NSSYNC

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Short Contents

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1 Introduction

BIND, the most frequently used DNS server, normally keeps its zone data in *zone files*. This approach becomes inconvenient when the number of zones grows beyond a certain limit. When this happens, the obvious solution is to move all data to a database and make `named` read it from there. Recent versions of BIND include *dynamically loadable zones* (*DLZ*) feature[1], which makes it possible to use such databases directly. However, DLZ has problems of its own, one of them being that it is unable to propagate glue records[2].

The `nssync` utility provides an alternative solution, which makes it possible to keep your zone data in an SQL[3] database without using DLZ and with glue records working.

It does so by periodically polling the database to determine which data have changed recently and converting the database into BIND zone files.

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[1] See `http://bind-dlz.sourceforge.net/`.

[2] See: `http://permalink.gmane.org/gmane.network.dns.bind9.dlz/2078`, `http://blog.gmane.org/gmane.network.dns.bind9.dlz/month=20110101`.

[3] As of version 1.1 only MySQL is supported.

2 Overview

The `nssync` utility is normally started periodically from crontab. Upon startup it reads its configuration file, which supplies the necessary program settings. Then, if the settings require so, it verifies that no other copy of the `nssync` is already running. Further on, it parses the `named` configuration file '`named.conf`' to determine several settings needed for its further operation, in particular, the value of the '`directory`' statement in the '`options`' block.

Once these preliminary operations are over, `nssync` starts its main task. Its configuration file defines, among other data, one or more *synchronization blocks*. Each such block defines SQL statements which return information about DNS zones as well as the location of `named` configuration file where the `zone` statements for these zones are to be stored (it is supposed that this file is included somewhere in the main '`named.conf`' file). For each synchronization block, the utility retrieves the zone data from the database and formats them into separate zone files. Each of these files is then compared to an already existing one (locations of the zone files are defined in the synchronization block they pertain to). If the files differ, new zone file replaces the old one and a flag is set indicating that the `named` daemon needs to be restarted in order to read new configuration.

When this stage is finished, `nssync` reloads the name server (if required) and exits.

Several command line options can be supplied in order to modify the program's behavior. In particular, it is possible to check the configuration file syntax or even instruct the utility to do everything, except modifying the zone files (a so-called *dry-run mode*). This allows you to debug your configuration before actually starting using `nssync`.

3 Configuration File

`Nssync` reads its settings from a configuration file '`nssync.conf`' located normally in the system configuration directory (usually '`/etc`' or '`/usr/local/etc`', depending on compile-time options).

This chapter describes the syntax of that file in general. The chapter that follows describes the `nssync`-specific settings in detail.

The configuration file consists of statements and comments.

There are three classes of lexical tokens: keywords, values, and separators. Blanks, tabs, newlines and comments, collectively called *white space* are ignored except as they serve to separate tokens. Some white space is required to separate otherwise adjacent keywords and values.

3.1 Comments

Comments may appear anywhere where white space may appear in the configuration file. There are two kinds of comments: single-line and multi-line comments. *Single-line* comments start with '`#`' or '`//`' and continue to the end of the line:

```
# This is a comment
// This too is a comment
```

Multi-line or *C-style* comments start with the two characters '`/*`' (slash, star) and continue until the first occurrence of '`*/`' (star, slash).

Multi-line comments cannot be nested. However, single-line comments may well appear within multi-line ones.

3.2 Pragmatic Comments

Pragmatic comments are similar to usual single-line comments, except that they cause some changes in the way the configuration is parsed. Pragmatic comments begin with a '`#`' sign and end with the next physical newline character.

`#include <file>`
`#include file`

: Include the contents of the file *file*. If *file* is an absolute file name, both forms are equivalent. Otherwise, the form with angle brackets searches for the file in the *include search path*, while the second one looks for it in the current working directory first, and, if not found there, in the include search path.

