



# Grandstream Networks, Inc.

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## DNS SRV Guide



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## SUPPORTED DEVICES

Following table shows Grandstream products supporting DNS-SRV protocol.

**Table 1: List of Supported Products**

| Model   | Supported | Firmware           |
|---|-----------|--------------------|
| <b>High End IP Phones<br/>GXP21XX Series</b>                      |           |                    |
| GXP2130/2140/2160   | Yes       | 1.0.7.25 or higher |
| GXP2135/2170  |           |                    |
| <b>Mid-Range IP Phones<br/>GXP17XX Series</b>                     |           |                    |
| GXP1760/1780/1782   | Yes       | 1.0.0.37 or higher |
| <b>Basic IP Phones<br/>GXP16XX Series</b>                         |           |                    |
| GXP1610/1615  | Yes       | 1.0.4.6 or higher  |
| GXP1620/1625  |           |                    |
| GXP1628/1630  |           |                    |
| <b>Full HD Video Conferencing System<br/>GVC32XX Series</b>       |           |                    |
| GVC3200/3202  | Yes       | 1.0.1.74 or higher |
| GVC3210   | Yes       | 1.0.1.69 or higher |
| GVC3220   | Yes       | 1.0.1.24 or higher |
| <b>Audio Conferencing System<br/>GAC2500 Series</b>               |           |                    |
| GAC2500   | Yes       | 1.0.1.44 or higher |
| <b>Analog VoIP Gateways<br/>GXW42XX / GXW40XX Series</b>          |           |                    |
| GXW4216/4224/4232/4248  | Yes       | 1.0.5.16 or higher |
| <b>Analog Telephone Adaptors<br/>HT5XX / HT7XX / HT8XX Series</b> |           |                    |
| HT502/503   | Yes       | 1.0.15.5 or higher |
| HT701/702/704   |           | 1.0.8.2 or higher  |
| HT802/812/814   |           | 1.0.2.5 or higher  |
| <b>Cordless IP Phones<br/>DP750/DP720 Series</b>                  |           |                    |
| DP750/752   | Yes       | 1.0.1.20 or higher |



## INTRODUCTION

SRV records (Service records) are names in DNS (Domain Name System) allowing to locate servers for specific service, by providing hostname, port number, weight and priority information in response to a DNS lookup request.

DNS SRV can be used to discover the SIP server domain, in order to get registered to make and receive calls, and can be also used to identify a backup SIP server domain in the event the primary server fails, providing high availability with no service interruption.

A SIP client configured with a domain name as SIP server (example: grandstream.com), if DNS lookup is using "A Record", the response from the DNS server will include a single IP address for this domain. While if this domain offers different servers for the same service (SIP), DNS SRV can help to provide hostnames, port number, weight and priority for each server, allowing SIP client to connect to the first available server (depending on priority and weight). In addition, Grandstream products support DNS SRV/NAPTR, NAPTR records are used in conjunction with SRV records to discover available services (SIP, email, web, FTP...) in a specific domain, and provide DNS SRV records as response to use for DNS lookup.

The following flow shows DNS interaction between Grandstream products and DNS server:

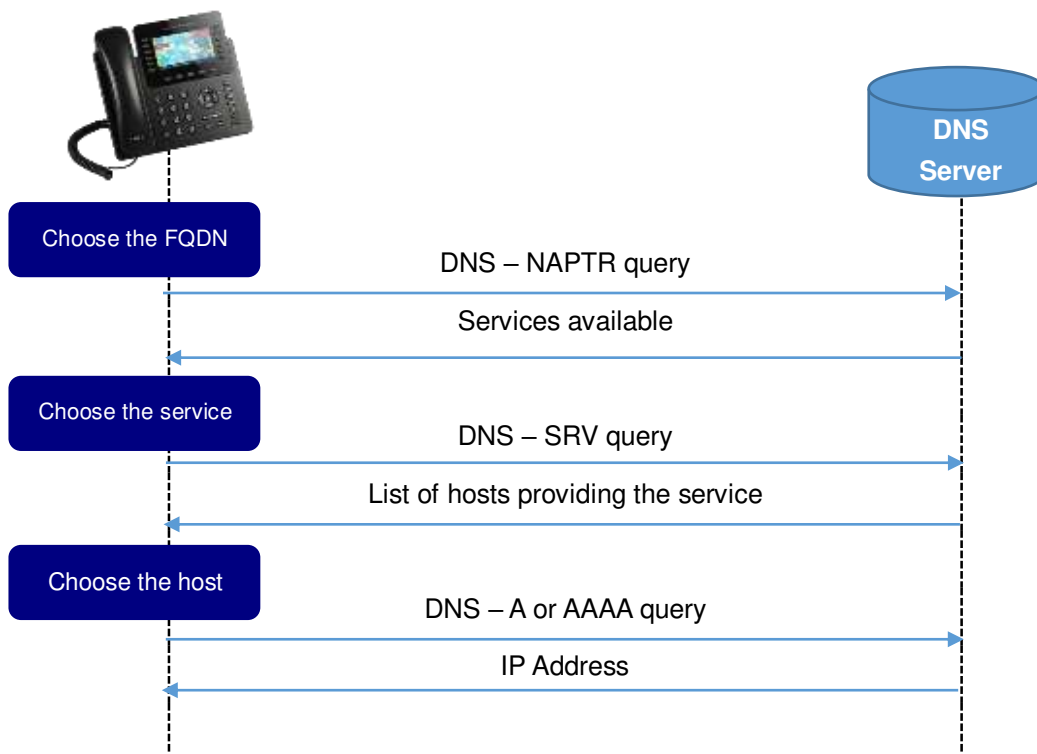


Figure 1: DNS Interaction

## DNS-SRV

## DNS-SRV Format

The format for a DNS SRV lookup is the following:

