. Configure an NTP authentication key, with the key ID of **88** and key value of **123456**. Input the key in plain text, and specify it as a trusted key.

```
[DeviceA] ntp-service authentication enable
[DeviceA] ntp-service authentication-keyid 88 authentication-mode md5 simple 123456
[DeviceA] ntp-service reliable authentication-keyid 88
```

# Configure Device A to operate in NTP broadcast client mode and receive NTP broadcast messages on VLAN-interface 2.

```
[DeviceA] interface vlan-interface 2
[DeviceA-Vlan-interface2] ntp-service broadcast-client
[DeviceA-Vlan-interface2] ip address 3.0.1.33 24
[DeviceA-Vlan-interface2] quit
```

# Configure Device B, Device D, and Device E in the same way Device A is configured. (Details not shown.)

## Verifying the configuration

# Verify that Device A has synchronized to Device C, and the clock stratum level is 3 on Device A and 2 on Device C.

```
[DeviceA] display ntp-service status
Clock status: synchronized
Clock stratum: 3
System peer: 3.0.1.31
Local mode: bclient
Reference clock ID: 3.0.1.31
Leap indicator: 00
Clock jitter: 0.000092 s
Stability: 0.000 pps
Clock precision: 2^-19
Root delay: 2.42615 ms
Root dispersion: 1950.98877 ms
Reference time: d5eed631.2f498d71 Thu, Sep 26 2019 15:50:09.184
System poll interval: 64 s
```

---

### NOTE:

- For the SC 3170 switch series and SC 3570 switch series, the value is 2<sup>-18</sup> for the **Clockprecision** field in the output from the **display ntp-service status** command.
-

# Configuration files

- Device A, Device B, Device D, and Device E:

```
#
interface Vlan-interface2
 ip address 3.0.1.33 255.255.255.0
 ntp-service broadcast-client
#
 ntp-service enable
 ntp-service authentication enable
 ntp-service authentication-keyid 88 authentication-mode md5 cipher
 $c$3$pU6KvpS80MadhM2zM
 CCSR07HX4qEbJhHvQ==
 ntp-service reliable authentication-keyid 88
#
```

- Device C:

```
#
interface Vlan-interface2
 ip address 3.0.1.31 255.255.255.0
 ntp-service broadcast-server authentication-keyid 88
#
 ntp-service enable
 ntp-service authentication enable
 ntp-service authentication-keyid 88 authentication-mode md5 cipher
 $c$3$iJudDKiqCVO+gOaG53
 63/fz4M3dQvHo2Fw==
 ntp-service reliable authentication-keyid 88
 ntp-service refclock-master 3
#
```