  The default include search path is:

  1. '`prefix/share/nssync/1.1/include`'
  2. '`prefix/share/nssync/include`'

  where *prefix* is the installation prefix.

`#include_once <file>`
`#include_once file`
: Same as `#include`, except that, if the *file* has already been included, it will not be included again.

`#line num`
`#line num "file"`
: This line causes the parser to believe, for purposes of error diagnostics, that the line number of the next source line is given by *num* and the current input file is named by *file*. If the latter is absent, the remembered file name does not change.

`# num "file"`
: This is a special form of `#line` statement, understood for compatibility with the C preprocessor.

In fact, these statements provide a rudimentary preprocessing features. For more sophisticated ways to modify configuration before parsing, see Section 3.4 [Preprocessor], page 8.

3.3 Statements

A *simple statement* consists of a keyword and value separated by any amount of whitespace. Simple statement is terminated with a semicolon (‘`;`’).

The following is a simple statement:

```
standalone yes;
pidfile /var/run/slb.pid;
```

A *keyword* begins with a letter and may contain letters, decimal digits, underscores (‘`_`’) and dashes (‘`-`’). Examples of keywords are: ‘`expression`’, ‘`output-file`’.

A *value* can be one of the following:

number
: A number is a sequence of decimal digits.

boolean
: A boolean value is one of the following: ‘`yes`’, ‘`true`’, ‘`t`’ or ‘`1`’, meaning *true*, and ‘`no`’, ‘`false`’, ‘`nil`’, ‘`0`’ meaning *false*.

unquoted string
: An unquoted string may contain letters, digits, and any of the following characters: ‘`_`’, ‘`-`’, ‘`.`’, ‘`/`’, ‘`@`’, ‘`*`’, ‘`:`’.

quoted string
: A quoted string is any sequence of characters enclosed in double-quotes (‘`"`’). A backslash appearing within a quoted string introduces an *escape sequence*, which is replaced with a single character according to the following rules:

Sequence	Replaced with
\a	Audible bell character (ASCII 7)
\b	Backspace character (ASCII 8)
\f	Form-feed character (ASCII 12)
\n	Newline character (ASCII 10)
\r	Carriage return character (ASCII 13)
\t	Horizontal tabulation character (ASCII 9)
\v	Vertical tabulation character (ASCII 11)
\\	A single backslash ('\')
\"	A double-quote.

Table 3.1: Backslash escapes

In addition, the sequence '`\newline`' is removed from the string. This allows to split long strings over several physical lines, e.g.:

```
"a long string may be\
 split over several lines"
```

If the character following a backslash is not one of those specified above, the backslash is ignored and a warning is issued.

Two or more adjacent quoted strings are concatenated, which gives another way to split long strings over several lines to improve readability. The following fragment produces the same result as the example above:

```
"a long string may be"
" split over several lines"
```

Here-document

A *here-document* is a special construct that allows to introduce strings of text containing embedded newlines.

The `<<word` construct instructs the parser to read all the following lines up to the line containing only *word*, with possible trailing blanks. Any lines thus read are concatenated together into a single string. For example:

```
<<EOT
A multiline
string
EOT
```

The body of a here-document is interpreted the same way as a double-quoted string, unless *word* is preceded by a backslash (e.g. '`<<\EOT`') or enclosed in double-quotes, in which case the text is read as is, without interpretation of escape sequences.