**\_Service.\_Proto.Name TTL Class SRV Priority Weight Port Target**

Table 2: DNS-SRV Fields Description

| Fields          | Description   |
|-----------------|---|
| <b>Service</b>  | The name of the service to resolve (http, sip, ldap...).  |
| <b>Proto</b>    | The protocol used by this service (udp or tcp).   |
| <b>Name</b>     | The domain name of the wanted service   |
| <b>TTL</b>      | The time interval that the resource record may be cached before the source of the information should again be consulted.  |
| <b>Class</b>    | Specify the type of the Resource record it can be: <ul style="list-style-type: none"> <li>• <b>IN</b>: The Internet class</li> <li>• <b>CS</b>: The CSNET class (Obsolete - used only for examples in some obsolete RFCs)</li> <li>• <b>CH</b>: The CHAOS class</li> <li>• <b>HS</b>: Hesiod [Dyer 87]</li> </ul> |
| <b>Priority</b> | A client attempt to contact the target host with the lowest-numbered priority it can reach, target hosts with the same priority will be tried in an order defined by the weight field. The range is 0-65535   |
| <b>Weight</b>   | It specifies a relative weight for entries with the same priority. Larger weight will get high priority of being selected. The range of this number is 0-65535.   |
| <b>Port</b>     | The port on this target host of this service. The range is 0-65535.   |
| <b>Target</b>   | The domain name of the target host. This entry should return one or more address records for this name.   |

## Configuring DNS-SRV On Grandstream Devices

GXP2170 is used in this guide as example for the configuration.

1. Enter account credentials under “**Accounts → Account X → General Settings**”.  
 In this example: “SIP Server” is “grandstream.com” and “Outbound proxy” is “test.grandstream.com”.



### General Settings

|                          |   |
|--------------------------|---|
| Account Active           | <input type="radio"/> No <input checked="" type="radio"/> Yes |
| Account Name             | <input type="text" value="2002"/>                             |
| SIP Server               | <input type="text" value="grandstream.com"/>                  |
| Secondary SIP Server     | <input type="text"/>  |
| Outbound Proxy           | <input type="text" value="test.grandstream.com"/>             |
| Backup Outbound Proxy    | <input type="text"/>  |
| SIP User ID              | <input type="text" value="2002"/>                             |
| Authenticate ID          | <input type="text" value="2002"/>                             |
| Authenticate Password    | <input type="text"/>  |
| Name                     | <input type="text" value="2002"/>                             |
| Voice Mail Access Number | <input type="text"/>  |

**Figure 2: GXP2170 SIP Configuration**

- Set “DNS Mode” to “SRV” under “**Accounts → Account X → Network Settings**”

### Network Settings

|                        |                                      |
|------------------------|--------------------------------------|
| DNS Mode               | <input type="text" value="SRV"/>     |
| DNS SRV Fail-over Mode | <input type="text" value="Default"/> |
| Primary IP             | <input type="text"/>                 |
| Backup IP 1            | <input type="text"/>                 |
| Backup IP 2            | <input type="text"/>                 |
| NAT Traversal          | <input type="text" value="No"/>      |
| Proxy-Require          | <input type="text"/>                 |

**Figure 3: Network Settings**

The table below explains available options related to DNS configuration:



Table 3: Phone DNS Settings

| Field                         | Description   |
|-------------------------------|---|
| <b>DNS Mode</b>               | <p>This parameter controls how the search appliance looks up IP addresses for hostnames. There are four modes: A Record, SRV, NAPTR/SRV, Use Configured IP. The default setting is "<b>A Record</b>". If the user wishes to locate the server by DNS SRV, the user may select "<b>SRV</b>" or "<b>NAPTR/SRV</b>". If "<b>Use Configured IP</b>" is selected, please fill in the three fields below:</p> <ul style="list-style-type: none"> <li>• <b>Primary IP.</b></li> <li>• <b>Backup IP 1.</b></li> <li>• <b>Backup IP 2.</b></li> </ul> <p>If SIP server is configured as domain name, phone will not send DNS query, but use "Primary IP" or "Backup IP x" to send SIP message if at least one of them are not empty. Phone will try to use "Primary IP" first. After 3 tries without any response, it will switch to "Backup IP x", and then it will switch back to "Primary IP" after 3 re-tries. If SIP server is already an IP address, phone will use it directly even "User Configured IP" is selected.</p> |
| <b>DNS SRV Fail-over Mode</b> | <p>The option will decide which IP is going to be used in sending SIP packets after IPs for SIP server host are resolved with DNS SRV.</p> <ul style="list-style-type: none"> <li>• <b>Default</b><br/>If the option is set with "default", it will again try to send register messages to one IP at a time, and the process repeats.</li> <li>• <b>Saved one until DNS TTL</b><br/>If the option is set with "Saved one until DNS TTL", it will send register messages to the previously registered IP first. If no response, it will try to send one at a time for each IP. This behavior lasts as long as DNS TTL (time-to-live) is up.</li> <li>• <b>Saved one until no responses</b><br/>If the option is set with "Saved one until no responses", it will send register messages to the previously registered IP first, but this behavior will persist until the registered server does not respond.</li> </ul>   |

## DNS-SRV Lookup

In order to Register account in the above example, the phone will try to resolve the domain "**test.grandstream.com**", therefore:

- The phone will send a SRV lookup for "**test.grandstream.com**".
- The DNS server will reply with a list of FQDN's with different weight and priorities.
- The phone will issue an A record query for all the FQDNs (Fully qualifies domain names) starting from the one with the lowest priority number.
- The DNS server will send back the IP addresses associated with those FQDNs.
- The phone will then send SIP REGISTER request to the IP address associated with the lowest priority number returned by the SRV lookup.





