Segno Documentation

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Contents

Segno generates QR Codes and Micro QR Codes according to `ISO/IEC 18004:2015(E)`.

Aside from other Python QR Code generators, Segno provides *a lot of output formats* without 3rd party dependencies and is very simple to use.

Contents:

CHAPTER 1

QR Code creation from the command line

The command line script **segno** can be used to print QR Codes to the terminal or to save them as file (SVG, PNG, EPS, ...).

By default, the script does not create Micro QR Codes, use *--micro* to allow the creation of Micro QR Codes or specify the version (like *--version=M3*) to create a Micro QR Code.

See the *CLI man page* for a detailed reference of all command line options.

1.1 Usage

Output the QR Code to the terminal:

```
$ segno "Little wing"
```

Same content, but as Micro QR Code (M4):

```
$ segno --micro "Little wing"
```

1.2 Version

If the *--version* parameter is not provided, Segno chooses the minimal version for the QR Code automatically. The version may be specified as integer or as Micro QR Code identifier.

The content 'Layla' would fit into a version 1 QR Code, but the following command enforces version 5:

```
$ segno --version=5 Layla
$ segno -v=5 Layla
```

Micro QR Code:

```
$ segno -v m4 Layla
$ segno --version M4 Layla
```

1.3 Error correction level

The default error correction level is “L” (or any better if `--no-error-boost` was not set, c.f. *Boost Error Correction Level*), use the `--error` parameter to change it:

```
$ segno --error=q "Ain't no grave"
$ segno -e=h "Heart of Gold"
```

“Heart of Gold” using error level “L”:

“Heart of Gold” using error level “H”:

1.4 QR Code serialization

Printing the QR Codes to the terminal is nice but the *--output* parameter serializes the QR Code in one of the supported file formats:

```
$ segno --output=white-room.png "White Room"
```

```
$ segno -o=satellite.svg "Satellite Of Love"
```

```
$ segno --output=mrs.eps "Mrs. Robinson"
$ segno --output=dedodo.pdf "De Do Do Do, De Da Da Da"
$ segno --output=tin-pan-alley.svgz "Tin Pan Alley"
```

```
$ segno --output=thrill-gone.txt "The Thrill Is Gone"
```

```
00000000000000000000000000000000000
00000000000000000000000000000000000
00000000000000000000000000000000000
00000000000000000000000000000000000
00001111111010111011001111111110000
00001000001011101111001000001000000
00001011101010001001001011101000000
00001011101011101100001011101000000
00001011101010001011001011101000000
00001000001000111101101000001000000
00001111111010101010101111111110000
00000000000011010100100000000000000
00000110101100000011101011111000000
00001001010100010000111000011000000
00000000111100010100010011111000000
00000000010001000000110011010000000
00001110101100100000101000000000000
00000100000010001001111001011000000
00001000111100010100101110111000000
00000111000010000001010110010000000
00001000101111011110111111111000000
00000000000011000101100010000000000
00001111111011001101101010111000000
00001000001000101111100010011000000
00001011101010110010111110001000000
00001011101001011010100111100000000
00001011101010110111010111010000000
00001000001011101100111110010000000
00001111111001001101111011011000000
00000000000000000000000000000000000
00000000000000000000000000000000000
00000000000000000000000000000000000
00000000000000000000000000000000000
```

1.5 Scaling QR Codes

If the resulting QR Code is too small, *--scale* can be used to create a more appropriate output:

```
$ segno --scale=10 --output=money-talks.png "Money Talks"
```

```
$ segno -s 10 --output=private-investigations.svg Private Investigations
```

If the serializer does not support a scaling factor (i.e. text output), this parameter is ignored.

1.6 Changing the size of the quiet zone

The generated QR Codes will have a recommended quiet zone / border around the symbol. To change the size of the border, *--border* can be utilized:

```
$ segno --border=0 --output=black-magic-woman.svg "Black Magic Woman"
```

```
$ segno --border=10 --output=diamond.png "Shine On You Crazy Diamond"
```

```
$ segno -b=30 --output=boom-boom.svg Boom Boom
```

1.7 Colors

Usually, all QR Codes are serialized in black and white. Use *--color* to change the color of the dark modules and *--background* to change the color of the light modules.

Change the foreground color to darkblue:

```
$ segno --color=darkblue --output=excited.png "So Excited"
```

Change the background color to transparent:

```
$ segno --background=transparent --output=hotel.png "Hotel California"
```

Change the foreground color to darkblue and background to yellow:

```
$ segno --color=darkblue --background=yellow --output=dontgiveup.svg "Don't Give Up"
```

If the serializer does not support *--color* or *--background*, these arguments are ignored.

1.8 Structured Append

The *Structured Append* mode can be used to split a message across multiple (max. 16) QR Codes.

To create a sequence of QR Codes, the *--seq* argument must be provided. Additonally, either the QR Code *--version* or the desired number of symbols (*--symbol-count*) must be provided:

```
$ segno --seq -v 1 "Well you should see Polythene Pam"
$ segno --seq --symbol-count=2 "We all live in a yellow submarine"
$ segno --seq -sc 2 "Half of what I say is meaningless"
```

CHAPTER 2

Creating QR Codes or Micro QR Codes

Segno's (Micro) QR Codes are independent of a concrete output format; it's possible to create more than one rendering (output format) from a single QR Code or Micro QR Code:

```
>>> import segno
>>> qr = segno.make('Henry Lee')
>>> qr.save('henry-lee.svg')  # SVG document
>>> qr.save('henry-lee.png')  # PNG image
>>> qr.save('henry-lee.eps')  # EPS document
>>> qr.save('henry-lee.txt')  # Text output
```

By default, the serialized (Micro) QR Codes are black and have a quiet zone (border) of four (or two for Micro QR Codes) light modules. Nearly all output formats provide options to change at least the scale of the code, the color, and border, see *segno.QRCode.save()* and *QR Code and Micro QR Code serialization* for details.

```
>>> import segno
>>> qr = segno.make('You Know My Name (Look Up The Number)')
>>> qr.save('you-know-my-name-no-border.svg', border=0)  # no border / quiet zone
>>> qr.save('you-know-my-name-color-green.svg', color='green')  # default border,␣
↪dark modules are green
>>> qr.save('you-know-my-name-background-grey.svg', background='#eee')  # default␣
↪border, background grey
```

The factory function *segno.make()* chooses the minimal possible (Micro) QR Code version with a maximal error correction for the provided input.

```
>>> import segno
>>> qr = segno.make('Rain')
>>> qr.version
'M3'
```

The caller may enforce that a QR Code instead of a Micro QR Code should be generated even if the content may fit into a Micro QR Code.

```
>>> import segno
>>> qr = segno.make('Rain', micro=False)
>>> qr.version
1
```

Further, Segno provides two additional factory functions to enforce the creation of QR Codes or Micro QR Codes: *segno.make_qr()* for QR Codes and *segno.make_micro()* to create Micro QR Codes:

```
>>> import segno
>>> mqr = segno.make_micro('The Beatles')  # Micro QR Code
>>> mqr.designator  # Get the version and error level
'M4-M'
>>> qr = segno.make_qr('The Beatles')  # Same content but as QR Code
>>> qr.designator
'1-Q'
>>> qr = segno.make('The Beatles', micro=False)  # Disallow Micro QR Codes
>>> qr.designator
'1-Q'
```

If the provided content is too large, a *segno.DataOverflowError* is thrown:

```
>>> import segno
>>> qr = segno.make_micro('The Curse of Millhaven')
Traceback (most recent call last):
    ...
DataOverflowError: Data too large. No Micro QR Code can handle the provided data
```

2.1 Version

It's possible to specify the desired version for the provided `content`.

```
>>> import segno
>>> qr = segno.make('Light My Fire')
>>> qr.version
'M4'
>>> qr.designator
'M4-M'
>>> qr = segno.make('Light My Fire', version=1)
>>> qr.version
1
>>> qr.designator
'1-M'
```

2.2 Error Correction Level

By default, Segno uses at minimum the error correction level "L" to encode the (Micro) QR Code.

Segno tries by default to enhance the provided error correction level if *boost_error* was not set to `False`; it takes the `error` level as minimum error level without changing the (Micro) QR Code version.

If this behaviour is not desired, *boost_error* must be set to `False` (default: `True`).

Use the parameter *error* to change the (minimum) error correction level.

