minIni

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minIni is a programmer's library to read and write "ini" files in embedded systems. minIni takes little resources, has a deterministic memory footprint, and can be configured for various kinds of file I/O libraries.

The principal purpose for minIni is to be used on embedded systems that run on an RTOS (or even without any operating system). minIni requires that such a system provides a kind of storage and file I/O system, but it does not require that this file I/O system is compatible with the standard C/C^{++} library —indeed, the standard library is often too big and resource-hungry for embedded systems.

Contents

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The MINIni library was derived in part from the article "Multiplatform .INI Files" by Joseph J. Graf in the March 1994 issue of Dr. Dobb's Journal.

Introduction

minIni is a library to read and write simple configuration files with a format compatible with "ini" files. The minIni library features a small code size footprint and it requires little resources (e.g. RAM). It is therefore suitable for use in (small) embedded systems.

Ini files are best known from Microsoft Windows, where functions like `GetProfileString` and `WriteProfileString` read from and write to ini files. The functions in minIni are modelled after the functions of the Windows SDK, but they are not fully compatible with them.

Although the main feature of minIni is that it is small and minimal, it has a few other features:

- minIni supports reading keys that are outside a section, and it thereby supports configuration files that do not use sections (but that are otherwise compatible with ini files).
- You may use a colon to separate key and value; the colon is equivalent to the equal sign. That is, the strings "`Name: Value`" and "`Name=Value`" have the same meaning.
- The hash character ("`#`") is an alternative for the semicolon to start a comment. Trailing comments (i.e. behind a key/value pair on a line) are allowed.
- Leading and trailing white space around key names and values is ignored.
- When writing a value that contains a comment character ("`;`" or "`#`"), that value will automatically be put between double quotes; when reading the value, these quotes are removed. When a double-quote itself appears in the setting, these characters are escaped.
- Section and key enumeration are supported.
- You can optionally set the line termination (for text files) that minIni will use. (This is a compile-time setting, not a run-time setting.)
- Since writing speed is *much* lower than reading speed in Flash memory (SD/MMC cards, USB memory sticks), minIni minimizes "file writes" at the expense of double "file reads".
- The memory footprint is deterministic. There is no dynamic memory allocation. The library is designed to be used in multi-tasking environments, but see section Multi-tasking on page 7 for the limitations.

Limitations

minIni's design is aimed at being full-featured while using a small and *deterministic* memory footprint. It is not optimized for speed. On performance-sensitive code, I advice to read any values or settings that are needed *ahead* of the time and to store these in variables.

Specifically, minIni does *not* cache any key/value pairs that it reads from the ini file. It also does *not* keep the ini file open between calls; minIni closes the file after every read or write operation. When writing to an ini file, minIni creates a temporary file into which it copies (with modifications) the original file. On success, it deletes the original file and renames the temporary file back.

As of version 1.2, the library has a function to browse through all settings in an ini file in one go. When you design your program to retrieve all settings on start-up, function `ini_browse` is the quickest way to retrieve the settings.

INI file syntax

Ini files have a simple syntax with name/value pairs in a plain text file. The name must be unique (per section) and the value must fit on a single line. An ini file is commonly separated into sections —in minIni, this is optional. A section is a name between square brackets, like "`[Network]`" in the following example.

Listing: **Example INI file**

```
[Network]
hostname = My Computer
address = dhcp
dns = 192.168.1.1
```

In the API and in this documentation, the "name" for a setting is denoted as the *key* for the setting. The key and the value are separated by an equal sign ("`=`"). minIni supports the colon ("`:`") as an alternative to the equal sign for the key/value delimiter.

Section and key name comparisons are case insensitive in minIni (as is the case in the Microsoft Windows API). In the ini file, you may type "`DNS = 192.168.1.1`" equally well (and meaning the same thing) as "`dns = 192.168.1.1`".

Leading a trailing spaces around values or key names are removed. If you need to include leading and/or trailing spaces in a value, put the value between double quotes. The `ini_gets` function strips off the double quotes from the returned value. Function `ini_puts` adds double quotes if the value to write contains trailing white space (or special characters).

minIni ignores spaces around the "`=`" or "`:`" delimiters, but it does not ignore spaces between the brackets in a section name. In other words, it is best not to put spaces behind the opening bracket "`[`" or before the closing bracket "`]`" of a section name.

Comments in the ini must start with a semicolon ("`;`") or a hash character ("`#`"), and run to the end of the line. A comment can be a line of its own, or it may follow a key/value pair.

Using minIni

The first step in using minIni is making sure that it compiles. The library consists of only one C file and two header files, so the amount of configuration to do is minimal. If you cannot use the standard C/C++ library, there is, however, a configuration file (or "glue" file) that you must make or customize; this file is explained in the next section. The minIni distribution comes with a default configuration file that maps to the standard C library (specifically the file I/O functions from the "`stdio`" package) and example glue files for two embedded file system libraries for embedded systems —see appendix A of this manual.

