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# **Border User Manual**

***Release 1.99.14.20260521081756.d9d7a78607***

**Banu Systems Private Limited**

**May 21, 2026**



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**Warning:** This document is still a work-in-progress. Large parts of it may be inaccurate, and it may mention programs, features and configuration options that do not exist in Border. This warning will be removed when the manual is known to be correct.



## INSTALLATION

### 1.1 Hardware requirements

Border is packaged for a set of supported operating system platforms (see *Supported platforms*). Any machine (real or virtual) with one of these platforms can be used to run Border.

For many installations, servers that have been pensioned off from active duty can perform admirably as Border servers. For serving a small LAN, even low-performance machines may be sufficient. If the server's operational duties are larger, then a suitably performant machine can be selected.

We aren't able to recommend specifications in this document as it would be outdated quickly. It is best to profile the usage patterns and prepare a hardware configuration accordingly.

**Error:** TODO: Add a link to Border support for help with hardware configuration.

**Error:** TODO: Add a link to a tuning section.

### 1.2 Supported platforms

Border is written to run on POSIX operating systems. The following platforms are supported by this release of Border:

- Red Hat Enterprise Linux 9 (x86\_64)
- Red Hat Enterprise Linux 9 (aarch64)
- Red Hat Enterprise Linux 10 (x86\_64)
- Red Hat Enterprise Linux 10 (aarch64)
- Fedora 43 (x86\_64)

- Fedora 43 (aarch64)
- Fedora 44 (x86\_64)
- Fedora 44 (aarch64)
- Debian 12 "bookworm" (amd64)
- Debian 12 "bookworm" (arm64)
- Debian 13 "trixie" (amd64)
- Debian 13 "trixie" (arm64)
- Debian 13 "trixie" (riscv64)
- Ubuntu 22.04 LTS "jammy" (amd64)
- Ubuntu 22.04 LTS "jammy" (arm64)
- Ubuntu 24.04 LTS "noble" (amd64)
- Ubuntu 24.04 LTS "noble" (arm64)
- Ubuntu 24.04 LTS "noble" (riscv64)

Packages for current versions of FreeBSD will be added in the future.

## 1.3 RPM platforms

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**Note:** Users of AlmaLinux, Rocky Linux, and Oracle Linux distributions may use the packages for the corresponding Red Hat Enterprise Linux version.

---

Installation instructions for each supported platform will be available soon. For now, if you know how to install RPMs using **dnf**, please adapt the following instructions for your platform.

To install Border on Red Hat Enterprise Linux 10 (x86\_64), you may run the following commands as the `root` user.

First, install the `akira-release` RPM package that will add the `akira-epel` and `akira-epel-testing` DNF repositories to your system, as well as associated GPG keys used to verify signed RPM packages from these repositories:

```
# dnf install https://download.banu.com/packages/akira/1.99/epel/
→testing/10/x86_64/akira-release-1.99.14.20260521081756.d9d7a78607-
→1.el10.noarch.rpm
```

Then, enable the `akira-epel-testing` DNF repository:

```
# dnf config-manager setopt akira-epel-testing.enabled=1
```



Then, install the `border` RPM package that will install the Border software and documentation:

```
# dnf install border
```

Then, if you wish to run Border, configure **border** suitably by editing `/etc/border/border.conf`, and then run it:

```
# systemctl enable --now border
```

---

**Note:** For information about Border's version numbering, see [Border version numbering scheme](#). For information about Border's branches and EOL dates, see [Border branches](#).

---

## 1.4 Debian and Ubuntu platforms

Debian and Ubuntu packages are currently not published in `apt` repositories. If you would like to use them, please contact us.

## 1.5 Upgrading

Please read the release notes before upgrading to a newer version of Border (see the chapter titled [Release notes](#)).



## PROGRAMS

The following sections document programs that are part of the Border software distribution.

### 2.1 **border** --- Network management application

#### 2.1.1 Synopsis

**border** [-c <config-file>] [-f] [-g] [-t <directory>] [-u <username>]

**border** [-h | -V]

#### 2.1.2 Description

**border** is a network management application with a web-based user interface. It also implements a REST API interface that can be used by non-interactive clients.

To access **border**'s web-based user interface, users require a JavaScript-capable web browser that supports modern web standards.

#### 2.1.3 Options

**-c** <config-file>

Use <config-file> as the **border** configuration file. The default is `/etc/border/border.conf`.

**-f**

Don't daemonize the **border** process. Run it in the foreground.

**-g**

Don't daemonize the **border** process. Run it in the foreground. Force all logging to standard-error.

**-h**

Print program usage information and exit.

**-t** <directory>  
*chroot(2)* to <directory> after processing the command line arguments, but before reading the configuration file.