The *error* parameter is case-insensitive. Available error correction levels are `L` (lowest error correction level), `M`, `Q` and `H` (highest error correction level). The error correction level "H" is not available for Micro QR Codes, if the user specifies the error correction level "H", a QR Code is generated by *segno.make()*, never a Micro QR Code.

```
>>> import segno
>>> qr = segno.make('Parisienne Walkways', error='l')  # Explicit (minimum) error␣
↪correction level
>>> qr.designator # The error correction level was changed to "Q" since there was␣
↪enough available space
'2-Q'
>>> qr = segno.make('Parisienne Walkways', error='l', boost_error=False)  # Explicit␣
↪error level
>>> qr.designator
'2-L'
>>> # Enhancing the error correction level may enforce another QR Code version
>>> qr = segno.make('Parisienne Walkways', error='H')
>>> qr.designator
'3-H'
```

2.3 Data Masking

Segno chooses by default an optimal mask for the provided input, but the user may specify the preferred mask as well. QR Codes support 8 mask patterns, while Micro QR Codes support 4 mask patterns, only.

```
>>> import segno
>>> qr = segno.make('Ai Du')
>>> qr.mask
0
>>> qr = segno.make('Ai Du', mask=3)
>>> qr.mask
3
```

2.3.1 Micro QR Code with different data masks

M3-M codes encoding "Ai Du" with the four different masks:

Fig. 1: Micro QR Code using data mask pattern 00 (mask=0)

Fig. 2: Micro QR Code using data mask pattern 01 (mask=1)

Fig. 3: Micro QR Code using data mask pattern 10 (mask=2)

2.3.2 QR Code with different data masks

1-H codes encoding "Ai Du" using the eight different mask patterns:

Fig. 4: Micro QR Code using data mask pattern 11 (mask=3)

Fig. 5: QR Code using data mask pattern 000 (mask=0)

Fig. 6: QR Code using data mask pattern 001 (mask=1)

Fig. 7: QR Code using data mask pattern 010 (mask=2)

Fig. 8: QR Code using data mask pattern 011 (mask=3)

Fig. 9: QR Code using data mask pattern 100 (mask=4)

Fig. 10: QR Code using data mask pattern 101 (mask=5)

Fig. 11: QR Code using data mask pattern 110 (mask=6)

Fig. 12: QR Code using data mask pattern 111 (mask=7)

CHAPTER 3

Structured Append

The Structured Append mode can be used to split a message across several QR Codes (it's not available for Micro QR Codes).

Example: The 2-L QR Code encodes the same information ("I read the news today oh boy") as the following 1-L QR Codes which are using Structured Append:

With Structured Append (version 1):

Segno provides a special factory function, *segno.make_sequence()*, to create a sequence of (up to 16) QR Codes. The function returns instances of *segno.QRCodeSequence*.

3.1 Structured Append by QR Code version

To create a sequence of QR Codes, the QR Code version must be specified. The number of symbols is automatically determined by the QR Code version.

```
>>> import segno
>>> seq = segno.make_sequence('I read the news today oh boy', version=1)
>>> len(seq)
2
>>> # Creates "a-day-in-the-life-02-01.svg" and "a-day-in-the-life-02-02.svg"
>>> seq.save('a-day-in-the-life.svg', scale=10)
```

If the provided content fits into one QR Code, the sequence behaves like a *segno.QRCode* instance.

```
>>> import segno
>>> seq = segno.make_sequence('I read', version=1)
>>> len(seq)
```

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```
1
>>> seq.designator
'1-H'
>>> # Creates "a-day-in-the-life.svg"
>>> seq.save('a-day-in-the-life.svg', scale=10)
```

3.2 Structured Append by number of symbols

The number of desired QR Code symbols may be specified directly. The utilized QR Code version is automatically determined by the number of symbols.

```
>>> import segno
>>> seq = segno.make_sequence('Day after day, alone on the hill', symbol_count=4)
>>> [qr.designator for qr in seq]
['1-Q', '1-Q', '1-Q', '1-Q']
>>> seq = segno.make_sequence('Day after day, alone on the hill', symbol_count=2)
>>> [qr.designator for qr in seq]
['2-Q', '2-Q']
>>> seq = segno.make_sequence('Day after day, alone on the hill', symbol_count=6)
>>> [qr.designator for qr in seq]
['1-Q', '1-Q', '1-H', '1-H', '1-H', '1-H']
```

Example: The 6-L QR Code encodes the same information (first verse of the song “Yesterday”) as the four 2-L QR Codes.

The following 2-L QR Codes were created by specifying that 4 codes should be generated (*symbol_count=4*). The result would be the same if the user specifies that a sequence of QR Codes with version 2 should be created.

CHAPTER 4

Boost Error Correction Level

If the user does not provide any *--version* or *version* keyword parameter for *segno.make()*, Segno uses the minimal possible (Micro) QR Code symbol with a maximal error correction level. The QR Code version dominates, meaning that Segno will never choose a better error correction level if this choice requires a higher (Micro) QR Code version.

If the user provides the *--error* (or *error* keyword for *segno.make()*), the error correction level is treated as minimal error correction level.

To prevent any error correction level enhancement, Segno provides the *--no-error-boost* option and *boost_error=False* option for *segno.make()*.

It's recommended to keep the error level correction boosting, because a better error correction level improves the probability that the QR Code can be read by average QR Code decoders under all circumstances.

4.1 Examples

Keeping the default (boost error level on):

```
>>> import segno
>>> qr = segno.make('The Long and Winding Road')
>>> qr.designator
'2-M'
```

Segno returns a 2-M QR Code (version 2, error correction level "M").

If the user does not allow any enhancement of the error correction level, Segno returns a 2-L QR Code (version 2, error correction level "L") which does not optimally exploit the possible error corrections:

```
>>> import segno
>>> qr = segno.make('The Long and Winding Road', boost_error=False)
>>> qr.designator
'2-L'
```

As shown, both QR codes use the same version (and are therefore have the same size). However, the first QR code uses a better error correction level (15% vs. 7%) and should be easier to read.

CHAPTER 5

QR Code and Micro QR Code serialization

A QR Code or Micro QR Code is independent of its output, it's just a matrix. To save a QR Code or Micro QR Code, Segno provides several output formats.

Segno provides a *segno.QRCode.save()* method to serialize the (Micro) QR Code in different formats:

```
>>> import segno
>>> qr = segno.make('Polly')
>>> qr.save('polly.svg')
>>> qr.save('polly.png')
>>> qr.save('polly.eps')
```

All serializers accept a `border` parameter which indicates the "quiet zone" of a (Micro) QR Code. If `border` is `None`, the default border (quiet zone) size will be used. If the resulting (Micro) QR Code should have no border or a custom border, the user may specify the border explicitly.

```
>>> import segno
>>> qr = segno.make('Vampire Blues')
>>> qr.save('vampire-blues.svg', border=0)  # No border
>>> qr.save('vampire-blues.png', border=10)  # Larger border
```

Most serializers accept a `scale` parameter which indicates the scaling factor of the serialization. By default, the scaling factor is `1` which means that size of a dark / light module is interpreted as one unit in the specific user space (i.e. 1 pixel for the *PNG* serializer or 1 point (1/72 of an inch) in *EPS*). Some serializers (like *PNG*) accept only an integer value or convert the provided scaling factor to an integer. Other, like *SVG* and *EPS*, accept float values and do not "downgrade" it to an integer.

```
>>> import segno
>>> qr = segno.make_qr('The Beatles')
>>> qr.save('the-beatles.png', scale=1.2)   # No scaling at all since int(1.2) is 1
>>> qr.save('the-beatles-2.png', scale=10)  # 1 module == 10 pixels
>>> qr.save('the-beatles.svg', scale=1.2)   # SVG accepts float values
>>> # The SVG serializer provides the "unit" parameter to specify
>>> # how to interpret the values
```

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```
>>> qr.save('the-beatles-2.svg', scale=10, unit='mm')  # 1 unit = 1 mm
>>> qr.save('the-beatles-2.svg', unit='cm')  # 1 unit = 1 cm, result as above
```

Many serializers accept the parameters `color` and `background` to specify the color of the dark modules and light modules (background). See *Colors* for details.

```
>>> import segno
>>> qr = segno.make('Neil Young')
>>> qr.save('neil-young.svg', color='darkblue', background='yellow')
>>> qr.save('neil-young.png', color='#ccc')
>>> qr.save('neil-young-2.png', background=None)  # Transparent background
>>> # Dark modules = transparent, light modules = black
>>> qr.save('neil-young-3.png', color=None, background='black')
>>> # Dark modules with alpha transparency
>>> qr.save('neil-young-4.png', color='#0000ffcc')
>>> qr.save('neil-young-4.svg', color='#00fc')  # Same as above but SVG
>>> # Anonther color, save as compressed SVG
>>> qr.save('neil-young-5.svgz', color=(8, 90, 117))
```

If the QR Code should be serialized to a buffer, use the *kind* parameter to specify the output format. Please note that some serializers write bytes while others write strings, see *segno.QRCode.save()* for details.

```
>>> import segno
>>> import io
>>> qr = segno.make('Neil Young')
>>> buff = io.BytesIO()
>>> qr.save(buff, kind='svg')
>>> # All other serializer parameters are supported as well
>>> buff = io.BytesIO()
>>> qr.save(buff, kind='svg', color='#ccc', background='green')
```

See *segno.QRCode.save()* for a complete reference which parameters are accepted by the specific serializer.