If *word* is prefixed with `-` (a dash), then all leading tab characters are stripped from input lines and the line containing *word*. Furthermore, if `-` is followed by a single space, all leading whitespace is stripped from them. This allows to indent here-documents in a natural fashion. For example:

```
<<- TEXT
    The leading whitespace will be
    ignored when reading these lines.
TEXT
```

It is important that the terminating delimiter be the only token on its line. The only exception to this rule is allowed if a here-document appears as the last element of a statement. In this case a semicolon can be placed on the same line with its terminating delimiter, as in:

```
help-text <<-EOT
        A sample help text.
EOT;
```

list A *list* is a comma-separated list of values. Lists are enclosed in parentheses. The following example shows a statement whose value is a list of strings:

```
alias (test,null);
```

In any case where a list is appropriate, a single value is allowed without being a member of a list: it is equivalent to a list with a single member. This means that, e.g.

```
alias test;
```

is equivalent to

```
alias (test);
```

A *block statement* introduces a logical group of statements. It consists of a keyword, followed by an optional value, and a sequence of statements enclosed in curly braces, as shown in the example below:

```
server srv1 {
  host 10.0.0.1;
  community "foo";
}
```

The closing curly brace may be followed by a semicolon, although this is not required.

3.4 Preprocessor

Before actual parsing, the configuration file is preprocessed. The built-in preprocessor handles only file inclusion and `#line` statements (see Section 3.2 [Pragmatic Comments], page 5), while the rest of traditional preprocessing facilities, such as macro expansion, is supported via `m4`, which serves as external preprocessor.

The detailed description of `m4` facilities lies far beyond the scope of this document. You will find a complete user manual in Section "GNU M4" in

GNU M4 macro processor. For the rest of this subsection we assume the reader is sufficiently acquainted with `m4` macro processor.

The external preprocessor is invoked with '`-s`' flag, which instructs it to include line synchronization information in its output. This information is then used by the parser to display meaningful diagnostic.

An initial set of macro definitions is supplied by the '`pp-setup`' file, located in '*prefix*`/share/nssync/1.1/include`' directory.

The default '`pp-setup`' file renames all `m4` built-in macro names so they all start with the prefix '`m4_`'. This is similar to GNU m4 '`--prefix-builtin`' option, but has an advantage that it works with non-GNU `m4` implementations as well.

4 Nssync Configuration

4.1 General Settings

These settings modify the behavior of `nssync` as a whole.

`pidfile` *`file`* [Configuration]

At startup, check if *file* already exists and is owned by an existing process. Exit if so. Use this statement to avoid accidentally running two copies of `nssync` simultaneously.

`tempdir` *`dir`* [Configuration]

Sets the name for the temporary directory. This is a directory where `nssync` creates temporary zone files. The argument must point to an existing directory.

`named-conf` *`file`* [Configuration]

Defines the full pathname of the `named` configuration file. Default is '`/etc/named.conf`'.

`bind-include-path` *`list`* [Configuration]

Sets include search path for `include` directives found in BIND configuration. The argument is either a single directory or a list of directories (see Section 3.3 [Statements], page 6).

`zonefile-pattern` *`pat`* [Configuration]

Defines the pattern for zone file names. The name of each zone file is created by expanding variable references in the *pat* argument. The following variable references are defined:

$zone
${zone} Name of the zone, without the trailing dot.

$synctag
${synctag}
Zone synchronization tag (see Section 4.3 [Synchronization Block], page 13).

Both notations (with and without braces) are equivalent. The notation with curly braces should be used if the reference is immediately followed by a letter.

The default zone file pattern is '`$zone.$synctag`'.

`zone-conf` *`pat`* [Configuration]

Defines the pattern for *zone configuration file*, i.e. a file containing `zone` statements.

The handling of *pat* is similar to that in `zonefile-pattern`, except that only the '`$synctag`' reference is defined.

`compare-command` *cmd* [Configuration]

Defines a command to be used for comparing two zone files. The *cmd* must be a command taking two files as its arguments and returning 0 if they are the same or non-zero if they differ. `Nssync` uses this command to determine whether a particular zone has changed. The following *variable references* are expanded in *cmd*:

$oldfile
${oldfile} Old zone file.

$newfile

${newfile} New zone file.

The default `compare-command` value is:

```
cmp $oldfile $newfile > /dev/null
```

`reload-command` *cmd* [Configuration]

Defines a command to reload the nameserver. The default is '`/usr/sbin/rndc reload`'.