Once you have a good glue file, you can add the source file of minIni to your project and include the header file "`minIni.h`" in your source code files. In your source code, you can then use the functions in the minIni library to read text and values from ini files and to write text and values to an ini file. See the function reference for details.

minIni uses string functions from the standard C/C++ library, including one function that is not in the ANSI C standard: `strnicmp`. On the Unix and Linux platforms, this function is usually called `strncasecmp`. If you are using a GNU GCC compiler, but you are not compiling for a Linux or "BSD" platform, you may need to define `strnicmp` as `strncasecmp` in the glue file (see below). If your compiler provides neither `strnicmp` nor `strncasecmp`, you can use a portable implementation in minIni by defining the macro `PORTABLE_STRNICMP` in the glue file (or on the compiler command line).

A notable limitation of minIni is that there is a (fixed) maximum length of a line that can be read from an ini file. This maximum length is configurable (at compile-time, not at run-time) and it may be short on embedded systems —see page 4.

When running in an Unicode environment or when moving the ini file across platforms, there may be other considerations concerning the use of minIni —see the relevant sections in this chapter, specifically page 5.

The "glue" file

The minIni library must be configured for a platform with the help of a so-called "glue file". This glue file contains macros (and possibly functions) that map file reading and writing functions used by the minIni library to those provided by the operating system. The glue file must be called "`minGlue.h`". See appendix A on page 16 for examples of glue files for various file systems.

One general configuration is whether internal error checking via "assertions" is active. The minIni library uses the `assert` macro to help catch errors in the minIni library and/or catch errors in how the application interfaces with the minIni library. To build a release version, one typically recompiles all source code with the `NDEBUG` macro set.

In the case that your (embedded) platform lacks an `assert.h` file, you may want to define `NDEBUG` in the `minGlue.h` file.

• I/O functions

The minIni source code requires functions from a file I/O library to perform the actual reading and writing. This can be any library; minIni does not rely on the availability of a standard C library, because embedded operating systems may have limited support for file I/O. Even on full operating systems, separating the file I/O from the ini format parsing carries advantages, because it allows you to cache the ini file and thereby enhance performance.

The functions that you need to implement, or map to standard file I/O functions are:

Listing: **Functions to map in the "glue file"**

```
int ini_openread(const char *filename, INI_FILETYPE *file)
int ini_openwrite(const char *filename, INI_FILETYPE *file)
int ini_close(INI_FILETYPE *file)
int ini_read(char *buffer, size_t size, INI_FILETYPE *file)
int ini_write(char *buffer, INI_FILETYPE *file)
int ini_rename(const char *source, const char *dest)
int ini_remove(const char *filename)
int ini_tell(INI_FILETYPE *file, INI_FILEPOS *pos)
int ini_seek(INI_FILETYPE *file, INI_FILEPOS *pos)
```

All functions should return zero on failure and a non-zero value on success. For examples of "implementations" for the above functions, see appendix A on page 16.

The `INI_FILETYPE` type used in the above "glue" functions, must also be defined in the glue file. If you are using the standard C/C++ file I/O library, this is the "`FILE*`" type of the standard C/C++ file I/O library. On embedded systems with a different I/O library, chances are that you need a different handle or "structure" to identify the storage. For example:

```
#define INI_FILETYPE    HANDLE
```

The minIni functions will declare variables of the `INI_FILETYPE` type and pass these variables to sub-functions (including the glue interface functions) by reference.

For read-only support of INI files (see also page 4), only the macros/functions `ini_openread`, `ini_close` and `ini_read` are needed. The other functions are only needed for writing support.

The type that holds the "file position" (for functions `ini_tell` and `ini_seek`) must be declared as well. For applications that use the standard C/C++ file I/O library functions `fgetpos` and `fsetpos`, this is the `fpos_t` type.

```
#define INI_FILEPOS     fpos_t
```

On Microsoft Windows and DOS, files can be opened in either "text mode" or in "binary mode", and this relates mostly on the line termination translation. Despite INI files being text files, it is advised to open the ini file in binary mode.

See see appendix A on page 16 for examples of glue files for various file systems.

• Buffer size (maximum line length)

Another item that needs to be configured is the buffer size. The functions in the minIni library allocate this buffer on the stack, so the buffer size is directly related to the stack usage. In addition, the buffer size determines the maximum line length that is supported in the ini file and the maximum path name length for the temporary file (for writing support). For example, to limit the line length of the ini files to 512 characters, `minGlue.h` would contain the definition:

```
#define INI_BUFFERSIZE      512
```

• Read-only support

In its default configuration, minIni supports both reading and writing ini files. If your application does not require write support, you can add a setting to the `minGlue.h` file to strip out the unneeded code.

```
#define INI_READONLY
```

When writing a setting to an INI file, MINIINI writes it to a temporary file, copies the other sections and keys from the original INI file, and then replaces the original file with the temporary file. This approach uses the least amount of memory. The path name of the temporary file is the same as the input file, but with the last character set to a tilde ("~").