5.1 More colorful QR Codes

The PNG serializer supports an optional color mapping which can define a specific color for each module type.

```
>>> import segno
>>> from segno import moduletypes as mt
>>> qr = segno.make('Yellow Submarine', error='h')
>>> colormap = {mt.TYPE_FINDER_PATTERN_DARK:'darkred', mt.TYPE_ALIGNMENT_PATTERN_DARK:
↪'darkred', mt.TYPE_TIMING_DARK: 'darkred', mt.TYPE_DARKMODULE: 'darkred', mt.TYPE_
↪DATA_DARK: 'darkorange', mt.TYPE_DATA_LIGHT: 'yellow', mt.TYPE_FORMAT_DARK: 'darkred
↪'}
>>> qr.save('yellow-submarine.png', scale=5, colormap=colormap)
```

5.2 Available serializers

ANSI ANSI escape code. The serializer supports the border keyword, only. See *ANSI* for details.

EPS Encapsulated PostScript (EPS). The serializer provides all default features (scale, border, color and background color), see *EPS* for details.

LaTeX LaTeX / PGF/TikZ. The serializer provides no background color, but all other default features (scale, border, color) are supported, see *LaTeX* for details.

PAM Portable Arbitrary Map (PAM). The serializer provides all default features (scale, border, color and background color), see *PAM* for details.

PBM Portable Bitmap (PBM). The serializer does not support any coloring, but the common featurs like scale and border are supported, see *PBM* for details.

PDF Portable Document Format (PDF). The serializer provides all default features (scale, border, color and background color), see *PDF* for details.

PNG Portable Network Graphics (PNG). The serializer provides all default features (scale, border, color and background color) and a few more to customize the output, see *PNG* for details.

SVG Scalable Vector Graphics (SVG). The serializer provides all default features (scale, border, color and background color) and many more to customize the output, see *SVG* for details. SVGZ (compressed SVG) is supported as well.

TXT Text output. The serializer does not support any scale or color, but the character for the dark and white modules may be specified via *color* and *background*, see *TXT* for details.

XBM X BitMap (XBM). The serializer does not support any coloring, but scale and border are supported, see *XBM* for details.

XPM X PixMap (XPM). The serializer provides all default features (scale, border, color and background color) and a few more, see *XPM* for details.

CHAPTER 6

Colors

Almost all serializers support custom settings for the color of the dark modules and the background (light modules) of a (Micro) QR Code.

The color values can be provided as tuple (`(R, G, B)`), as web color name (like 'red') or as hexadecimal `#RRGGBB` value (i.e. '#085A75'). If alpha transparency is supported (i.e. *PNG* and *SVG*), hexadecimal values like `#RRGGBBAA` are accepted.

In almost all cases the color values are automatically converted into a meaningful value of the specific output format.

Note: Providing an alpha channel to a serializer which does not accept an alpha channel results usually into an error.

CHAPTER 7

Special QR Code factory functions

The *segno.helpers* module provides factory functions to create common QR Codes for encoding WIFI configurations, *vCards and MeCards*, *EPC QR Codes* or geographic locations.

The created QR Codes use at minimum the error correction level "L". If a better error correction level is possible without changing the QR Code version, the better error correction level will be used.

7.1 Create a QR Code for a WIFI configuration

```
>>> from segno import helpers
>>> # Create a WIFI config with min. error level "L" or better
>>> qr = helpers.make_wifi(ssid='My network', password='secret', security='WPA')
>>> qr.designator
'3-M'
```

If you want more control over the creation of the QR Code (i.e. using a specific version or error correction level, use the *segno.helpers.make_wifi_data()* factory function, which returns a string which encodes the WIFI configuration.

```
>>> import segno
>>> from segno import helpers
>>> config = helpers.make_wifi_data(ssid='My network', password='secret', security=
↪'WPA')
>>> config
'WIFI:T:WPA;S:My network;P:secret;;'
>>> # Create a QR Code with error correction level "L"
>>> qr = segno.make(config, error='l', boost_error=False)
>>> qr.designator
'3-L'
```

7.2 Create a QR Code encoding geographic information

```
>>> from segno import helpers
>>> latitude, longitude = 38.8976763,-77.0365297
>>> qr = helpers.make_geo(latitude, longitude)
>>> qr.designator
'2-M'
```

A factory function for encoding the geographic information as string is also available.

```
>>> import segno
>>> from segno import helpers
>>> latitude, longitude = 38.8976763, -77.0365297
>>> geo_uri = helpers.make_geo_data(latitude, longitude)
>>> geo_uri
'geo:38.8976763,-77.0365297'
>>> # Use version 4 instead of the minimum version
>>> qr = segno.make(geo_uri, version=4)
>>> qr.designator
'4-H'
```

CHAPTER 8

Creating a QR Code encoding contact information

8.1 MeCard

The function *segno.helpers.make_mecard()* returns a QR Code which encodes contact information as MeCard.

```
>>> from segno import helpers
>>> qr = helpers.make_mecard(name='Doe,John', email='me@example.org', phone='+1234567
↪')
>>> qr.designator
'3-L'
>>> # Some params accept multiple values, like email, phone, url
>>> qr = helpers.make_mecard(name='Doe,John', email=('me@example.org',
↪'another@example.org'), url=['http://www.example.org', 'https://example.org/~joe'])
>>> qr.save('my-mecard.svg')
```

A factory function which returns the MeCard as string is available as well.

```
>>> import segno
>>> from segno import helpers
>>> mecard = helpers.make_mecard_data(name='Doe,John', email='me@example.org', phone=
↪'+1234567')
>>> mecard
'MECARD:N:Doe,John;TEL:+1234567;EMAIL:me@example.org;;'
>>> qr = segno.make(mecard, error='H')
>>> qr.designator
'6-H'
```

8.2 vCard

The function *segno.helpers.make_vcard()* returns a QR Code which encodes contact information as vCard version 3.0.

```
>>> from segno import helpers
>>> qr = helpers.make_vcard(name='Doe;John', displayname='John Doe', email=
↪'me@example.org', phone='+1234567')
>>> qr.designator
'5-L'
>>> # Some params accept multiple values, like email, phone, url
>>> qr = helpers.make_vcard(name='Doe;John', displayname='John Doe', email=(
↪'me@example.org', 'another@example.org'), url=['http://www.example.org', 'https://
↪example.org/~joe'])
>>> qr.save('my-vcard.svg')
```

A factory function which returns the vCard as string is available as well.

```
>>> import segno
>>> from segno import helpers
>>> vcard = helpers.make_vcard_data(name='Doe;John', displayname='John Doe', email=
↪'me@example.org', phone='+1234567')
>>> vcard
'BEGIN:VCARD\r\nVERSION:3.0\r\nN:Doe;John\r\nFN:John Doe\r\nEMAIL:me@example.
↪org\r\nTEL:+1234567\r\nEND:VCARD\r\n'
>>> qr = segno.make(vcard, error='H')
>>> qr.designator
'9-H'
```

CHAPTER 9

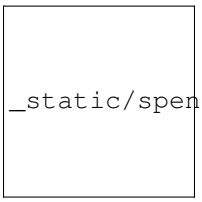
EPC QR Codes

European Payments Council Quick Response Code (EPC QR Codes) are used to initiate SEPA credit transfers. They encode all necessary data (IBAN, amount, recipient) and may be placed on invoices to eliminate the error-prone typing of payment Information.

See the EPC guidelines (PDF document) for more information.