## Registration Process

If the primary SIP server where the phone is registered (192.168.10.13) fails, the phone act as follow:

- After the register expiration, the phone will send 3 SIP REGISTER requests to the primary server, and won't get a reply.
- The phone will consider the server not available and then send a REGISTER request to the backup server (192.168.10.12).

| No.  | Time   | Source        | Destination   | Protocol | Info  |
|------|--------|---------------|---------------|----------|---|
| 153  | 5.711  | 192.168.10.10 | 192.168.10.13 | SIP      | Request: REGISTER sip:grandstream.com (1 binding) |
| 154  | 5.767  | 192.168.10.13 | 192.168.10.10 | SIP      | Status: 200 OK (1 binding)                        |
| 955  | 51.844 | 192.168.10.10 | 192.168.10.13 | SIP      | Request: REGISTER sip:grandstream.com (1 binding) |
| 970  | 52.343 | 192.168.10.10 | 192.168.10.13 | SIP      | Request: REGISTER sip:grandstream.com (1 binding) |
| 990  | 53.344 | 192.168.10.10 | 192.168.10.13 | SIP      | Request: REGISTER sip:grandstream.com (1 binding) |
| 1010 | 55.349 | 192.168.10.10 | 192.168.10.12 | SIP      | Request: REGISTER sip:grandstream.com (1 binding) |
| 1013 | 55.366 | 192.168.10.12 | 192.168.10.10 | SIP      | Status: 401 Unauthorized                          |
| 1014 | 55.372 | 192.168.10.10 | 192.168.10.12 | SIP      | Request: REGISTER sip:grandstream.com (1 binding) |
| 1015 | 55.390 | 192.168.10.12 | 192.168.10.10 | SIP      | Status: 200 OK (1 binding)                        |

Figure 4: Registration Process

Once the primary server returns to normal, after the register expiration the phone will send again REGISTER request to the primary server.

**Note:** The same REGISTER process is applied for INVITE and BYE messages.

| No. | Time  | Source        | Destination   | Protocol | Length | Info   |
|-----|-------|---------------|---------------|----------|--------|--|
| 238 | 51.27 | 192.168.10.11 | 192.168.10.10 | DNS      | 90     | Standard query 0x0008 SRV _sip_udp.test.grandstream.com  |
| 241 | 51.27 | 192.168.10.10 | 192.168.10.11 | DNS      | 241    | Standard query response 0x0008 SRV 2 1 5060 test1.grandstream.com SRV 1 1 5060 test2.grandstream.com |
| 242 | 51.28 | 192.168.10.11 | 192.168.10.10 | DNS      | 81     | Standard query 0x0009 A test2.grandstream.com  |
| 243 | 51.28 | 192.168.10.10 | 192.168.10.11 | DNS      | 122    | Standard query response 0x0009 A 192.168.10.13   |
| 244 | 51.29 | 192.168.10.11 | 192.168.10.10 | DNS      | 81     | Standard query 0x000a A test1.grandstream.com  |
| 245 | 51.29 | 192.168.10.10 | 192.168.10.11 | DNS      | 122    | Standard query response 0x000a A 192.168.10.12   |

```

sip_udp.test.grandstream.com: type SRV, class IN
Answers
  _sip_udp.test.grandstream.com: type SRV, class IN, priority 2, weight 1, port 5060, target test1.grandstream.com
    Service: _sip
    Protocol: _udp
    Name: test.grandstream.com
    Type: SRV (Server Selection) (33)
    Class: IN (0x0001)
    Time to live: 3
    Data length: 29
    Priority: 2
    Weight: 1
    Port: 5060
    Target: test1.grandstream.com
  _sip_udp.test.grandstream.com: type SRV, class IN, priority 1, weight 1, port 5060, target test2.grandstream.com
    Service: _sip
    Protocol: _udp
    Name: test.grandstream.com
    Type: SRV (Server Selection) (33)
    Class: IN (0x0001)
    Time to live: 3
    Data length: 29
    Priority: 1
    Weight: 1
    Port: 5060
    Target: test2.grandstream.com
Authoritative nameservers
  grandstream.com: type NS, class IN, ns elmrabet-pc
Additional records
  test1.grandstream.com: type A, class IN, addr 192.168.10.12
  test2.grandstream.com: type A, class IN, addr 192.168.10.13
  
```

Figure 5: SRV Lookup

## DNS NAPTR/SRV

### DNS NAPTR/SRV Format

NAPTR resource records are used to replace compact, regular expressions with a replacement field that may well be a pointer to another rule, its DNS-type code is 35.

The format of an NAPTR record is as follows:

**Domain    TTL    Class    Type    Order    Preference    Flags    Service    Regexp    Replacement**

Table 4: DNS-NAPTR/SRV Fields Description

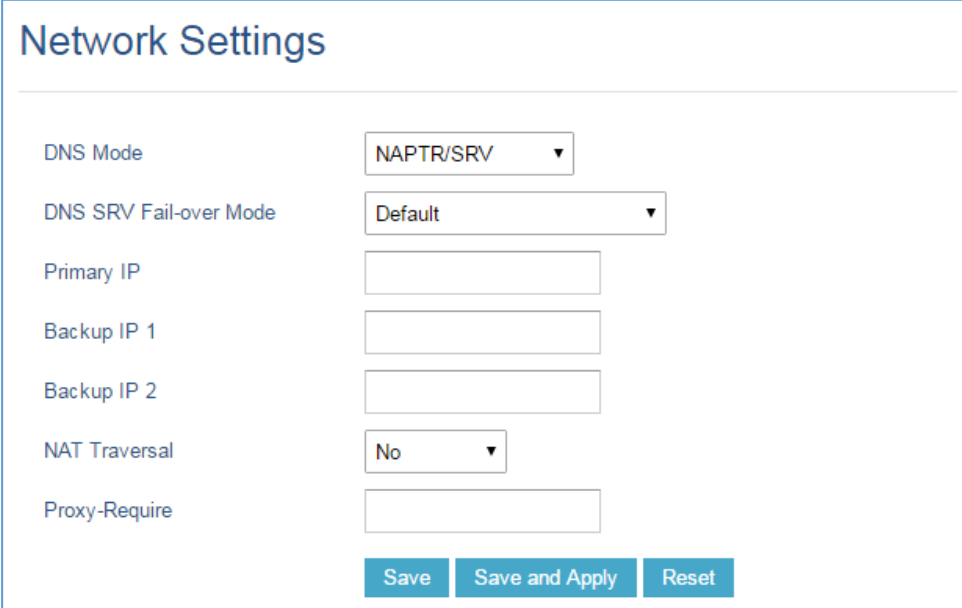
| Fields            | Description  |
|-------------------|--|
| <b>Domain</b>     | The domain name to which this resource record refers   |
| <b>TTL</b>        | Specify the time interval that the resource record may be cached before the source of the information should again be consulted.   |
| <b>Class</b>      | Specify the type of the Resource record it can be: <ul style="list-style-type: none"> <li>• <b>IN:</b> The Internet class</li> <li>• <b>CS:</b> The CSNET class (Obsolete - used only for examples in some obsolete RFCs)</li> <li>• <b>CH:</b> The CHAOS class</li> <li>• <b>HS:</b> Hesiod [Dyer 87]</li> </ul>  |
| <b>Type</b>       | DNS type code for NAPTR is 35  |
| <b>Order</b>      | Specify the order in which the NAPTR records need to be processed, low numbers are processed before high numbers.  |
| <b>Preference</b> | Specifies the order in which NAPTR records with the same “Order” values need to be processed. records are processed from lower preference numbers to higher preference numbers.  |
| <b>Flags</b>      | Indicate what happens next after this lookup, at this time 4 flags are defined. <ul style="list-style-type: none"> <li>• The “S” flag indicates that the next lookup should be an SRV lookup.</li> <li>• The “A” flag indicates that the next step is a DNS A, AAAA, A6 record lookup.</li> <li>• The “U” flag means that the next step is not a DNS lookup but that the output of the Regexp field is an URI that adheres to the 'absoluteURI'.</li> <li>• The “P” flag indicates that the remainder of the lookup are defined by the application that uses the NAPTR.</li> </ul> |
| <b>Service</b>    | Specifies the services available in this domain. The replacement field is used to get to this service.   |



|                    |  |
|--------------------|--|
|                    | <p>It can also specify the protocol used to communicate with the server that offers this service. In SIP, three services are defined along with their resolution services (resolution services are defined after the “+” sign):</p> <ul style="list-style-type: none"> <li>• “<b>SIPS+D2T</b>”: Secure SIP, TLS over TCP.</li> <li>• “<b>SIP+D2T</b>”: SIP over TCP.</li> <li>• “<b>SIPS+D2S</b>”: Secure SIP, TLS over SCTP.</li> <li>• “<b>SIP+D2S</b>”: SIP over SCTP.</li> <li>• “<b>SIP+D2U</b>”:SIP over UDP.</li> </ul> |
| <b>Regexp</b>      | Carries a substitution expression that is applied to the original domain name in order to construct a new domain name for the next lookup.   |
| <b>Replacement</b> | The next name used to query a DNS. This could be another NAPTR, SRV or A record. In SIP the replacement fields are SRV RRs and hence the flag field is set to “S”.   |

## DNS NAPTR/SRV Lookup

Using the GXP2170 example the DNS settings can be found under “**Accounts → Account X → Network Settings**”.



The screenshot shows the 'Network Settings' configuration page. It includes the following fields and options:

- DNS Mode:** A dropdown menu set to 'NAPTR/SRV'.
- DNS SRV Fail-over Mode:** A dropdown menu set to 'Default'.
- Primary IP:** An empty text input field.
- Backup IP 1:** An empty text input field.
- Backup IP 2:** An empty text input field.
- NAT Traversal:** A dropdown menu set to 'No'.
- Proxy-Require:** An empty text input field.

At the bottom of the form are three buttons: 'Save', 'Save and Apply', and 'Reset'.

**Figure 6: Network Settings 2**

Using the example in Figure 1, in order to register the account, the phone will make the following lookup:

- The phone will send a NAPTR lookup for the domain “**test.grandstream.com**”.
- The server will return back a NAPTR record reply that contain the next step for the lookup.
- The phone will send an SRV lookup for using parameters returned on the NAPTR record.
- The DNS server will reply with a list of FQDN’s with different weight and priorities.



- The phone will issue an A record query for all the FQDNs starting from the one with the lowest priority number.
- The DNS server will send back the IP addresses associated with those FQDNs.
- The phone will then send SIP REGISTER request to the IP address associated with the lowest priority number returned by the SRV lookup.

| No. | Time  | Source        | Destination   | Protocol | Length | Info   |
|-----|-------|---------------|---------------|----------|--------|--|
| 254 | 16.08 | 192.168.10.11 | 192.168.10.10 | DNS      | 80     | Standard query 0x0140 NAPTR test.grandstream.com   |
| 255 | 16.08 | 192.168.10.10 | 192.168.10.11 | DNS      | 164    | Standard query response 0x0140 NAPTR 80 60 s   |
| 256 | 16.10 | 192.168.10.11 | 192.168.10.10 | DNS      | 90     | Standard query 0x0141 SRV _sip._udp.test.grandstream.com   |
| 257 | 16.10 | 192.168.10.10 | 192.168.10.11 | DNS      | 241    | Standard query response 0x0141 SRV 2 1 5060 test1.grandstream.com SRV 1 1 5060 test2.grandstream.com |
| 258 | 16.10 | 192.168.10.11 | 192.168.10.10 | DNS      | 81     | Standard query 0x0142 A test2.grandstream.com  |
| 259 | 16.10 | 192.168.10.10 | 192.168.10.11 | DNS      | 122    | Standard query response 0x0142 A 192.168.10.13   |
| 260 | 16.11 | 192.168.10.11 | 192.168.10.10 | DNS      | 81     | Standard query 0x0143 A test1.grandstream.com  |
| 261 | 16.11 | 192.168.10.10 | 192.168.10.11 | DNS      | 122    | Standard query response 0x0143 A 192.168.10.12   |

```

[Request In: 254]
[Time: 0.000679000 seconds]
Transaction ID: 0x0140
Flags: 0x8580 Standard query response, No error
Questions: 1
Answer RRs: 1
Authority RRs: 1
Additional RRs: 0
Queries
  test.grandstream.com: type NAPTR, class IN
Answers
  test.grandstream.com: type NAPTR, class IN, order 80, preference 60, flags s
    Name: test.grandstream.com
    Type: NAPTR (Naming Authority Pointer) (35)
    Class: IN (0x0001)
    Time to live: 3
    Data length: 47
    Order: 80
    Preference: 60
    Flags Length: 1
    Flags: s
    Service Length: 7
    Service: SIP+D2U
    Regex Length: 0
    Regex:
    [Replacement Length: 32]
    Replacement: _sip._udp.test.grandstream.com
Authoritative nameservers
  grandstream.com: type NS, class IN, ns e1mrabet-pc
  