Furthermore, when writing to the temporary file, MINIINI on repeatedly looks ahead in the INI and jumps back to a position that it marked earlier. The goal of this design is to minimize the number of individual "write actions" to the file, because on Flash memory (and EEPROM memory), writing is an order of magnitude slower than reading.

• Rational number support

MINIINI optionally supports reading and writing single-precision floating point values —see functions `ini_getf` and `ini_putf`. Embedded processors may lack floating point hardware and software emulation of floating-point operations may be too costly in resources (memory). For these platforms, alternatives are to switch to a fixed-point representation or, when rational numbers are not relevant for the project, to disable the rational number support in MINIINI altogether.

To enable rational number support, a macro for the type and macros or interface functions for number-to-text conversions must be added to `minGlue.h`. For the standard C/C++ library, you can add the following definitions to the glue file:

```
#define INI_REAL                float
#define ini_ftoa(string,value)  sprintf((string),"%f",(value))
#define ini_atof(string)        (INI_REAL)strtod((string),NULL)
```

For a different representation of rational numbers, only the definitions in `minGlue.h` have to change. The following example is based on the "`fixedptc`" library by Ivan Voras.

```
#define INI_REAL                fixedpt
#define ini_ftoa(string,value)  fixedpt_str((value),(string))
#define ini_atof(string)        fixedpt_val((string))
```

To disable rational number support, remove the declaration macro for the `INI_REAL` type from the `minGlue.h` file.

• Unicode (enable/disable)

MINIINI can be compiled with Unicode support, but it delegates storing the actual characters to the "glue" routines. Although you can use standard Unicode file reading and writing routines to create and query INI files in Unicode text format, it is advised to keep the INI file format as ASCII, for best compatibility with other implementations. To store Unicode characters in the ASCII file, convert the Unicode data to (and from) UTF-8 (the MINIINI library does not provide functions for this conversion).

It is advised to keep the section and key names as ASCII or ANSI Latin-1; only the "values" of each key should be encoded as UTF-8.

Currently, all distributions of Linux lack a header file called `tchar.h` which adds a portability layer for source code that can be compiled as ASCII or as Unicode. MINIINI relies on `tchar.h` when compiling for Unicode. Therefore, when compiling a Unicode application under Linux, you have two options: create a minimal version of `tchar.h` yourself, or compile MINIINI for the 8-bit ANSI character set, while the remainder of the application is Unicode. To force-compile MINIINI for ANSI, add the definition `INI_ANSIONLY` in the glue file ("`minGlue.h`"). For example:

```
#define INI_ANSIONLY      /* ignore UNICODE or _UNICODE macros, compile as ASCII/ANSI */
```

• Line termination

On Microsoft and DOS, lines of text files are usually terminated by a CR-LF character pair ("`\r\n`" in C/C++ terminology). On Linux and Unix, the line terminator is only the LF character and on the Macintosh, it is only the CR character.

The line termination convention is not important when reading from INI files, because MINIINI strips off all trailing white space (and control characters such as carriage-return and line-feed are considered white space). The line termination convention is also not important when the INI file is only accessed by MINIINI. Finally, if you use the standard C/C++ library as the back-end for reading and writing files, this standard C/C++ library may already handle the platform-dependent line termination for you.

However, if you wish to read and adjust the INI files with other applications, across platforms —e.g. edit the INI file with a simple text editor as Notepad on Microsoft Windows and then store it on an embedded device with a Linux-based operating system, then it may be advantageous to tell MINIINI the line termination characters to use. To do so, define the macro `INI_LINETERM` in the file "`minGlue.h`" and set it to the character or characters to use. For example:

```
#define INI_LINETERM    "\r\n"
```

• Summary of configuration macros

`INI_ANSIONLY` If this macro is defined, INI files are forced to be written with 8-bit characters (ASCII or ANSI character sets), regardless of whether the remainder of the application is written as Unicode. See page 5.

`INI_BUFFERSIZE` The maximum line length that is supported, as well as the maximum path length for temporary file (if write access is enabled). The default value is 512. See page 4.

`INI_FILEPOS` The type for a position in a file. This is a *required setting* if writing support is enabled.

`INI_FILETYPE` The type for a variable that represents a file. This is a *required setting*. See page 4.

`INI_LINETERM` This macro should be set to the line termination character (or characters). If left undefined, the default is a line-feed character. Note that the standard file I/O library may translate a line-feed character to a carriage-return/line-feed pair (this depends on the file I/O library). See page 6

`INI_NOBROWSE` Excludes the function `ini_browse` from the MINIINI library.

`INI_READONLY` If this macro is defined, write access is disabled (and the code for writing INI files is stripped from the MINIINI library. See page 4

`INI_REAL` The type for a variable that represents a rational number. If left undefined, rational number support is disabled. See page 5.