The function *segno.helpers.make_epc_qr()* is used to create a EPC QR Code. It is not possible to modify the error correction level or to change the version of the QR Code. The EPC guidelines specify that the error correction level is fixed to "M" and the QR Code version must not be higher than 13.

```
>>> from segno import helpers
>>> qr = helpers.make_epc_qr(name='Wikimedia Foerdergesellschaft', iban=
↪'DE33100205000001194700', amount=20, text='Spende fuer Wikipedia')
>>> qr.save('spende-wikipedia.png', scale=3)
```



The QR Code shown above encodes the following information:

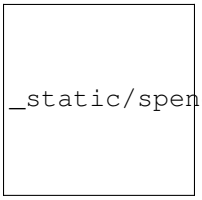
```
BCD
002
2
SCT

Wikimedia Foerdergesellschaft
DE33100205000001194700
EUR20
```

By default, the function uses the minimal possible encoding to encode the provided data. If another encoding, i.e. UTF-8, is required, the user may specify the encoding with an integer referring to one of the supported encodings

(1: UTF-8, 2: ISO 8859-1, 3: ISO 8859-2, 4: ISO 8859-4, 5: ISO 8859-5, 6: ISO 8859-7, 7: ISO 8859-10, 8: ISO 8859-15)

```
>>> from segno import helpers
>>> qr = helpers.make_epc_qr(name='Wikimedia Foerdergesellschaft', iban=
↪'DE33100205000001194700', amount=13.05, text='Spende fuer Wikipedia', encoding=1)
>>> qr.save('spende-wikipedia2.png', scale=3)
```



Decoded infomation:

```
BCD
002
1
SCT

Wikimedia Foerdergesellschaft
DE33100205000001194700
EUR13.05


Spende fuer Wikipedia
```

CHAPTER 10

Comparison of Python QR Code libraries

10.1 Features

Description	qrcode	PyQRCode	PyQRCodeNG	qrcodegen	Segno
Library license	BSD	BSD	BSD	MIT	BSD
Library version	6.1	1.2.1	1.3.6	1.5.0	0.3.4
Mode Numeric	Yes	Yes	Yes	Yes	Yes
Mode Alphanumeric	Yes	Yes	Yes	Yes	Yes
Mode Byte	Yes	Yes	Yes	Yes	Yes
Mode Kanji	No	Yes	Yes	No	Yes
Mode ECI	No	No	No	Yes	Yes
Mode FNC1	No	No	No	No	No
Mode Structured Append	No	No	No	No	Yes
Mixing modes	Yes	No	No	Yes	Yes
QR Codes version 1 - 40	Yes	Yes	Yes	Yes	Yes
Micro QR Codes version M1 - M4	No	No	No	No	Yes

Continued on next page

Table 1 – continued from previous page

Description	qrcode	PyQRCode	PyQRCodeNG	qrcodegen	Segno
Output acc. to ISO/IEC 18004:2015(E) Fig. 1	No	No	No	No	Yes
Output acc. to ISO/IEC 18004:2015(E) Fig. 2	•	•	•	•	Yes
Find maximal error correction level	No	No	No	Yes	Yes
Optimize QR Codes	Yes	No	No	No	No
PNG output	Yes	Yes	Yes	No	Yes
SVG output	Yes	Yes	Yes	Yes	Yes
EPS output	Yes	Yes	Yes	No	Yes
PDF output	Yes	No	No	No	Yes
XBM output	Yes	Yes	Yes	No	Yes
XPM output	No	No	No	No	Yes
PBM output	Yes	No	No	No	Yes
PAM output	No	No	No	No	Yes
LaTeX support	No	No	No	No	Yes
PNG data URI	No	No (no valid URI)	Yes	No	Yes
SVG data URI	No	No	No	No	Yes
Text output	Yes	Yes	Yes	No	Yes
ANSI escape code output	Yes	Yes	Yes	No	Yes
Other output formats (i.e. JPEG)	Yes	No	No	No	No, but via PIL plugin
Black and white QR Codes	Yes	Yes	Yes	Yes	Yes
Colored QR Codes	Yes	Yes	Yes	No	Yes
Animated QR Codes (GIF, APNG)	No	No	No	No	No

Continued on next page

Table 1 – continued from previous page

Description	qrcode	PyQRCode	PyQRCodeNG	qrcodegen	Segno
Changing size of modules (scaling factor)	Yes	Yes	Yes	No	Yes
Command line script	Yes	No	Yes	No	Yes
Plugins	No	No	No	No	Yes
Default encoding in Byte mode	ISO/IEC 8859-1 or UTF-8	ISO/IEC 8859-1 or UTF-8	ISO/IEC 8859-1 or UTF-8	ISO/IEC 8859-1 or UTF-8	ISO/IEC 8859-1 or UTF-8
3rd party dependencies	six, Pillow or Pymaging and Pymaging-PNG (Windows: colorama)	PyPNG	PyPNG	•	•

10.2 Performance

Some performance indicators. The script benchmarks.py ran on a Intel i7-8559U / CPython 3.7. Each SVG / PNG image uses a scaling factor of 10 (aside from qrcodegen which does not support any scaling).

10.2.1 Create a 1-M QR Code

1-M QR Code encoding "QR Code Symbol"

10.2.2 Create a 7-Q QR Code

7-Q QR Code encoding "QR Code Symbol"

10.2.3 Create a 30-H QR Code

30-H QR Code encoding "QR Code Symbol"

10.2.4 Create a QR Code and serialize it as SVG

Create a QR Code 1-M "QR Code Symbol" and serialize it as SVG document.

[1] Even if all libs generate the same byte output (`40 e5 15 22 04 36 f6 46 52 05 37 96 d6 26 f6 c0`), the generated QR Code may look different because they choose a different mask pattern. ISO/IEC 18004:2015(E) (cf. page 7) uses mask 5, while qrcode and qrcodegen use mask 4 and PyQRCode / PyQRCodeNG use mask 6. All these QR Codes can be read by common QR Code readers.

10.2.5 Create a QR Code and serialize it as PNG

Create a QR Code 1-M “QR Code Symbol” and serialize it as PNG image.

CHAPTER 11

Man Pages

Documentation of the command line interface.

11.1 segno

11.1.1 Synopsis

segno [*options*] content

11.1.2 Description

segno creates QR Codes and Micro QR Codes.

It can be used to print the codes to a terminal or to serialize them in several output formats (like SVG and PNG).

11.1.3 Command Line Options

--ver, -V
: Shows Segno's version and exit

-h, --help
: Show a help message which lists all commands and exit

QR Code Options

--version VERSION, **-v** VERSION
: QR Code version: 1 .. 40 or Micro Code Version "M1", "M2", "M3", "M4"

--error {L,M,Q,H,-}, **-e** {L,M,Q,H,-}
Error correction level: “L”: 7% (default), “M”: 15%, “Q”: 25%, “H”: 30%, “-“: no error correction (used for M1 symbols)

--mode {numeric,alphanumeric,byte,kanji}, **-m** {numeric,alphanumeric,byte,kanji}
Mode. If unspecified (default), an optimal mode is choosen for the given input.

--pattern PATTERN, **-p** PATTERN
Mask pattern to use. If unspecified (default), an optimal mask pattern is used. Valid values for QR Codes: 0 .. 7 Valid values for Micro QR Codes: 0 .. 3

--micro
Allow the creation of Micro QR Codes

--no-micro
Disallow creation of Micro QR Codes (default)

--no-error-boost
Disables the automatic error correction level incrementation. By default, the maximal error correction level is used (without changing the version).

--seq
Creates a sequence of QR Codes (Structured Append mode). The *--version* or *--symbol-count* must be provided

--symbol-count SYMBOL_COUNT, **-sc** SYMBOL_COUNT
Number of symbols to create

Output Options

--scale SCALE, **-s** SCALE
Scaling factor of the output. By default, a scaling factor of 1 is used which can result into too small images. Some output formats, i.e. SVG, accept a decimal value.

--border BORDER, **-b** BORDER
Size of the border / quiet zone of the output. By default, the standard border (4 modules for QR Codes, 2 modules for Micro QR Codes) will be used. A value of 0 omits the border

--color COLOR
Color of the dark modules. The color may be specified as web color name, i.e. “red” or as hexadecimal value, i.e. “#0033cc”. Some serializers, i.e. SVG and PNG, support alpha channels (8-digit hexadecimal value) and some support “transparent” as color value. The standard color is black.

--background BACKGROUND, **-bg** BACKGROUND
Color of the light modules. See *--color* for a description of possible values. The standard background color is white.

--output OUTPUT, **-o** OUTPUT
Output file. If not specified, the QR Code is printed to the terminal

SVG Options

--no-classes
Omits the (default) SVG classes

--no-xmldecl
Omits the XML declaration header

--no-namespace
Indicates that the SVG document should have no SVG namespace declaration

--no-newline
Indicates that the SVG document should have no trailing newline

--title TITLE
Specifies the title of the SVG document

--desc DESC
Specifies the description of the SVG document

--svgid SVGID
Indicates the ID of the <svg/> element

--svgclass SVGCLASS
Indicates the CSS class of the <svg/> element

--lineclass LINECLASS
Indicates the CSS class of the <path/> element (the dark modules)

--no-size
Indicates that the SVG document should not have "width" and "height" attributes

--unit UNIT
Indicates SVG coordinate system unit

--svgversion SVGVERSION
Indicates the SVG version

--encoding ENCODING
Specifies the encoding of the document

PNG Options

--dpi DPI
Sets the DPI value of the PNG file

11.1.4 Exit Status

segno exits 0 on success, and >0 if an error occurs.