4.2 SQL Access

The following statements define the database server and the database to use:

`host` *hostname*[:*port-or-socket*] [Configuration]

Defines the SQL server IP and port. The *hostname* can be either the server IP address or its hostname. The *port-or-socket* part, if supplied, can be either the number of TCP port to use instead of the default 3306 or the full pathname of the UNIX socket. In the latter case *hostname* is effectively ignored.

`database` *name* [Configuration]

Sets the database name.

`ssl-ca` *file* [Configuration]

Defines the name of the Certificate Authority (CA) file.

There are two ways to supply database access credentials. The simplest one is by using `user` and `password` statements:

`user` *name* [Configuration]

Sets SQL user name.

`password` *arg* [Configuration]

Sets SQL user password.

The drawback of this approach is that the password appears in plaintext, which means the permissions of the '`nssync.conf`' file must be tightened so as to avoid its compromise.

The following two statements provide an alternative, more safe and flexible way of setting access credentials:

`sql-config-file` *file* [Configuration]
Read MySQL configuration from the *option file file*. See Section "option-files" in *MySQL Manual*, for a description of MySQL option file format.

`sql-config-group` *name* [Configuration]
Read the named group from the SQL configuration file.

To illustrate their use, suppose your '`nssync.conf`' file contains the following:

```
sql-config-file /etc/nssync.my;
sql-config-group nssync;
```

The the '`/etc/nssync.my`' will contain the actual SQL access configuration, which can look as in the example below:

```
[nssync]
socket = /var/db/mysql.sock
database = dns
user = root
pass = guessme
```

`slave-status-file` *file* [Configuration]
Use this statement if `nssync` reads data from a slave database. It allows you to avoid recreating zone files if the database information has not changed since the previous run.

If this statement is present, `nssync` will save the state of the SQL slave in *file*. Upon startup, it will read these data and compare them with the current state. If they are the same, it will exit immediately.

4.3 Synchronization Block

A *synchronization block* defines a set of zones to be synchronized from the database and configures SQL statements which return the zone data. This set is identified by *synchronization tag*, supplied as the argument to the `sync` statement:

```
# Define a synchronization block.
sync tag {
  # zone configuration file
  zone-conf pat;
  # pattern for new zone file names
  zonefile-pattern pat;
  # add these statements to each generated zone file
  add-statements text;
  # a query for retrieving SOA records
  soa-query string;
  # a query for retrieving NS and similar records
  ns-query string;
  # a query for retrieving the rest of RRs
```

```
    rr-query string;
    # a query for retrieving RRs from reverse delegation zones
    rev-rr-query string;
  }
```

Statements within the `sync` block configure the zones:

`zone-conf` *pat* [Configuration]
: Defines the pattern for the name of zone configuration file for zones in this synchronization block. If not supplied, the global `zone-conf` statement will be used instead (see [zone-conf], page 11).

`zonefile-pattern` *pat* [Configuration]
: Defines the pattern for zone file names. If not supplied, the global `zonefile-pattern` statement will be used instead (see [zonefile-pattern], page 11).

`add-statements` *text* [Configuration]
: Append *text* to each generated zone statement. For example, the following can be used to redefine forwarders and query ACLs for zones in this synchronization block:

```
add-statements <<EOT
  forwarders { /* empty */ };
  allow-query { local-query-only; };
EOT;
```

Notice the use of the *here-document* construct.

The following statements define which zones pertain to this particular synchronization block:

`soa-query` *string* [Configuration]
: A query for retrieving SOA records.

`ns-query` *string* [Configuration]
: A query for retrieving NS and similar records. Use the '`$zone`' reference for the zone name.

`rr-query` *string* [Configuration]
: A query for retrieving the rest of RRs. Use the '`$zone`' reference for the zone name.

`rev-rr-query` *string* [Configuration]
: A query for retrieving RRs from reverse delegation zones. Use the '`$zone`' reference for the zone name.