---

**Note:** This option should be used in conjunction with the **-u** option, as *chrooting* a process running as root doesn't enhance security on most systems; the way *chroot(2)* is defined allows a process with root privileges to escape a *chroot* jail.

---

**-u** <username>  
*setuid(2)* to user <username> after completing privileged operations, such as creating sockets that listen on privileged ports.

On Linux, **border** uses the kernel's capability mechanism to drop all root privileges except the ability to *bind(2)* to a privileged port (*CAP\_NET\_BIND\_SERVICE*) and set process resource limits (*CAP\_SYS\_RESOURCE*).

**-v**  
Print program version and exit.

## 2.1.4 Files

/etc/border/border.conf

The default configuration file. A complete description of **border**'s configuration file is provided in *border.conf(5)* and in the Border User Manual.

/var/run/border/border.pid

The default process ID file.

## 2.1.5 See also

*border.conf(8)*

## 2.1.6 Copyright

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## 2.2 `border-crypt` --- Crypted password generator

### 2.2.1 Synopsis

`border-crypt`

### 2.2.2 Description

**`border-crypt`** is an interactive command-line program that reads a clear-text password from the user and prints a salted hashed passphrase for use in the `user` statement in `border.conf(5)`. The hashed passphrase is generated using the `crypt_ra(3)` function with its default setting.

---

**Note:** **`border-crypt`** needs to be run interactively in a console.

---

### 2.2.3 Options

**`border-crypt`** does not use any command-line arguments.

### 2.2.4 See also

`border.conf(5)`, `crypt_ra(3)`

### 2.2.5 Copyright

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## CONFIGURATION AND DATA

The following sections document configuration files and data files of some programs that are part of the Border software distribution.

### 3.1 `border.conf` --- border program's configuration

#### 3.1.1 Description

`border.conf` is the configuration file for *border* (8) --- a network management application.

#### 3.1.2 Configuration grammar

The configuration file consists of configuration statements and comments. Statements end with a semicolon. Statements and comments are the only elements that can appear without enclosing braces. Many statements contain a block of sub-statements, which are also terminated with a semicolon. Clauses in the statements are also semi-colon terminated. See the [Comments syntax](#) section for a description of comments, and the Border User Manual for some examples.

`border.conf` supports the following statements:

**border** Specifies global configuration options.

---

**Note:** The `border` statement may occur only once in the configuration file.

---

### 3.1.2.1 border statement

```
border {
    enabled <boolean>;
    jwt-secret <string>;
    jwt-expiry <ttlval>;
    listen-on [ port <port:integer> ] { ( <ipv4_address> |
↪<ipv6_address> ) [ port <integer> ]; ... };
    pid-file ( <quoted_string> | none );
    user <username:quoted_string> <hashed-passphrase:quoted_
↪string>; // may occur multiple times
};
```

The `border` statement sets up global options to be used by Border. If there is no `border` statement, a `border` statement with each option set to its default value will be used.

---

**Note:** The `border` statement may occur only once in the configuration file.

---

**enabled** <boolean>

**Warning:** This option is obsolete and will be removed in a future release of Border. Please do not use this option.

**jwt-secret** <string>

This option specifies a Base64-encoded 64-octet key to be used as the JWT secret. If this option is not specified, a random key is generated in memory by *border(8)* and used automatically. But the random key is not persistent, and JWT tokens created using such a random key will not be usable after a restart of the *border(8)* program. For example, after a restart of the *border(8)* program, this would lead to authentication failures and clients would have to re-authenticate.

**jwt-expiry** <ttlval>

This option specifies the time in seconds that a JWT token generated by *border(8)* is valid for. The default value is 1d (1 day).

**listen-on** [ port <port:integer> ] { ( <ipv4\_address> | <ipv6\_address> ) [

This option configures the socket addresses on which *border(8)* listens on. <port> can be specified for all sockets or per-socket as shown in the syntax. The default value is address 127.0.0.1 and port 5009.

**pid-file** ( <quoted\_string> | none );

The pathname of the file the **border** process writes its process ID (PID) to. The default is `/var/run/border/border.pid`. The PID file can be used by programs that want to send signals to the **border** process. Specifying `none` disables



the use of a PID file; no file will be written and any existing file will be removed.

---

**Note:** `none` is a keyword, not a filename, and therefore must not be enclosed in double quotes.

---

**user** <username> <hashed-passphrase>

This option specifies the username and password for a user, using which a user may login into the web interface of *border(8)*. The <username> should be formatted as an email address. <password> should be generated using the *border-crypt(1)* program.