11.1.5 Examples

```
$ segno "Up jumped the devil"
```

Prints a 2-Q QR code to the terminal

```
$ segno -o=yesterday.png "Yesterday"
```

Saves the 1-Q QR code as PNG image.

```
$ segno -o=fool.svg --title="Example QR code" "The Fool on the Hill"
```

Saves the 2-Q QR code as SVG document with the given title.

```
$ segno -o=number.svg --scale=10 --color="darkblue" "A Day in the Life"
```

Saves the 1-L QR code as SVG document, using a scaling factor of 10 and the dark modules use the color “darkblue” instead of black.

```
$ segno -o rain.png -s 10 --color="#003399" --micro RAIN
```

Saves the Micro QR Code (M2-M) as PNG image, using the color #003399 for dark modules. Each module corresponds to 10 x 10 pixels because the scaling factor was set to a value of 10.

CHAPTER 12

Replace existing QR Code libs with Segno

The sub-project Segno Mimos provides APIs which are usable to replace common Python QR Code libs like PyQR-Code and qrcode with Segno while keeping the API of the replaced libs.

CHAPTER 13

Writing plugins for Segno

segno.QRCode provides a plugin architecture which utilizes egg entry points.

All plugins must use the `segno.plugin.converter` entry point to be recognized. If a plugin is detected, the user may use the the plugin by calling `to_XXX` where `XXX` refers to the plugin name.

The specific plugin is invoked by providing the *segno.QRCode* instance and any further arguments or keywords.

13.1 Simple plugin

This section explains how to write a plugin which writes to `stdout` and uses `X` for dark modules and _ for light modules.

Content of `simple_plugin.py`:

```
import sys

def write(qrcode):
    write = sys.stdout.write
    for row in qrcode.matrix:
        for col in row:
            write('X' if col else '_')
        write('\n')
```

`setup.py`:

```
setup(
    name='simple-plugin',
    version='1.0',
    license='BSD',
    author='John Doe',
    author_email='john@example.org',
    platforms=['any'],
    py_modules=['simple_plugin'],
```

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```
    entry_points="""
    [segno.plugin.converter]
    simple = simple_plugin:write
    """,
    install_requires=['segno'],
)
```

Once installed, it's possible to call this plugin via:

```
>>> import segno
>>> qr = segno.make('Chelsea Hotel No. 2')
>>> qr.to_simple()
XXXXXXX_XXXX_XX_X_XXXXXXX
X_____X_____________X_____X
X_XXX_X_XX__XXX___X_XXX_X
X_XXX_X__X_XXX_X__X_XXX_X
X_XXX_X__XX_XX__X_X_XXX_X
X_____X_X__XXX__X_X_____X
XXXXXXX_X_X_X_X_X_XXXXXXX
___________X_X__XX_______
X_X___XX__XXXXX_X__X__X_X
_XX__X_XXXXXX__XX_XX_X__X
_X____X____X_XXXX__XX_X_X
_XX__X_XX_XXX__XXXX_XX___
__X_XXXX_XXX_XX_X_XXXX_X_
_____X_X_X___X__XXXX_XX_X
XXXXX_X_X_XX___XX_XXXXX_X
____XX__XXX__X_______X_XX
XX_X__X__XXXXX_XXXXXX__XX
_________X_X_X___X___X____
XXXXXXX_X___XXX_X_X_X___X
X_____X__X_XX_X_X___XX_XX
X_XXX_X___X__XXXXXXXXX_XX
X_XXX_X_____XX__X__XX_X_
X_XXX_X_XXXX_____X_XX_XXX
X_____X___X__X__XX_X_X___
XXXXXXX_XXXXXX__X_XXXX__X
```

CHAPTER 14

Segno package

14.1 Module contents

QR Code and Micro QR Code implementation.

"QR Code" and "Micro QR Code" are registered trademarks of DENSO WAVE INCORPORATED.

segno.**make**(*content*, *error=None*, *version=None*, *mode=None*, *mask=None*, *encoding=None*, *eci=False*, *micro=None*, *boost_error=True*)

Creates a (Micro) QR Code.

This is main entry point to create QR Codes and Micro QR Codes.

Aside from *content*, all parameters are optional and an optimal (minimal) (Micro) QR Code with a maximal error correction level is generated.

Parameters

- **content** (*str, int, bytes*) – The data to encode. Either a Unicode string, an integer or bytes. If bytes are provided, the *encoding* parameter should be used to specify the used encoding.
- **error** (*str or None*) – Error correction level. If `None` (default), error correction level `L` is used (note: Micro QR Code version M1 does not support any error correction. If an explicit error correction level is used, a M1 QR Code won't be generated). Valid values: `None` (allowing generation of M1 codes or use error correction level "L" or better see *boost_error*), "L", "M", "Q", "H" (error correction level "H" isn't available for Micro QR Codes).

Error correction level	Error correction capability
L (Segno's default unless version M1)	recovers 7% of data
M	recovers 15% of data
Q	recovers 25% of data
H (not available for Micro QR Codes)	recovers 30% of data

Higher error levels may require larger QR Codes (see also *version* parameter).

The *error* parameter is case insensitive.

See also the *boost_error* parameter.

- **version** (*int, str or None*) – QR Code version. If the value is None (default), the minimal version which fits for the input data will be used. Valid values: "M1", "M2", "M3", "M4" (for Micro QR Codes) or an integer between 1 and 40 (for QR Codes). The *version* parameter is case insensitive.
- **mode** (*str or None*) – "numeric", "alphanumeric", "byte", or "kanji". If the value is None (default) the appropriate mode will automatically be determined. If *version* refers a to Micro QR Code, this function may raise a *ModeError* if the provided *mode* is not supported.

Mode	(Micro) QR Code Version
numeric	1 - 40, M1, M2, M3, M4
alphanumeric	1 - 40, M2, M3, M4
byte	1 - 40, M3, M4
kanji	1 - 40, M3, M4

The *mode* parameter is case insensitive.

- **mask** (*int or None*) – Data mask. If the value is None (default), the appropriate data mask is chosen automatically. If the *mask* parameter is provided, this function may raise a *MaskError* if the mask is invalid.
- **encoding** (*str or None*) – Indicates the encoding in mode "byte". By default (*encoding* is None) the implementation tries to use the standard conform ISO/IEC 8859-1 encoding and if it does not fit, it will use UTF-8. Note that no ECI mode indicator is inserted by default (see *eci*). The *encoding* parameter is case insensitive.
- **eci** (*bool*) – Indicates if binary data which does not use the default encoding (ISO/IEC 8859-1) should enforce the ECI mode. Since a lot of QR Code readers do not support the ECI mode, this feature is disabled by default and the data is encoded in the provided *encoding* using the usual "byte" mode. Set *eci* to True if an ECI header should be inserted into the QR Code. Note that the implementation may not know the ECI designator for the provided *encoding* and may raise an exception if the ECI designator cannot be found. The ECI mode is not supported by Micro QR Codes.
- **micro** (*bool or None*) – If *version* is None (default) this parameter can be used to allow the creation of a Micro QR Code. If set to False, a QR Code is generated. If set to None (default) a Micro QR Code may be generated if applicable. If set to True the algorithm generates a Micro QR Code or raises an exception if the *mode* is not compatible or the *content* is too large for Micro QR Codes.
- **boost_error** (*bool*) – Indicates if the error correction level may be increased if it does not affect the version (default: True). If set to True, the *error* parameter is interpreted as minimum error level. If set to False, the resulting (Micro) QR Code uses the provided *error* level (or the default error correction level, if error is None)

Raises *QRCodeError*: In case of a problem. In fact, it's more likely that a derived exception is thrown: *ModeError*: In case of problems with the mode (i.e. invalid mode or invalid *mode* / *version* combination. *VersionError*: In case the *version* is invalid or the *micro* parameter contradicts the provided *version*. *ErrorLevelError*: In case the error level is invalid or the error level is not supported by the provided *version*. *DataOverflowError*: In case the data

does not fit into a (Micro) QR Code or it does not fit into the provided *version*. *MaskError*: In case an invalid data mask was specified.

Return type *QRCode*

segno.**make_qr**(*content*, *error=None*, *version=None*, *mode=None*, *mask=None*, *encoding=None*, *eci=False*, *boost_error=True*)
Creates a QR Code (never a Micro QR Code).

See *make()* for a description of the parameters.

Return type *QRCode*

segno.**make_micro**(*content*, *error=None*, *version=None*, *mode=None*, *mask=None*, *encoding=None*, *boost_error=True*)
Creates a Micro QR Code.

See *make()* for a description of the parameters.

Note: Error correction level "H" isn't available for Micro QR Codes. If used, this function raises a *segno.ErrorLevelError*.

Return type *QRCode*

segno.**make_sequence**(*content*, *error=None*, *version=None*, *mode=None*, *mask=None*, *encoding=None*, *boost_error=True*, *symbol_count=None*)
Creates a sequence of QR Codes using the Structured Append mode.

If the content fits into one QR Code and neither `version` nor `symbol_count` is provided, this function may return a sequence with one QR Code which does not use the Structured Append mode. Otherwise a sequence of 2 .. n (max. n = 16) QR Codes is returned which use the Structured Append mode.

The Structured Append mode allows to split the content over a number (max. 16) QR Codes.

The Structured Append mode isn't available for Micro QR Codes, therefor the returned sequence contains QR Codes, only.

Since this function returns an iterable object, it may be used as follows:

```
for i, qrcode in enumerate(segno.make_sequence(data, symbol_count=2)):
    qrcode.save('seq-%d.svg' % i, scale=10, color='darkblue')
```

The number of QR Codes is determined by the *version* or *symbol_count* parameter.

See *make()* for a description of the other parameters.

Parameters **symbol_count** (*int*) – Number of symbols.

Return type *QRCodeSequence*

class segno.**QRCode**(*code*)
Represents a (Micro) QR Code.

matrix = None
Returns the matrix.

Return type tuple of `bytearray` instances.

mask = None
Returns the data mask pattern reference

Return type int

version
(Micro) QR Code version. Either a string ("M1", "M2", "M3", "M4") or an integer in the range of 1 .. 40.

Return type str or int

error
Error correction level; either a string ("L", "M", "Q", "H") or `None` if the QR Code provides no error correction (Micro QR Code version M1)

Return type str

mode
String indicating the mode ("numeric", "alphanumeric", "byte", "kanji"). May be `None` if multiple modes are used.

Return type str or None

designator
Returns the version and error correction level as string *V-E* where *V* represents the version number and *E* the error level.

Return type str

default_border_size
Indicates the default border size aka quiet zone.

QR Codes have a quiet zone of four light modules, while Micro QR Codes have a quiet zone of two light modules.

Return type int

is_micro
Indicates if this QR Code is a Micro QR Code

Return type bool

symbol_size(*scale=1*, *border=None*)
Returns the symbol size (width x height) with the provided border and scaling factor.

Parameters

- **scale** (*int or float*) – Indicates the size of a single module (default: 1). The size of a module depends on the used output format; i.e. in a PNG context, a scaling factor of 2 indicates that a module has a size of 2 x 2 pixel. Some outputs (i.e. SVG) accept floating point values.
- **border** (*int*) – The border size or `None` to specify the default quiet zone (4 for QR Codes, 2 for Micro QR Codes).

Return type tuple (width, height)

matrix_iter(*scale=1*, *border=None*, *verbose=False*)
Returns an iterator over the matrix which includes the border.

The border is returned as sequence of light modules. Dark modules are reported as `0x1`, light modules have the value `0x0`.

The following example converts the QR Code matrix into a list of lists which use boolean values for the modules (True = dark module, False = light module):

```
>>> import segno
>>> qr = segno.make('The Beatles')
>>> width, height = qr.symbol_size(scale=2)
>>> res = []
>>> # Scaling factor 2, default border
>>> for row in qr.matrix_iter(scale=2):
```

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```
>>>     res.append([col == 0x1 for col in row])
>>> width == len(res[0])
True
>>> height == len(res)
True
```

Parameters

- **scale** (*int*) – The scaling factor (default: 1).
- **border** (*int*) – The size of border / quiet zone or None to indicate the default border.
- **verbose** (*bool*) – Indicates if the type of the module should be returned instead of 0x1 and 0x0 values. See *segno.moduletypes* for the return values. This feature is currently in EXPERIMENTAL state.

Raises ValueError if the scaling factor or the border is invalid (i.e. negative).

show(*delete_after=20*, *scale=10*, *border=None*, *color=u'#000'*, *background=u'#fff'*)

Displays this QR code.

This method is mainly intended for debugging purposes.

This method saves QR code as an image (by default with a scaling factor of 10) to a temporary file and opens it with the standard PNG viewer application or within the standard webbrowser. The temporary file is deleted afterwards (unless *delete_after* is set to None).

If this method does not show any result, try to increase the *delete_after* value or set it to None

Parameters

- **delete_after** (*int or None*) – Time in seconds to wait till the temporary file is deleted.
- **scale** (*int*) – Integer indicating the size of a single module.
- **border** (*int or None*) – Integer indicating the size of the quiet zone. If set to None (default), the recommended border size will be used.
- **color** – The color of the dark modules (default: black).
- **background** – The color of the background (default: white).

svg_data_uri(*xmldecl=False*, *encode_minimal=False*, *omit_charset=False*, *nl=False*, ***kw*)

Converts the QR Code into a SVG data URI.

The XML declaration is omitted by default (set *xmldecl* to True to enable it), further the newline is omitted by default (set nl to True to enable it).

Aside from the missing *out* parameter, the different *xmldecl* and *nl* default values, and the additional parameters *encode_minimal* and *omit_charset*, this method uses the same parameters as the usual SVG serializer, see *save()* and the available *SVG parameters*

Parameters

- **xmldecl** (*bool*) – Indicates if the XML declaration should be serialized (default: False)
- **encode_minimal** (*bool*) – Indicates if the resulting data URI should use minimal percent encoding (disabled by default).
- **omit_charset** (*bool*) – Indicates if the ;charset=... should be omitted (disabled by default)

Return type str

png_data_uri(**kw)
Converts the QR Code into a PNG data URI.

Uses the same keyword parameters as the usual PNG serializer, see `save()` and the available *PNG parameters*

Return type str

terminal(*out=None*, *border=None*)
Serializes the matrix as ANSI escape code.

Under Windows, no ANSI escape sequence is generated but the Windows API is used *unless* `out` is a writable object or using WinAPI fails.

Parameters

- **out** – Filename or a file-like object supporting to write text. If `None` (default), the matrix is written to `sys.stdout`.
- **border** (*int*) – Integer indicating the size of the quiet zone. If set to `None` (default), the recommended border size will be used (`4` for QR Codes, `2` for Micro QR Codes).

save(*out*, *kind=None*, **kw)
Serializes the QR Code in one of the supported formats. The serialization format depends on the filename extension.

Common keywords

Name	Description
scale	Integer or float indicating the size of a single module. Default: 1. The interpretation of the scaling factor depends on the serializer. For pixel-based output (like *PNG*) the scaling factor is interepreted as pixel-size (1 = 1 pixel). *EPS* interprets `1` as 1 point (1/72 inch) per module. Some serializers (like *SVG*) accept float values. If the serializer does not accept float values, the value will be converted to an integer value (note: int(1.6) == 1).
border	Integer indicating the size of the quiet zone. If set to `None` (default), the recommended border size will be used (`4` for QR Codes, `2` for a Micro QR Codes). A value of `0` indicates that border should be omitted.
color	A string or tuple representing a color value for the dark modules. The default value is "black". The color can be provided as `(R, G, B)` tuple, as web color name (like "red") or in hexadecimal format (`#RGB` or `#RRGGBB`). Some serializers (i.e. *SVG* and *PNG*) accept an alpha transparency value like `#RRGGBBAA`.
background	A string or tuple representing a color for the light modules or background. See *color* for valid values. The default value depends on the serializer. *SVG* uses no background color (`None`) by default, other serializers, like *PNG*, use "white" as default background color.

Scalable Vector Graphics (SVG)

Name	Description
out	Filename or `io.BytesIO`
kind	"svg" or "svgz" (to create a gzip compressed SVG)
scale	integer or float
color	Default: "#000" (black) `None` is a valid value. If set to `None`, the resulting path won't have a "stroke" attribute. The "stroke" attribute may be defined via CSS (external). If an alpha channel is defined, the output depends of the used SVG version. For SVG versions >= 2.0, the "stroke" attribute will have a value like "rgba(R, G, B, A)", otherwise the path gets another attribute "stroke-opacity" to emulate the alpha channel. To minimize the document size, the SVG serializer uses automatically the shortest color representation: If a value like "#000000" is provided, the resulting document will have a color value of "#000". If the color is "#FF0000", the resulting color is not "#F00", but the web color name "red".
background	Default value `None`. If this paramater is set to another value, the resulting image will have another path which is used to define the background color. If an alpha channel is used, the resulting path may have a "fill-opacity" attribute (for SVG version < 2.0) or the "fill" attribute has a "rgba(R, G, B, A)" value. See keyword "color" for further details.
xmldecl	Boolean value (default: `True`) indicating whether the document should have an XML declaration header. Set to `False` to omit the header.
svgns	Boolean value (default: `True`) indicating whether the document should have an explicit SVG namespace declaration. Set to `False` to omit the namespace declaration. The latter might be useful if the document should be embedded into a HTML 5 document where the SVG namespace is implicitly defined.
title	String (default: `None`) Optional title of the generated SVG document.
desc	String (default: `None`) Optional description of the generated SVG document.
svgid	A string indicating the ID of the SVG document (if set to `None` (default), the SVG element won't have an ID).
svgclass	Default: "segno". The CSS class of the SVG document (if set to `None`, the SVG element won't have a class).
lineclass	Default: "qrline". The CSS class of the path element (which draws the dark modules (if set to `None`, the path won't have a class).
omitsize	Indicates if width and height attributes should be omitted (default: `False`). If these attributes are omitted, a `viewBox` attribute will be added to the document.
unit	Default: `None` Inidctaes the unit for width / height and other coordinates. By default, the unit is unspecified and all values are in the user space. Valid values: em, ex, px, pt, pc, cm, mm, in, and percentages (any string is accepted, this parameter is not validated by the serializer)
encoding	Encoding of the XML document. "utf-8" by default.
svgversion	SVG version (default: `None`). If specified (a float), the resulting document has an explicit "version" attribute. If set to `None`, the document won't have a "version" attribute. This parameter is not validated.
compresslevel	Default: 9. This parameter is only valid, if a compressed SVG document should be created (file extension "svgz"). 1 is fastest and produces the least compression, 9 is slowest and produces the most. 0 is no compression.