Here is an example of a working `sync` directive:

```
sync external {
  zone-conf "/var/namedb/nssync/zones.external";
  zonefile-pattern "/var/namedb/external/db.${zone}";
```

```
  soa-query    "select zone, ttl, type, data, resp_person, "
               "serial, refresh, retry, expire, minimum "
               "from dns_soa where type='SOA' "
               "and view='external' order by zone";

  ns-query     "select ttl, type, data "
               "from dns_soa where zone='$zone' "
               "and type<>'SOA' and view='external'";

  rr-query     "select host, ttl, type, mx_priority, "
               "case when type='TXT' then "
               "concat('\"', data, '\"') "
               "else data end "
               "from dns_records "
               "where zone='$zone' and view='external' "
               "order by 1";

  rev-rr-query "select host, ttl, type, mx_priority, "
               "case when type='TXT' then "
               "concat('\"', data, '\"') "
               "else data end "
               "from dns_records "
               "where zone='$zone' and view='external' "
               "order by cast(host as unsigned)";
}
```

5 Invocation

The `nssync` is normally invoked periodically from a crontab, e.g.:

```
*/5 * * * *  /usr/sbin/nssync | \
  /usr/bin/logger -t nssync -p local1.err
```

The following table summarizes available command line options:

‘`-E`’
: Preprocess configuration file and exit.

‘`-c file`’
‘`--config-file=file`’
: Use *file* instead of the default configuration file.

‘`-f`’
‘`--force`’
: Proceed even if slave status has not changed (see [slave-status-file], page 13).

‘`-n`’
‘`--dry-run`’
: Do nothing, print almost everything; implies ‘`--debug --stderr`’. Use additional ‘`--debug`’ options to get even more info.

‘`-t`’
‘`--lint`’
: Parse configuration file and exit. The return status is 0 if the syntax is OK, and 78 if errors were detected (see Chapter 6 [Exit Codes], page 19).

‘`-D symbol=value`’
‘`--define=symbol[=value]`’
: Define a preprocessor symbol.

‘`-I dir`’
‘`--include-directory=dir`’
: Add include directory.

‘`--no-preprocessor`’
: Disable preprocessing.

‘`--preprocessor=command`’
: Use *command* instead of the default preprocessor.

‘`-d`’
‘`--debug`’
: Increase debug level.

‘`-X`’
‘`--debug-lexer`’
: Debug configuration file lexer.

‘`-x`’
‘`--debug-parser`’
: Debug configuration file parser.

'--config-help'
: Show configuration file summary

'-V'

'--version'
: Print program version.

'-h'

'--help'
: Give this help list.

'--usage'
: Give a short usage message.

6 Exit Codes

Apart from issuing a descriptive error message, `nssync` attempts to indicate the reason of its termination by its error code. As usual, a zero exit code indicates normal termination. The table below summarizes all possible error codes. For each error code, it indicates its decimal value and its symbolic name from '`include/sysexits.h`' (if available).

0
EX_OK
: Program terminated correctly.

64
EX_USAGE
: The program was invoked incorrectly, e.g. an invalid option was given, or an erroneous argument was supplied to an option.

69
EX_UNAVAILABLE
: The program exited due to some error not otherwise described in this table.

70

EX_SOFTWARE
: Some internal software error occurred.

78
EX_CONFIG
: An error in the configuration file was detected.

7 How to Report a Bug

Email bug reports to `gray+nssync@gnu.org.ua`. Please include a detailed description of the bug and information about the conditions under which it occurs, so we can reproduce it. To facilitate the task, the following list shows the basic set of information that is needed in order to find the bug:

- Package version you use.
- A detailed description of the bug.
- Conditions under which the bug appears.
- It is often helpful to send the contents of '`config.log`' file along with your bug report. This file is created after running `./configure` in the '`nssync`' source root directory.

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Concept Index

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