`NDEBUG` If defined, the `assert` macro in the MINIINI source code is disabled. Typically developers build with assertions enabled during development and disable them for a release version. If your platform lacks an `assert` macro, you may want to define the `NDEBUG` macro in `minGlue.h`.

`PORTABLE_STRNICMP`

When this macro is defined, minIni uses an internal, portable `strnicmp` function. This is required for platforms that lack this function —note that minIni already handles the common case where this function goes under the name `strncasecmp`. See page 3.

Multi-tasking

The minIni library does not have any global variables and it does not use any dynamically allocated memory. Yet, the library should not be considered "thread-safe" or re-entrant, because it implicitly uses a particular shared resource: the file system.

Multiple tasks reading from an ini file do not pose a problem. However, when one task is writing to an ini file, no other tasks should access this ini file —neither for reading, nor for writing. It might be easier, in the implementation, to serialize *all* accesses of the ini file.

The first advise in protecting resources from concurrent access in a multi-tasking environment is to avoid sharing resources between tasks. If only a single task uses a resource, no semaphore protection is necessary and no priority inversion or deadlock problems can occur. This advise also applies to the minIni library. If possible, make a single task the "owner" of the ini file and create a client/server architecture for other tasks to query and adjust settings.

If the ini file must be shared between tasks (and at least one of the tasks writes to the ini file), you need to write wrappers around the functions of the minIni library that block on a mutex or binary semaphore.

Key and section enumeration

minIni can list all sections in an ini file and all keys in a section, in two alternative ways.* To list all sections, call function `ini_getsection` with an incremental "index" number until it fails. Similarly, to list all keys in a section, call `ini_getkey` with an incremental "index" number (plus the name of the section) until it fails.

Listing: **Browsing through all keys and all sections in "config.ini"**

```
int s, k;
char section[40], key[40];
for (s = 0; ini_getsection(s, section, sizeof section, "config.ini") > 0; s++) {
    printf("[%s]\n", section);
    for (k = 0; ini_getkey(section, k, key, sizeof key, "config.ini") > 0; k++)
        printf("\t%s\n", key);
} /* for */
```

Alternatively, call `ini_browse` passing a callback function. The callback will be invoked for every key/value pair that is read from the ini file.

Listing: **Implementation of a callback function**

```
int my_callback(const char *section, const char *key, const char *value, const void *userdata)
{
    printf("[%s]\t%s=%s\n", section, key, value);
    return 1;
}
```

* ... but both are different than how the function *GetProfileString* from the Microsoft Windows API does it.

Listing: **Browse through an INI file called "config.ini"**

```
char buffer[256];
ini_browse(my_callback, buffer, sizeof(buffer), NULL, "config.ini");
```

Note that the `ini_browse` function is excluded from the MINIINI library if the compiler macro `INI_NOBROWSE` is defined, see page 6.

Function reference

In addition to the functions in plain C, minIni comes with a C++ class. When creating a variable of the `minIni` class, you pass in the name of the INI file once, so that this name does not need to be passed to every other function. The class exists for the standard C++ string library and for wxWidgets, using the `wxString` type. The function reference only lists the methods with the `std::string` type, but these are replaced by versions that use `wxString` when compiling for wxWidgets.

minIni::minIni — class constructor

The `minIni` constructor creates an instance of the `minIni` class.

Syntax: `minIni(const std::string& filename)`

`filename` The full file and path name of the INI file to use for all reads and writes, through this instance.

Example: Creating a class instance to read a setting (C++ only):

```
minIni ini("config.ini");
std::string username = ini.gets("Users", "admin");
```

ini_browse — Browse through all settings

`ini_browse` reads through an INI file and invokes a callback for every key/value pair that it reads.

Syntax:
```
int ini_browse(INI_CALLBACK Callback, const void *UserData,
               const TCHAR *Filename)
```

`Callback` A pointer to a callback function. See the notes for its definition.

`UserData` This value is passed to the callback function. The `ini_browse` function does not use this value itself.

`Filename` The full path name of the INI file.

Returns: 1/`true` on success, 0/`false` on failure.

Notes: The `Callback` function must have the following signature:

```
int Callback(const TCHAR *Section, const TCHAR *Key, const TCHAR *Value, const void *UserData)
```

The function is passed the names of the active section and key. The `UserData` parameter is the same as what is passed to `ini_browse`.

Function `ini_browse` uses a local buffer to store the lines that it reads from the INI file, plus to store the current "section" of the INI file. The size of this buffer is `INI_BUFFERSIZE`, see page 4. This constant should therefore be configured to be big enough to hold the longest line in the INI file, plus the longest section name.

The `ini_browse` function can be disabled (i.e. removed from the library) with the compiler macro `INI_NOBROWSE`, see page 6.

Example: See page 7 for an example of `ini_browse`.

minIni::del — Delete a section or a key

Delete a key or an entire section.

Syntax:
```
bool del(const std::string& Section, const std::string& Key)
bool del(const std::string& Section)
```

`Section` The name of the section.