Portable Network Graphics (PNG)

This writes either a grayscale (maybe with transparency) PNG (color type 0) or a palette-based (maybe with transparency) image (color type 3). If the color / background values are `None`, white or black, the serializer chooses the more compact grayscale mode, in all other cases a palette-based image is written.

Name	Description
out	Filename or `io.BytesIO`
kind	"png"
scale	integer
color	Default: "#000" (black) `None` is a valid value iff background is not `None`. If set to `None`, the dark modules become transparent.
background	Default value "#fff" (white) See keyword "color" for further details.
compresslevel	Default: 9. Integer indicating the compression level for the `IDAT` (data) chunk. 1 is fastest and produces the least compression, 9 is slowest and produces the most. 0 is no compression.
dpi	Default: `None`. Specifies the DPI value for the image. By default, the DPI value is unspecified. Please note that the DPI value is converted into meters (maybe with rounding errors) since PNG does not support the unit "dots per inch".
colormap	Optional module type -> color mapping. If provided, the "color" and "background" arguments are ignored. All undefined module types will have the default colors (light: white, dark: black). See ""color" for valid color values. `None` is accepted as valid color value as well (becomes transparent).

Encapsulated PostScript (EPS)

Name	Description
out	Filename or `io.StringIO`
kind	"eps"
scale	integer or float
color	Default: "#000" (black)
background	Default value: `None` (no background)

Portable Document Format (PDF)

Name	Description
out	Filename or `io.BytesIO`
kind	"pdf"
scale	integer or float
color	Default: "#000" (black)
background	Default value: `None` (no background)
compresslevel	Default: 9. Integer indicating the compression level. 1 is fastest and produces the least compression, 9 is slowest and produces the most. 0 is no compression.

Text (TXT)

Does not support the "scale" keyword!

Name	Description
out	Filename or `io.StringIO`
kind	"txt"
color	Default: "1"
background	Default: "0"

ANSI escape code

Supports the "border" keyword, only!

Name	Description
out	Filename or `io.StringIO`
kind	"ans"

Portable Bitmap (PBM)

Name	Description
out	Filename or `io.BytesIO`
kind	"pbm"
scale	integer
plain	Default: False. Boolean to switch between the P4 and P1 format. If set to `True`, the (outdated) P1 serialization format is used.

Portable Arbitrary Map (PAM)

Name	Description
out	Filename or `io.BytesIO`
kind	"pam"
scale	integer
color	Default: "#000" (black).
background	Default value "#fff" (white). Use `None` for a transparent background.

LaTeX / PGF/TikZ

To use the output of this serializer, the `PGF/TikZ` (and optionally `hyperref`) package is required in the LaTeX environment. The serializer itself does not depend on any external packages.

Name	Description
out	Filename or `io.StringIO`
kind	"tex"
scale	integer or float
color	LaTeX color name (default: "black"). The color is written "at it is", please ensure that the color is a standard color or it has been defined in the enclosing LaTeX document.
url	Default: `None`. Optional URL where the QR Code should point to. Requires the `hyperref` package in your LaTeX environment.

X BitMap (XBM)

Name	Description
out	Filename or `io.StringIO`
kind	"xbm"
scale	integer
name	Name of the variable (default: "img")

X PixMap (XPM)

Name	Description
out	Filename or io.StringIO
kind	"xpm"
scale	integer
color	Default: "#000" (black).
background	Default value "#fff" (white) None indicates a transparent background.
name	Name of the variable (default: "img")

Parameters

- **out** – A filename or a writable file-like object with a name attribute. Use the *kind* parameter if *out* is a io.BytesIO or io.StringIO stream which don't have a name attribute.
- **kind** – If the desired output format cannot be determined from the out parameter, this parameter can be used to indicate the serialization format (i.e. "svg" to enforce SVG output)
- **kw** – Any of the supported keywords by the specific serialization method.

class segno.**QRCodeSequence**

Represents a sequence of 1 .. n (max. n = 16) *QRCode* instances.

Iff this sequence contains only one item, it behaves like *QRCode*.

terminal(*out=None*, *border=None*)

Serializes the sequence of QR Codes as ANSI escape code.

See *QRCode.terminal()* for details.

save(*out*, *kind=None*, ***kw*)

Saves the sequence of QR Code to *out*.

If *out* is a filename, this method modifies the filename and adds <Number of QR Codes>-<Current QR Code> to it. structured-append.svg becomes (if the sequence contains two QR Codes): structured-append-02-01.svg and structured-append-02-02.svg

Please note that using a file or file-like object may result into an invalid serialization format since all QR Codes are written to the same output.

See *QRCode.save()* for a detailed enumeration of options.

exception segno.**QRCodeError**

Generic QR Code error.

exception segno.**ErrorLevelError**

Indicates errors related to QR Code error correction level.

exception segno.**ModeError**

Indicates errors related to QR Code mode.

exception segno.**MaskError**

Indicates errors related to QR Code data mask.

exception segno.**VersionError**

Indicates errors related to the QR Code version.

exception segno.**DataOverflowError**

Indicates a problem that the provided data does not fit into the provided QR Code version or the data is too large in general.

14.2 Utilities

Utility functions useful for writers or QR Code objects.

segno.utils.**get_default_border_size**(*version*)
Returns the default border size (quiet zone) for the provided version.

Parameters **version** (*int*) – 1 .. 40 or a Micro QR Code version constant.

Return type int

segno.utils.**get_border**(*version*, *border*)
Returns *border* if not `None`, otherwise the default border size for the provided QR Code.

Parameters

- **version** (*int*) – 1 .. 40 or a Micro QR Code version constant
- **border** (*int or None*) – The size of the quiet zone or `None`.

Return type int

segno.utils.**get_symbol_size**(*version*, *scale=1*, *border=None*)
Returns the symbol size (width x height) with the provided border and scaling factor.

Parameters

- **version** (*int*) – A version constant.
- **scale** (*int or float*) – Indicates the size of a single module (default: 1). The size of a module depends on the used output format; i.e. in a PNG context, a scaling factor of 2 indicates that a module has a size of 2 x 2 pixel. Some outputs (i.e. SVG) accept floating point values.
- **border** (*int*) – The border size or `None` to specify the default quiet zone (4 for QR Codes, 2 for Micro QR Codes).

Return type tuple (width, height)

segno.utils.**check_valid_scale**(*scale*)
Raises a `ValueError` iff *scale* is negative or zero.

Parameters **scale** (*float or int*) – Scaling factor.

segno.utils.**check_valid_border**(*border*)
Raises a `ValueError` iff *border* is negative.

Parameters **border** (*int*) – Indicating the size of the quiet zone.

segno.utils.**matrix_to_lines**(*matrix*, *x*, *y*, *incby=1*)
Converts the *matrix* into an iterable of ((x1, y1), (x2, y2)) tuples which represent a sequence (horizontal line) of dark modules.

The path starts at the 1st row of the matrix and moves down to the last row.

Parameters

- **matrix** – An iterable of bytearrays.
- **x** – Initial position on the x-axis.
- **y** – Initial position on the y-axis.
- **incby** – Value to move along the y-axis (default: 1).

Return type iterable of (x1, y1), (x2, y2) tuples

segno.utils.**matrix_iter**(*matrix*, *version*, *scale=1*, *border=None*)
Returns an iterator / generator over the provided matrix which includes the border and the scaling factor.

If either the *scale* or *border* value is invalid, a `ValueError` is raised.

Parameters

- **matrix** – An iterable of bytearrays.
- **version** (*int*) – A version constant.
- **scale** (*int*) – The scaling factor (default: `1`).
- **border** (*int*) – The border size or `None` to specify the default quiet zone (4 for QR Codes, 2 for Micro QR Codes).