```

Figure 7: DNS NAPTR/SRV Lookup

**Note:** The registration process is the same as described previously on SRV section.



## DNS SERVER CONFIGURATION

A trial Version of **Simple DNS Plus** is used as DNS server in this example.

In order to configure Simple DNS with SRV and NAPTR records please follow those steps:

1. Download and install Simple DNS plus from this link: [SimpleDNSPlus](#).
2. Open Simple DNS Plus and Click on Records to start configuration.

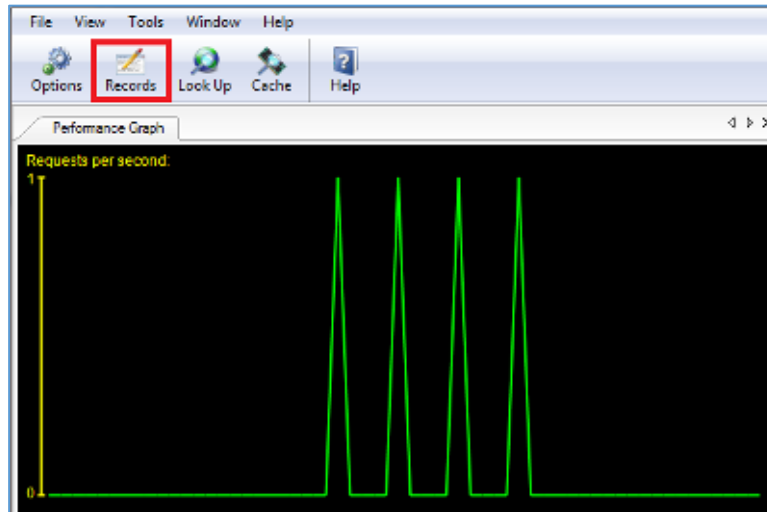


Figure 8: Configure Records

3. Create a new Primary Zone.

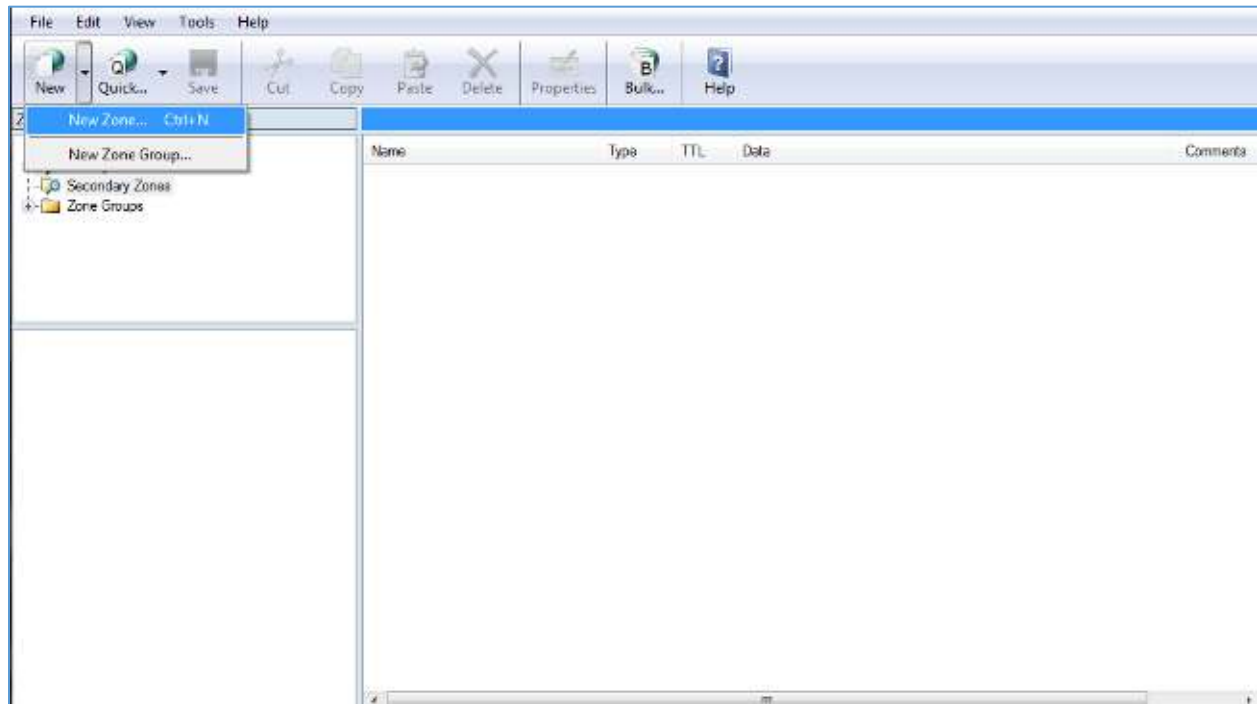


Figure 9: New Zone

- The following window will be prompt, select Forward Zone and Click “Next”.