`Key` The name of the key.

Returns: `true` on success, `false` on failure.

Notes: This method is the equivalent of `ini_puts` with the parameter `Key` and/or `Value` parameters to NULL.

This function is unavailable if MINIINI is configured as a read-only library (page 4).

See also: `ini_puts`

ini_getbool / minIni::getbool — Read a "truth" flag

`ini_getbool` returns the zero for false or one for true, depending on the value that is found in the given section and at the given key.

Syntax:
```
int ini_getbool(const char *Section, const char *Key, int DefValue,
                const char *Filename)
bool getbool(const std::string& Section, const std::string& Key,
             bool DefValue=false)
```

`Section` The name of the section. If this parameter is *NULL* or an empty string, the `Key` is searched outside any section.

`Key` The name of the key. This parameter may not be *NULL*.

`DefValue` The default value, which will be returned if the key is not present in the INI file. Even though it is declared as an "`int`" in the C interface, it should be either 0 (zero) or 1 (one).

`Filename` The full path name of the INI file. The C++ class uses the filename specified in the class constructor.

Returns: The true/false flag as interpreted from the value read at the given key, or `DefValue` if the key is not present in the given section (or if it cannot be interpreted to either a "true" or a "false" flag).

Specifically, the return value depends on the first letter of the value read at the key. If that first character is:
◇ "Y", "T" or "1", the function returns `true` (or 1);
◇ "N", "F" or "0", the function returns `false` (or 0);
◇ anything else, the function returns parameter `DefValue`.

Notes: To set a boolean value in the C++ interface, use `minIni::put`; For the C interface, use either `ini_putl`. Alternatively, you can store texts like "Yes" and "No" at the key using `minIni::put` and `ini_puts`.

See also: `ini_getl`

ini_getf / minIni::getf — Read a rational number

`ini_getf` returns the numeric value that is found in the given section and at the given key. The value may have a fractional part (i.e. rational numbers).

Syntax:
```
INI_REAL ini_getf(const char *Section, const char *Key,
                  INI_REAL DefValue, const char *Filename)

INI_REAL getf(const std::string& Section, const std::string& Key,
              INI_REAL DefValue=0)
```

`Section` The name of the section. If this parameter is *NULL* or an empty string, the `Key` is searched outside any section.

`Key` The name of the key. This parameter may not be *NULL*.

`DefValue` The default value, which will be returned if the key is not present in the INI file.

`Filename` The full path name of the INI file. The C++ class uses the filename specified in the class constructor.

Returns: The value read at the given key, or `DefValue` if the key is not present in the given section.

Notes: Rational number support must have been *enabled* for this function to be present —see page 5. The type for the rational numbers, `INI_REAL`, depends on the configuration of MINIINI.

See also: `ini_getl`, `ini_putf`

ini_getkey / minIni::getkey — Enumerate keys

Read the name of an indexed key inside a given section.

Syntax:
```
int ini_getkey(const char *Section, int Index, char *Buffer,
               int BufferSize, const char *Filename)

std::string getkey(const std::string& Section, int Index)
```

`Section` The name of the section. If this parameter is *NULL* or an empty string, the keys outside any section are enumerated.

`Index` The zero-based index of the key to return.

`Buffer` The buffer into which this function will store the key name.

`BufferSize` The size of the buffer pointed at by parameter `Buffer`. This is the maximum number of characters that will be read and stored.

`Filename` The full path name of the INI file. The C++ class uses the filename specified in the class constructor.

Returns: The C function returns the number of characters read into parameter `Buffer`, or zero if no (more) keys are present in the specified section. The C++ method returns the name of the key in a string.

Example: Enumerating keys in section “Devices”:

```
int k;
char name[20];
for (k = 0; ini_getkey("Devices", k, name, 20, "config.ini") > 0; k++)
    printf("%s\n", name);
```

See also: ini_getsection

ini_getl / minIni::getl — Read a numeric value

`ini_getl` returns the integer value (a "whole number") that is found in the given section and at the given key.

Syntax:

```
long ini_getl(const char *Section, const char *Key, long DefValue,
              const char *Filename)

long getl(const std::string& Section, const std::string& Key,
          long DefValue=0)

int geti(const std::string& Section, const std::string& Key,
         int DefValue=0)
```

`Section` The name of the section. If this parameter is *NULL* or an empty string, the `Key` is searched outside any section.

`Key` The name of the key. This parameter may not be *NULL*.

`DefValue` The default value, which will be returned if the key is not present in the INI file.

`Filename` The full path name of the INI file. The C++ class uses the filename specified in the class constructor.

Returns: The value read at the given key, or `DefValue` if the key is not present in the given section.

If the key is present, but it does not represent an integer (a "whole number", this function may return zero or an incorrect value.

Notes: The number must be in decimal or in hexadecimal format. For hexadecimal values, the value must be preceded with "`0x`"; for example, `0x1234` stands for the decimal value 4660.