### 3.1.3 Comments syntax

The comment syntax allows for comments to appear anywhere that whitespace may appear in a config file. To appeal to all programmers, they can be written in the C, C++, or shell/Perl style:

- C-style comments start with the two characters `/*` (slash, star) and end with `*/` (star, slash). Because they are completely delimited within these characters, they can be used to comment only a portion of a line or to span multiple lines. For example:

```
/*
 * This is a multi-line
 * comment.
 */
```

C-style comments cannot be nested. For example, the following syntax is not valid because the entire comment ends with the first `*/`:

```
/* This is the start of a comment.
   This is still part of the comment.
/* This is an incorrect attempt at nesting a comment. */
   This is no longer in any comment. */
```

- C++-style comments start with the two characters `//` (slash, slash) and continue to the end of the physical line. They cannot be continued across multiple physical lines; to have one logical comment span multiple lines, each line must use the `//` pair. For example:

```
// This is a comment. It continues to end of line.
// This next line is a new comment, even though it is
// logically part of the previous comment.
```

- Shell-style or Perl-style comments start with the character `#` (number/hash sign) and continue to the end of the physical line. They cannot be continued across multiple physical lines; to have one logical comment span multiple lines, each line must use the `#` character. For example:

```
# This is a comment. It continues to end of line.  
# This next line is a new comment, even though it is  
# logically part of the previous comment.
```

---

**Note:** You cannot use the ";" (semi-colon) character to start a comment such as you would in a zone file. The semicolon indicates the end of a configuration statement.

---

### 3.1.4 Files

`/etc/border/border.conf`

The configuration file for the *border(8)* program.

### 3.1.5 See also

*border(8)*, *border-crypt(1)*

### 3.1.6 Copyright

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## RELEASE NOTES

This documentation corresponds to Border version 1.99.14.20260521081756.d9d7a78607.

### 4.1 Border 1.99.14

The following are release notes for Border 1.99.14:

- RT1923: Upgrade NPM dependency packages
- RT1918: Fix section title syntax error

### 4.2 Border 1.99.13

The following are release notes for Border 1.99.13:

- RT1911: Upgrade NPM dependency packages
- RT1914: Update code that decrypts Border assets

### 4.3 Border 1.99.12

The following are release notes for Border 1.99.12:

- RT1891: Fix first release date from 1.99 branch
- RT1879: Upgrade NPM dependency packages
- RT1875: Add missing cocci files to dist
- RT1870: Fix `configure.ac` warnings
- RT1869: Update main copyrights to 2026

## 4.4 Border 1.99.11

The following are release notes for Border 1.99.11:

- RT1857: Upgrade NPM dependency packages
- RT1837: Upgrade NPM dependency packages
- RT1842: Add libxcrypt to dependencies
- RT1840: Fix release notes text

## 4.5 Border 1.99.10

The following are release notes for Border 1.99.10:

- RT1819: Fix Debian package homepage URLs

## 4.6 Border 1.99.9

The following are release notes for Border 1.99.9:

- RT1813: Upgrade NPM dependency packages
- RT1812: Add Debian and Ubuntu to supported platforms
- RT1801: Fix warning about possible thread name buffer overflow (`pthread_setname_np()`)
- RT1799: Upgrade NPM dependency packages
- RT1791: Upgrade NPM dependency packages
- RT1755: Add Debian packaging
- RT1747: Upgrade NPM dependency packages
- RT1746: Fix user creation in RPM spec file for new RPM versions
- RT1743: Disable parallel make in docs directories when using Sphinx
- RT1740: Update list of supported platforms

## 4.7 Border 1.99.8

The following are release notes for Border 1.99.8:

- RT1674: Reset button in forms clear any previous alerts now.
- RT1679: NPM dependency packages have been upgraded.
- RT1671: libevent and libzip deps are limited to just the border RPM package now.
- RT1681: Installation instructions are now included in the Border User Manual; they were previously missing from the dist.
- RT1682: Form resets are handled more consistently now similar to submit.
- RT1683: Some JavaScript was moved out of the JSX HTML.
- RT1692: NPM dependency packages have been upgraded.
- RT1706: NPM dependency packages have been upgraded.

## 4.8 Border 1.99.7

This is the first release of Border. Border has been a part of a source code tree with other dependency components such as Loop and Lease for some time now. It was not packaged for release previously.

The following are release notes for Border 1.99.7:

- RT1428: Border is now packaged.
- RT1642: A header was added to Border web licenses.
- RT1664: Border now supports the `listen-on` statement in `border.conf(5)`.
- RT1665: The **border** process now runs as a daemon.
- RT1667: The **border** process now drops privileges when run as `root` user using capabilities under Linux. It also supports being run in a chroot directory.
- RT1666: The **border** process now creates PID files in its runstate directory.
- RT1668: The **border** process is now run as the `border` user when started from the systemd `border.service`.
- RT1673: Copyright year was updated in various web source files.

To install Border, please see the chapter titled [Installation](#).