**New Zone Wizard**

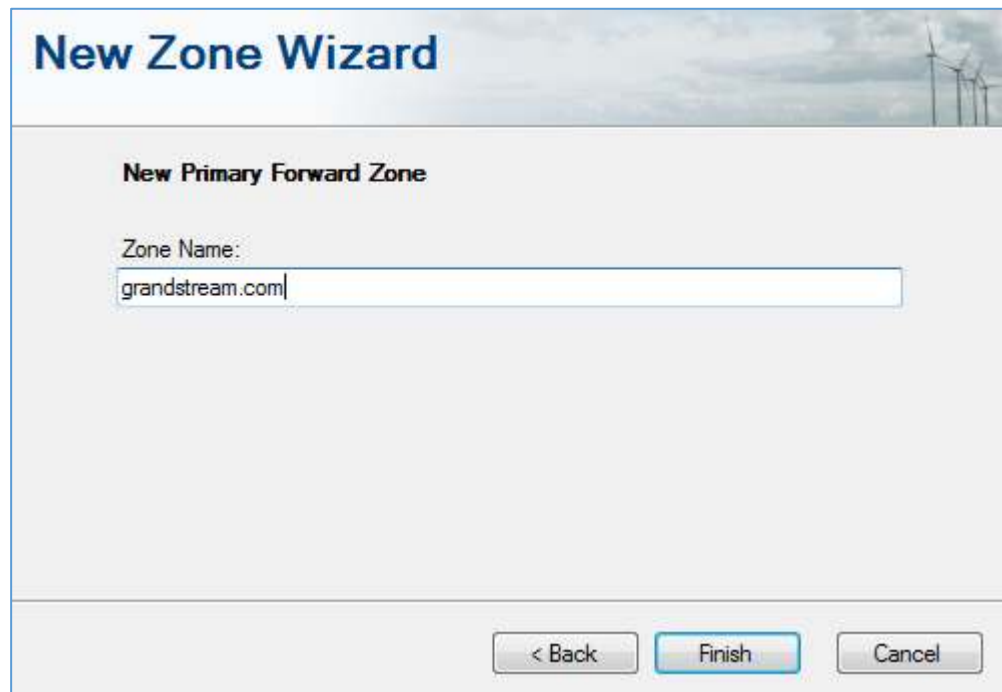
Select the type of Primary zone you want to create:

- Forward Zone**  
A forward zone holds DNS records for domain name to IP address lookups, as well as other DNS record types. This is the most common zone type.
- Reverse Zone**  
A reverse zone holds DNS records for IP address to domain name lookups. Use the "Reverse Zone Wizard" to create and modify records.
- Alias Zone**  
Creates a new zone which shares its DNS records and settings with another zone. This can save a lot time when managing a large number of zones with identical data.  
Warning: Changes made in one zone reflects in all aliased zones.

< Back   Next >   Cancel

Figure 10: Forward Zone

- Enter the name of your zone which is “**grandstream.com**” in this example, then click on “Finish”.