See also: ini_getf, ini_gets, ini_putl

ini_gets / minIni::gets — Read a string

`ini_gets` reads the textual value that is found in the given section and at the given key.

Syntax:

```
int ini_gets(const char *Section, const char *Key,
             const char *DefValue, char *Buffer, int BufferSize,
             const char *Filename)

std::string gets(const std::string& Section,
                 const std::string& Key,
                 const std::string& DefValue="")
```

`Section` The name of the section. If this parameter is *NULL* or an empty string, the `Key` is searched outside any section.

`Key` The name of the key. This parameter may not be *NULL*.

`DefValue` The default value, which will be returned (in parameter `Buffer`) if the key is not present in the INI file.

`Buffer` The buffer into which this function will store the data read.

`BufferSize` The size of the buffer pointed at by parameter `Buffer`. This is the maximum number of characters that will be read and stored.

`Filename` The full path name of the INI file. The C++ class uses the filename specified in the class constructor.

Returns: The C function returns the number of characters read into parameter `Buffer`. The C++ method returns the string read at the given key, or `DefValue` if the key is not present in the given section.

See also: `ini_getl`, `ini_puts`

---

ini_getsection / minIni::getsection — Enumerate sections

`ini_getsection` reads the name of an indexed section.

Syntax:
```
int ini_getsection(int Index, char *Buffer, int BufferSize,
                   const char *Filename)

std::string getsection(int Index)
```

`Index` The zero-based index of the section to return.

`Buffer` The buffer into which this function will store the section name.

`BufferSize` The size of the buffer pointed at by parameter `Buffer`. This is the maximum number of characters that will be read and stored.

`Filename` The full path name of the INI file. The C++ class uses the filename specified in the class constructor.

Returns: The C function returns the number of characters read into parameter `Buffer`, or zero if no (more) sections are present in the INI file. The C++ method returns the name of the section in a string.

Example: Enumerating all sections in file "config.ini":

```
int s;
char name[20];
for (s = 0; ini_getsection(s, name, 20, "config.ini") > 0; s++)
    printf("%s\n", name);
```

See also: `ini_getkey`

---

ini_putf / minIni::put — Store a rational number

`ini_putf` stores the numeric value that in the given section and at the given key. The numeric value is written as a rational number, with a "whole part" and a fractional part.

Syntax:
```
int ini_putf(const char *Section, const char *Key, INI_REAL Value,
             const char *Filename)
```

```
bool put(const std::string& Section, const std::string& Key,
         INI_REAL Value)
```

`Section` The name of the section. If this parameter is *NULL* or an empty string, the `Key` is stored outside any section (i.e. above the first section, if the INI file has any sections).

`Key` The name of the key. This parameter may not be *NULL*.

`Value` The value to write at the key and the section.

`Filename` The full path name of the INI file. The C++ class uses the filename specified in the class constructor.

Returns: 1/`true` on success, 0/`false` on failure.

Notes: This function is unavailable if MINIINI is configured as a read-only library (page 4). It is also unavailable if rational number support has *not* been enabled (page 5).

The type for the rational numbers, `INI_REAL`, depends on the configuration of MINIINI.

See also: `ini_getf`, `ini_putl`

---

ini_putl / minIni::put — Store a numeric value

`ini_putl` stores the numeric value that in the given section and at the given key.

Syntax:
```
int ini_putl(const char *Section, const char *Key, long Value,
             const char *Filename)
```

```
bool put(const std::string& Section, const std::string& Key,
         long Value)
```

`Section` The name of the section. If this parameter is *NULL* or an empty string, the `Key` is stored outside any section (i.e. above the first section, if the INI file has any sections).

`Key` The name of the key. This parameter may not be *NULL*.

`Value` The value to write at the key and the section.

`Filename` The full path name of the INI file. The C++ class uses the filename specified in the class constructor.

Returns: 1/`true` on success, 0/`false` on failure.

Notes: This function is unavailable if MINIINI is configured as a read-only library (page 4).

See also: `ini_getl`, `ini_puts`

---

ini_puts / minIni::put — Store a string

`ini_puts` stores the text parameter that in the given section and at the given key.

Syntax:
```
int ini_puts(const char *Section, const char *Key,
             const char *Value, const char *Filename)
```

```
bool put(const std::string& Section, const std::string& Key,
         const std::string& Value)
```

```
bool put(const std::string& Section, const std::string& Key,
         const char* Value)
```

`Section` The name of the section. If this parameter is *NULL* or an empty string, the `Key` is stored outside any section (i.e. above the first section, if the INI file has any sections).

`Key` The name of the key. If this parameter is *NULL*, the function erases all keys (and their associated values) from the section.

`Value` The text to write at the key and the section. This string should not contain any line breaking characters, such as carriage-return or line-feed characters. If this parameter is *NULL*, the function erases the key/value pair.

`Filename` The full path name of the INI file. The C++ class uses the filename specified in the class constructor.