## 4.9 Border version numbering scheme

Border version numbers have the grammar `<MAJOR>.<MINOR>.<PATCH>.<COMMIT-TIMESTAMP>.<COMMIT-HASH>`. The *MAJOR* and *MINOR* version numbers together represent a source code branch of Border (see [Border branches](#)).

- The *MAJOR* version number is incremented when configuration options, API, and behavior of features change compared to the existing version. Switching to a new *MAJOR* version may require modifying existing config files to make them compatible with the new version.
- The *MINOR* version number is incremented when new configuration options, API, and features are introduced that are compatible with existing configuration options. Switching to a new *MINOR* version will not require modifying existing config files to make them compatible with the new version.
- The *PATCH* version number is incremented when only bugs have been fixed in a new version. Switching to a new *PATCH* version will not require modifying existing config files to make them compatible with the new version.
- The *COMMIT-TIMESTAMP* field is auto-generated and contains the UTC timestamp of the source code commit from which the Border release was made. The timestamp value is formatted as `YYYYMMDDHHMMSS`, as the output of:

```
date +%Y%m%d%H%M%S
```

- The *COMMIT-HASH* field is auto-generated and contains the abbreviated commit hash of the source code commit from which the Border release was made. The hash value is formatted as the output of:

```
git log -n1 --reverse --pretty=%h
```

For example,

- If you're upgrading from version 1.2.1 to version 1.4.0, Border's config files should not require any changes. You may also check for new features that have become available in the 1.4 branch.
- If you're upgrading from version 1.2.1 to version 2.0.0, it is possible that some of the contents of your existing config files may need changes. You may also check for new features that have become available in the 2.0 branch.
- If you're upgrading from version 1.2.1 to version 1.2.4, Border's config files should not require any changes. The newer version only contains bugfixes.

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**Note:** During a major version's release series, features and/or programs scheduled for removal in the next major release may be marked as deprecated. They will however still be supported until the end-of-life of that major release.

---

### 4.9.1 Stable and development versions

Even-numbered *minor* versions indicate stable branch releases, whereas odd-numbered *minor* versions indicate development branch releases. For example,

- 1.2.0 is a stable branch release,
- 1.3.0 is a development branch release,
- 1.99.0 is a development branch release,
- 2.0.3 is a stable branch release, and
- 2.1.1 is a development branch release.

**Warning:** Development branch releases should not be used in production as their features and interfaces may change. Development branch releases may not work properly, may have unexpected behaviors, may crash, etc.

## 4.10 Border branches

The following is information on current Border branches.

Branch	Type	First release date	End-of-life date
1.99	Development	2024-12-10	To be announced
2.0	Stable	To be announced	To be announced

Development branches have no planned end-of-life. Typically, development on such branches is stopped when a new *MINOR*+1 or *MAJOR*+1 stable branch is created off it.





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## **DATA AND PRIVACY**

Border implements---as part of its software features---support for logging various types of activity for the administrator to use.

- Logging may be performed on behalf of the administrator on the machine where the Border software is installed.
- Log messages may contain personal data about a user such as, but not limited to, IP addresses, MAC addresses, hostnames, DNS names, TSIG key names, timestamps, etc.

We note that:

- Border does not share user data or logs with Banu Systems Private Limited, unless the administrator explicitly configures it to do so.
- Border does not share user data or logs with other companies, organizations, or persons, unless the administrator explicitly configures it to do so.



## Symbols

-V  
     command line option, 8  
 -c <config-file>  
     command line option, 7  
 -f  
     command line option, 7  
 -g  
     command line option, 7  
 -h  
     command line option, 7  
 -t <directory>  
     command line option, 7  
 -u <username>  
     command line option, 8

## C

command line option  
     -V, 8  
     -c <config-file>, 7  
     -f, 7  
     -g, 7  
     -h, 7  
     -t <directory>, 7  
     -u <username>, 8  
 enabled <boolean>, 12  
 jwt-expiry <ttlval>, 12  
 jwt-secret <string>, 12  
 listen-on [ port  
     <port:integer> ] {  
     ( <ipv4\_address> |  
     <ipv6\_address> ) [ port  
     <integer> ]; ... }; 12  
 pid-file ( <quoted\_string>  
     | none );, 12  
 user <username>  
     <hashed-passphrase>, 13

## E

enabled <boolean>  
     command line option, 12

## J

jwt-expiry <ttlval>  
     command line option, 12  
 jwt-secret <string>  
     command line option, 12

## L

listen-on [ port  
     <port:integer> ] {  
     ( <ipv4\_address> |  
     <ipv6\_address> ) [ port  
     <integer> ]; ... };  
     command line option, 12

## P

pid-file ( <quoted\_string> |  
     none );  
     command line option, 12

## U

user <username>  
     <hashed-passphrase>  
     command line option, 13