**New Zone Wizard**

**New Primary Forward Zone**

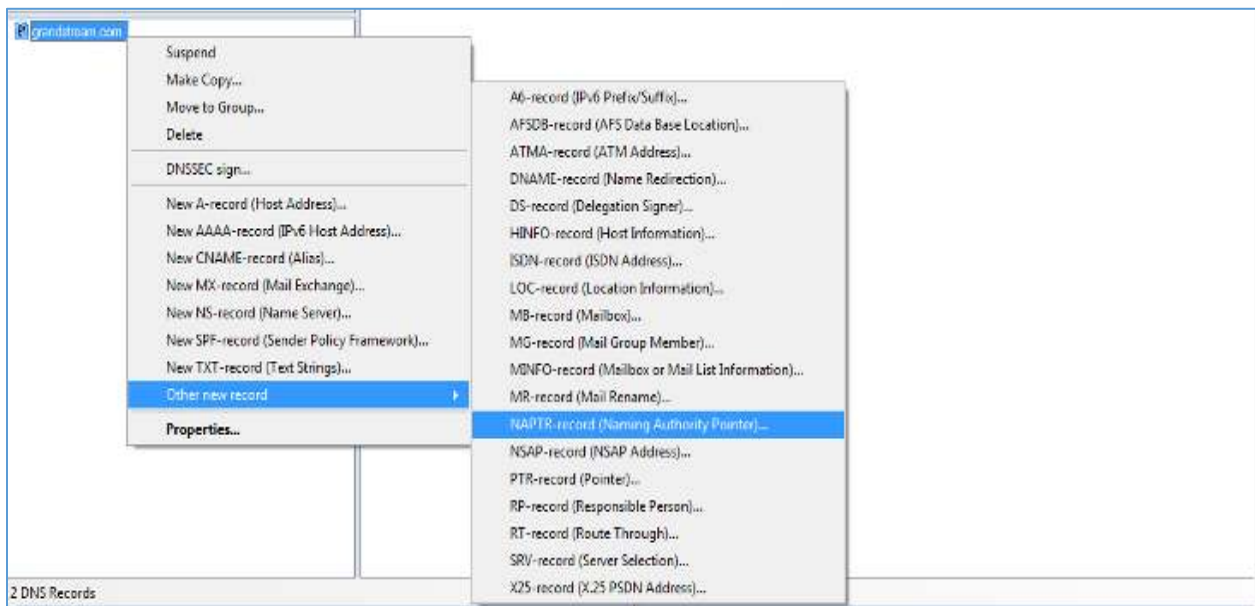
Zone Name:  
grandstream.com

< Back   Finish   Cancel

Figure 11: Zone Name

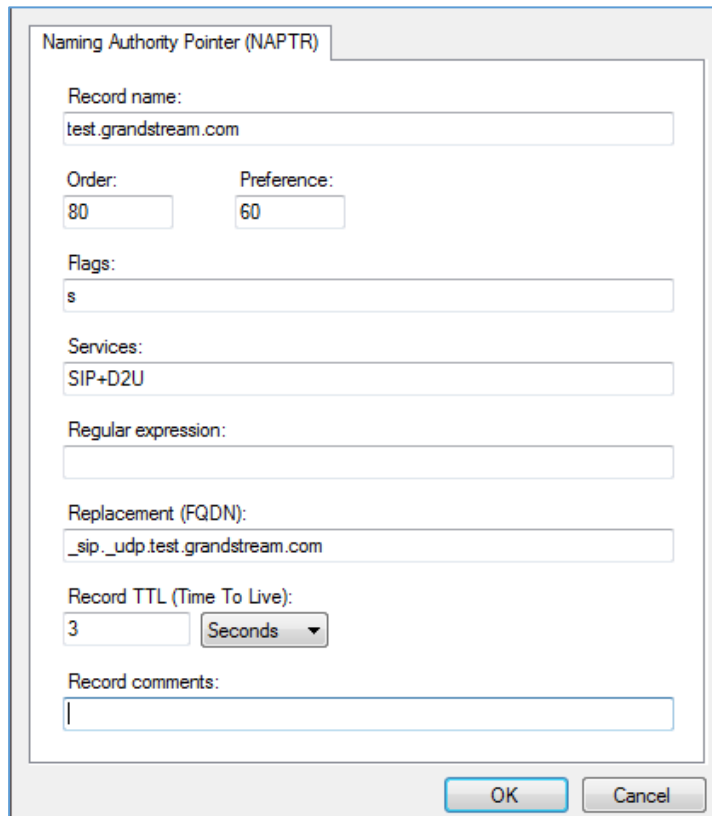
Once the zone is created successfully, start creating the records as shown in the following figure:

- Right Click on the zone created which is “grandstream.com” then select “**Other New Records**” and click on “**NAPTR-record**”, this will create our NAPTR record.



**Figure 12: New NAPTR Record**

- Fill the information related to the NAPTR record and click “OK” as shown below.


 A screenshot of the 'Naming Authority Pointer (NAPTR)' configuration dialog box. The dialog has the following fields and values:
 

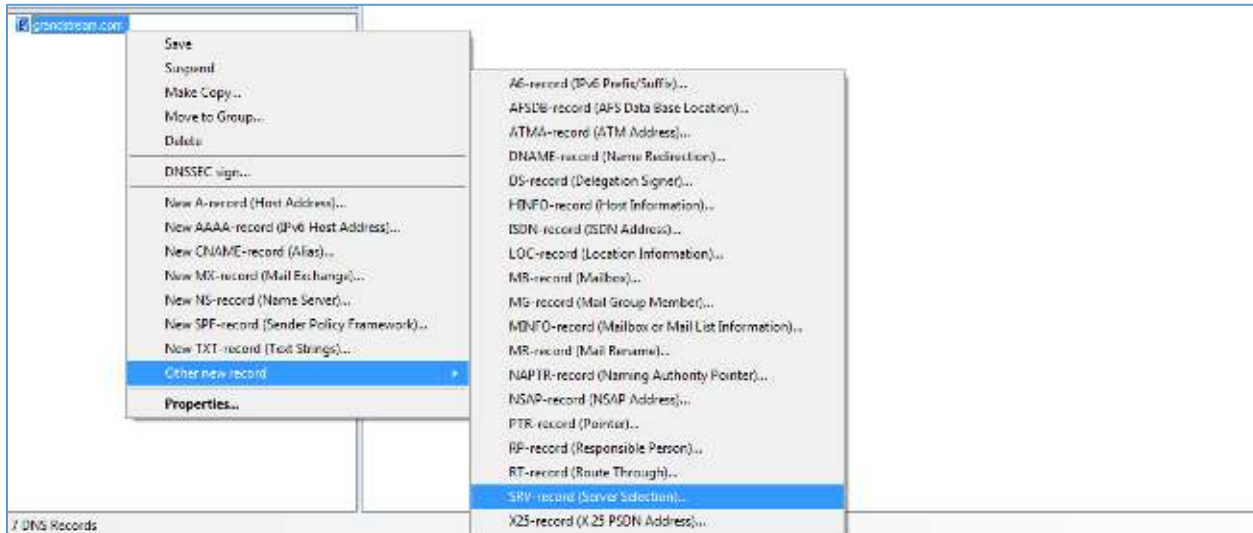
- Record name: test.grandstream.com
- Order: 80
- Preference: 60
- Flags: s
- Services: SIP+D2U
- Regular expression: (empty)
- Replacement (FQDN): \_sip.\_udp.test.grandstream.com
- Record TTL (Time To Live): 3 Seconds
- Record comments: (empty)

 At the bottom right, there are 'OK' and 'Cancel' buttons.

**Figure 13: NAPTR Record**

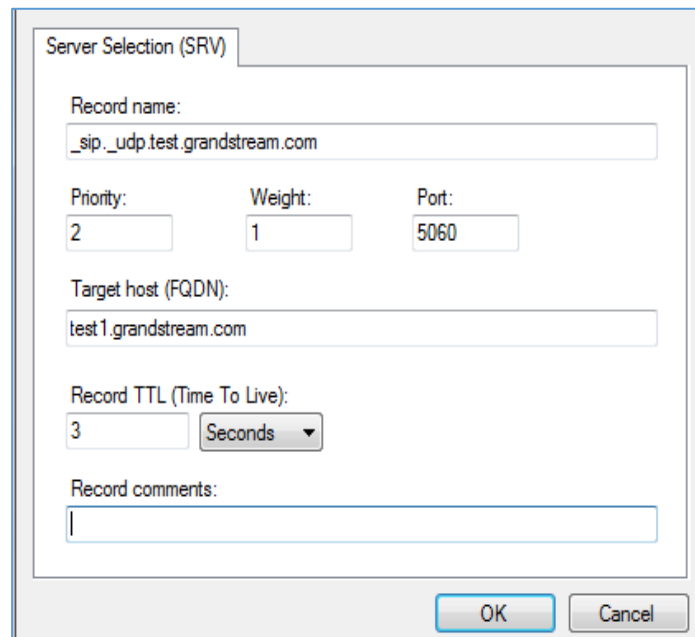


8. Create SRV records by clicking on “grandstream.com” zone, then select “Other New Records” and click on “SRV-record”, this will create our NAPTR record.