Returns: 1/`true` on success, 0/`false` on failure.

Notes: This function can also be used to delete entries or sections, by setting the `Key` or `Value` parameters to NULL.

This function is unavailable if MINIINI is configured as a read-only library (page 4).

See also: `ini_gets`, `ini_putl`

APPENDIX A

Example glue files

• stdio (standard C/C++ library)

On Microsoft Windows or DOS, it is advised to open the INI file in binary mode, despite INI files being *text* files. If text mode is unavailable on yor platform, change `"rb"` and `"wb"` to `"r"` and `"w"` respectively.

```
/* map required file I/O types and functions to the standard C library */
#include <stdio.h>

#define INI_FILETYPE                  FILE*
#define ini_openread(filename,file)   ((*(file) = fopen((filename),"rb")) != NULL)
#define ini_openwrite(filename,file)  ((*(file) = fopen((filename),"wb")) != NULL)
#define ini_close(file)               (fclose(*(file)) == 0)
#define ini_read(buffer,size,file)    (fgets((buffer),(size),*(file)) != NULL)
#define ini_write(buffer,file)        (fputs((buffer),*(file)) >= 0)
#define ini_rename(source,dest)       (rename((source), (dest)) == 0)
#define ini_remove(filename)          (remove(filename) == 0)

#define INI_FILEPOS                   fpos_t
#define ini_tell(file,pos)            (fgetpos(*(file), (pos)) == 0)
#define ini_seek(file,pos)            (fsetpos(*(file), (pos)) == 0)

/* for floating-point support, define additional types and functions */
#define INI_REAL                      float
#define ini_ftoa(string,value)        sprintf((string),"%f",(value))
#define ini_atof(string)              (INI_REAL)strtod((string),NULL)
```

• CCS FAT library (http://www.ccsinfo.com)

```
#define INI_BUFFERSIZE  256       /* maximum line length, maximum path length */

#ifndef FAT_PIC_C
  #error FAT library must be included before this module
#endif
#define const                     /* keyword not supported by CCS */

#define INI_FILETYPE                  FILE
#define ini_openread(filename,file)   (fatopen((filename), "r", (file)) == GOODEC)
#define ini_openwrite(filename,file)  (fatopen((filename), "w", (file)) == GOODEC)
#define ini_close(file)               (fatclose((file)) == 0)
#define ini_read(buffer,size,file)    (fatgets((buffer), (size), (file)) != NULL)
#define ini_write(buffer,file)        (fatputs((buffer), (file)) == GOODEC)
#define ini_remove(filename)          (rm_file((filename)) == 0)

#define INI_FILEPOS                   fatpos_t
#define ini_tell(file,pos)            (fatgetpos((file), (pos)) == 0)
#define ini_seek(file,pos)            (fatsetpos((file), (pos)) == 0)

#ifndef INI_READONLY
/* CCS FAT library lacks a rename function, so instead we copy the file to the
 * new name and delete the old file
 */
static int ini_rename(char *source, char *dest)
{
  FILE fr, fw;
  int n;

  if (fatopen(source, "r", &fr) != GOODEC)
    return 0;
  if (rm_file(dest) != 0)
    return 0;
  if (fatopen(dest, "w", &fw) != GOODEC)
    return 0;
```

```
  /* With some "insider knowledge", we can save some memory: the "source"
   * parameter holds a filename that was built from the "dest" parameter. It
   * was built in a local buffer with the size INI_BUFFERSIZE. We can reuse
   * this buffer for copying the file.
   */
  while (n=fatread(source, 1, INI_BUFFERSIZE, &fr))
    fatwrite(source, 1, n, &fw);

  fatclose(&fr);
  fatclose(&fw);

  /* Now we need to delete the source file. However, we have garbled the buffer
   * that held the filename of the source. So we need to build it again.
   */
  ini_tempname(source, dest, INI_BUFFERSIZE);
  return rm_file(source) == 0;
}
#endif
```