**Figure 14: New SRV Record**

9. Fill the information related to the SRV record and click “OK” as shown below.

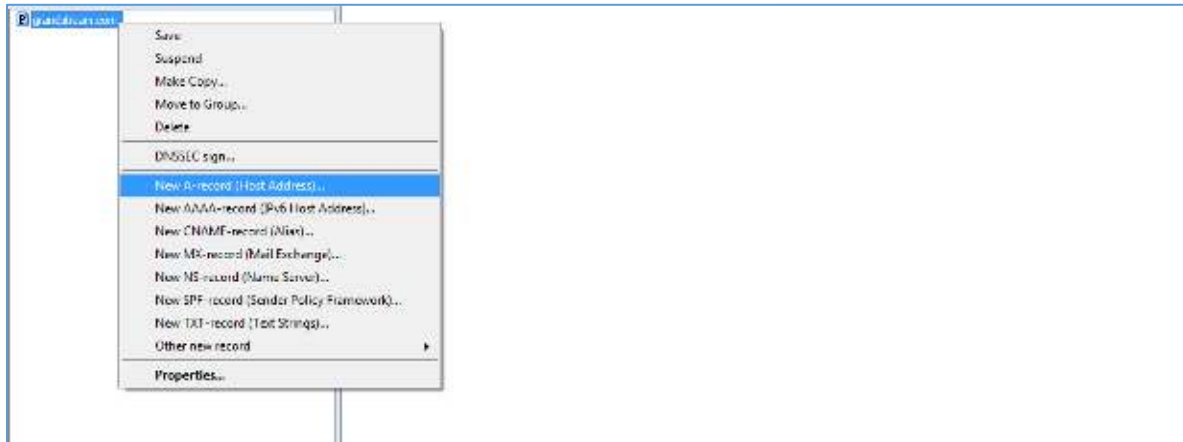


**Figure 15: SRV Record**

10. Click on “grandstream.com” zone to Create SRV records, then select “Other New Records” and select “SRV-record”, this will create our NAPTR record.

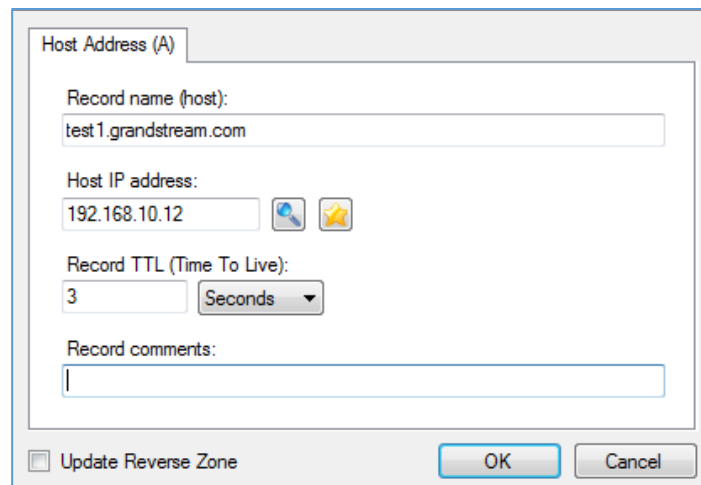






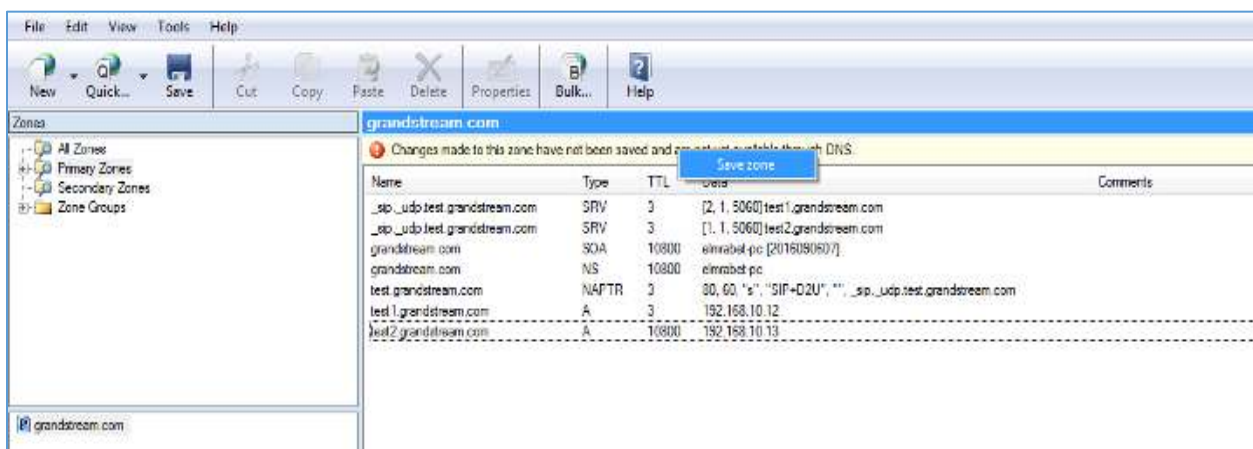
**Figure 16: New A Record**

11. Fill the information related to the A record and click “OK” as shown below.



**Figure 17: A Record**

Once all the Records are created, click on Save Zone as shown below to save the zone and finish the Server configuration.



**Figure 18: Save Settings**