- EFSL (http://www.efsl.be/)

```
#define INI_BUFFERSIZE  256       /* maximum line length, maximum path length */
#define INI_LINETERM    "\r\n"    /* set line termination explicitly */

#include "efs.h"
extern EmbeddedFileSystem g_efs;

#define INI_FILETYPE                  EmbeddedFile
#define ini_openread(filename,file)   (file_fopen((file), &g_efs.myFs, (char*)(filename), 'r') == 0)
#define ini_openwrite(filename,file)  (file_fopen((file), &g_efs.myFs, (char*)(filename), 'w') == 0)
#define ini_close(file)               file_fclose(file)
#define ini_read(buffer,size,file)    (file_read((file), (size), (buffer)) > 0)
#define ini_write(buffer,file)        (file_write((file), strlen(buffer), (char*)(buffer)) > 0)
#define ini_remove(filename)          rmfile(&g_efs.myFs, (char*)(filename))

#define INI_FILEPOS                   euint32
#define ini_tell(file,pos)            (*(pos) = (file)->FilePtr))
#define ini_seek(file,pos)            file_setpos((file), (*pos))

#if ! defined INI_READONLY
/* EFSL lacks a rename function, so instead we copy the file to the new name
 * and delete the old file
 */
static int ini_rename(char *source, const char *dest)
{
  EmbeddedFile fr, fw;
  int n;

  if (file_fopen(&fr, &g_efs.myFs, source, 'r') != 0)
    return 0;
  if (rmfile(&g_efs.myFs, (char*)dest) != 0)
    return 0;
  if (file_fopen(&fw, &g_efs.myFs, (char*)dest, 'w') != 0)
    return 0;

  /* With some "insider knowledge", we can save some memory: the "source"
   * parameter holds a filename that was built from the "dest" parameter. It
   * was built in buffer and this buffer has the size INI_BUFFERSIZE. We can
   * reuse this buffer for copying the file.
   */
  while (n=file_read(&fr, INI_BUFFERSIZE, source))
    file_write(&fw, n, source);

  file_fclose(&fr);
  file_fclose(&fw);

  /* Now we need to delete the source file. However, we have garbled the buffer
   * that held the filename of the source. So we need to build it again.
   */
  ini_tempname(source, dest, INI_BUFFERSIZE);
  return rmfile(&g_efs.myFs, source) == 0;
}
#endif
```

- FatFs & Tiny-FatFs (http://elm-chan.org/)

```
#define INI_BUFFERSIZE  256       /* maximum line length, maximum path length */

/* You must set _USE_STRFUNC to 1 or 2 in the include file ff.h (or tff.h)
 * to enable the "string functions" fgets() and fputs().
 */
#include "ff.h"                   /* include tff.h for Tiny-FatFs */

#define INI_FILETYPE    FIL
#define ini_openread(filename,file)   (f_open((file), (filename), FA_READ+FA_OPEN_EXISTING) == FR_OK)
#define ini_openwrite(filename,file)  (f_open((file), (filename), FA_WRITE+FA_CREATE_ALWAYS) == FR_OK)
#define ini_close(file)               (f_close(file) == FR_OK)
#define ini_read(buffer,size,file)    f_gets((buffer), (size),(file))
#define ini_write(buffer,file)        f_puts((buffer), (file))
#define ini_remove(filename)          (f_unlink(filename) == FR_OK)

#define INI_FILEPOS                   DWORD
#define ini_tell(file,pos)            (*(pos) = f_tell((file)))
#define ini_seek(file,pos)            (f_lseek((file), *(pos)) == FR_OK)

static int ini_rename(TCHAR *source, const TCHAR *dest)
{
  /* Function f_rename() does not allow drive letters in the destination file */
  char *drive = strchr(dest, ':');
  drive = (drive == NULL) ? dest : drive + 1;
  return (f_rename(source, drive) == FR_OK);
}
```

- "Memory Disk Drive" file system (Microchip)

```
#define INI_BUFFERSIZE  256       /* maximum line length, maximum path length */

#include "MDD File System\fsio.h"
#include <string.h>

#define INI_FILETYPE                  FSFILE*
#define ini_openread(filename,file)   ((*(file) = FSfopen((filename), FS_READ)) != NULL)
#define ini_openwrite(filename,file)  ((*(file) = FSfopen((filename), FS_WRITE)) != NULL)
#define ini_close(file)               (FSfclose(*(file)) == 0)
#define ini_write(buffer,file)        (FSfwrite((buffer), 1, strlen(buffer), (*file)) > 0)
#define ini_remove(filename)          (FSremove((filename)) == 0)

#define INI_FILEPOS                   long
#define ini_tell(file,pos)            (*(pos) = FSftell(*(file)))
#define ini_seek(file,pos)            (FSfseek(*(file), *(pos), SEEK_SET) == 0)

/* Since the Memory Disk Drive file system library reads only blocks of files,
 * the function to read a text line does so by "over-reading" a block of the
 * of the maximum size and truncating it behind the end-of-line.
 */
static int ini_read(char *buffer, int size, INI_FILETYPE *file)
{
  size_t numread = size;
  char *eol;

  if ((numread = FSfread(buffer, 1, size, *file)) == 0)
    return 0;                   /* at EOF */
  if ((eol = strchr(buffer, '\n')) == NULL)
    eol = strchr(buffer, '\r');
  if (eol != NULL) {
    /* terminate the buffer */
    *++eol = '\0';
    /* "unread" the data that was read too much */
    FSfseek(*file, - (int)(numread - (size_t)(eol - buffer)), SEEK_CUR);
  } /* if */
  return 1;
}
```

```
#ifndef INI_READONLY
static int ini_rename(const char *source, const char *dest)
{
  FSFILE* ftmp = FSfopen((source), FS_READ);
  FSrename((dest), ftmp);
  return FSfclose(ftmp) == 0;
}
#endif
```

APPENDIX B

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