Raises `ValueError` if an illegal scale or border value is provided

segno.utils.**matrix_iter_verbose**(*matrix*, *version*, *scale=1*, *border=None*)
EXPERIMENTAL: Returns an iterator / generator over the provided matrix which includes the border and the scaling factor.

This iterator / generator returns different values for dark / light modules and therefor the different parts (like the finder patterns, alignment patterns etc.) are distinguishable. If this information isn't necessary, use the *matrix_iter()* function because it is much cheaper and faster.

If either the *scale* or *border* value is invalid, a py:exc:*ValueError* is raised.

Parameters

- **matrix** – An iterable of bytearrays.
- **version** (*int*) – A version constant.
- **scale** (*int*) – The scaling factor (default: `1`).
- **border** (*int*) – The border size or `None` to specify the default quiet zone (4 for QR Codes, 2 for Micro QR Codes).

Raises `ValueError` if an illegal scale or border value is provided

14.3 Module Types

Module types (EXPERIMENTAL).

To distinguish between dark and light modules without taking the concrete value into account, use:

```
if m >> 8:
    print('dark module')

if not m >> 8:
    print('light module')
```

segno.moduletypes.**TYPE_ALIGNMENT_PATTERN_DARK = 2560**
Dark alignment pattern module.

segno.moduletypes.**TYPE_ALIGNMENT_PATTERN_LIGHT = 10**
Light alignment pattern module.

segno.moduletypes.**TYPE_DARKMODULE = 512**
A single dark module which occurs in QR Codes (but not in Micro QR Codes).

segno.moduletypes.**TYPE_DATA_DARK = 1024**
Dark module in the encoding area (either a data module or an error correction module).

segno.moduletypes.**TYPE_DATA_LIGHT = 4**
Light module in the encoding area (either a data module or an error correction module).

segno.moduletypes.**TYPE_FINDER_PATTERN_DARK = 1536**
Dark finder module.

segno.moduletypes.**TYPE_FINDER_PATTERN_LIGHT = 6**
Light finder module

segno.moduletypes.**TYPE_FORMAT_DARK = 3584**
Dark format information module.

segno.moduletypes.**TYPE_FORMAT_LIGHT = 14**
Light format information module.

segno.moduletypes.**TYPE_QUIET_ZONE = 18**
Border of light modules.

segno.moduletypes.**TYPE_SEPARATOR = 8**
Separator around the finder patterns (light module)

segno.moduletypes.**TYPE_TIMING_DARK = 3072**
Dark timing patten module.

segno.moduletypes.**TYPE_TIMING_LIGHT = 12**
Light timing pattern module.

segno.moduletypes.**TYPE_VERSION_DARK = 4096**
Dark version information module.

segno.moduletypes.**TYPE_VERSION_LIGHT = 16**
Light version information module.

14.4 High level QR Code factories

Additional factory functions for common QR Codes.

The factory functions which return a QR Code with the minimum error correction level "L" (or better). To create a (Micro) QR Code which should use a specific error correction level or version etc., use the "_data" factory functions which return a string which can be used as input for *segno.make()*.

segno.helpers.**make_email**(*to*, *cc=None*, *bcc=None*, *subject=None*, *body=None*)
Encodes either a simple e-mail address or a complete message with (blind) carbon copies and a subject and a body.

Parameters

- **to** (*str or iterable of strings*) – The email address (recipient). Multiple values are allowed.
- **cc** (*str, iterable of strings, or None*) – The carbon copy recipient. Multiple values are allowed.
- **bcc** (*str, iterable of strings, or None*) – The blind carbon copy recipient. Multiple values are allowed.
- **subject** (*str or None*) – The subject.
- **body** (*str or None*) – The message body.

Return type *segno.QRCode*

segno.helpers.**make_epc_qr**(*name*, *iban*, *amount*, *text=None*, *reference=None*, *bic=None*, *purpose=None*, *encoding=None*)

Creates and returns an European Payments Council Quick Response Code (EPC QR Code) version 002.

Note: Either the `text` or `reference` must be provided but not both

Note: Neither the IBAN, BIC, nor remittance reference number or any other information is validated (aside from checks regarding the allowed string lengths).

Parameters

- **name** (*str*) – Name of the recipient.
- **iban** (*str*) – International Bank Account Number (IBAN)
- **amount** (*int, float, decimal.Decimal*) – The amount (in EUR) to transfer. The currency is always Euro, no other currencies are supported.
- **text** (*str*) – Remittance Information (unstructured)
- **reference** (*str*) – Remittance Information (structured)
- **bic** (*str*) – Bank Identifier Code (BIC). Optional, only required for non-EEA countries.
- **purpose** (*str*) – SEPA purpose code.
- **encoding** (*int*) – By default, this function tries to find the best, minimal encoding. If another encoding should be used, the number of the encoding can be provided: 1: UTF-8, 2: ISO 8859-1, 3: ISO 8859-2, 4: ISO 8859-4, 5: ISO 8859-5, 6: ISO 8859-7, 7: ISO 8859-10, 8: ISO 8859-15

Return type *segno.QRCode*

segno.helpers.**make_geo**(*lat*, *lng*)

Returns a QR Code which encodes geographic location using the `geo` URI scheme.

Parameters

- **lat** (*float*) – Latitude
- **lng** (*float*) – Longitude

Return type *segno.QRCode*

segno.helpers.**make_geo_data**(*lat*, *lng*)

Creates a geo location URI.

Parameters

- **lat** (*float*) – Latitude
- **lng** (*float*) – Longitude

Return type str

segno.helpers.**make_make_email_data**(*to*, *cc=None*, *bcc=None*, *subject=None*, *body=None*)

Creates either a simple "mailto:" URL or complete e-mail message with (blind) carbon copies and a subject and a body.

Parameters

- **to** (*str or iterable of strings*) – The email address (recipient). Multiple values are allowed.
- **cc** (*str, iterable of strings, or None*) – The carbon copy recipient. Multiple values are allowed.
- **bcc** (*str, iterable of strings, or None*) – The blind carbon copy recipient. Multiple values are allowed.
- **subject** (*str or None*) – The subject.
- **body** (*str or None*) – The message body.

Return type str

segno.helpers.**make_mecard**(*name*, *reading=None*, *email=None*, *phone=None*, *videophone=None*, *memo=None*, *nickname=None*, *birthday=None*, *url=None*, *pobox=None*, *roomno=None*, *houseno=None*, *city=None*, *prefecture=None*, *zipcode=None*, *country=None*)

Returns a QR Code which encodes a MeCard

Parameters

- **name** (*str*) – Name. If it contains a comma, the first part is treated as lastname and the second part is treated as forename.
- **reading** (*str or None*) – Designates a text string to be set as the kana name in the phonebook
- **email** (*str, iterable of strings, or None*) – E-mail address. Multiple values are allowed.
- **phone** (*str, iterable of strings, or None*) – Phone number. Multiple values are allowed.
- **videophone** (*str, iterable of strings, or None*) – Phone number for video calls. Multiple values are allowed.
- **memo** (*str or None*) – A notice for the contact.
- **nickname** (*str or None*) – Nickname.
- **birthday** (*str, datetime.date or None*) – Birthday. If a string is provided, it should encode the date as YYYYMMDD value.
- **url** (*str, iterable of strings, or None*) – Homepage. Multiple values are allowed.
- **pobox** (*str or None*) – P.O. box (address information).
- **roomno** (*str or None*) – Room number (address information).
- **houseno** (*str or None*) – House number (address information).
- **city** (*str or None*) – City (address information).
- **prefecture** (*str or None*) – Prefecture (address information).
- **zipcode** (*str or None*) – Zip code (address information).
- **country** (*str or None*) – Country (address information).

Return type *segno.QRCode*

segno.helpers.**make_mecard_data**(*name*, *reading=None*, *email=None*, *phone=None*, *videophone=None*, *memo=None*, *nickname=None*, *birthday=None*, *url=None*, *pobox=None*, *roomno=None*, *houseno=None*, *city=None*, *prefecture=None*, *zipcode=None*, *country=None*)

Creates a string encoding the contact information as MeCard.

Parameters

- **name** (*str*) – Name. If it contains a comma, the first part is treated as lastname and the second part is treated as forename.
- **reading** (*str or None*) – Designates a text string to be set as the kana name in the phonebook
- **email** (*str, iterable of strings, or None*) – E-mail address. Multiple values are allowed.
- **phone** (*str, iterable of strings, or None*) – Phone number. Multiple values are allowed.
- **videophone** (*str, iterable of strings, or None*) – Phone number for video calls. Multiple values are allowed.
- **memo** (*str or None*) – A notice for the contact.
- **nickname** (*str or None*) – Nickname.
- **birthday** (*str, datetime.date or None*) – Birthday. If a string is provided, it should encode the date as YYYYMMDD value.
- **url** (*str, iterable of strings, or None*) – Homepage. Multiple values are allowed.
- **pobox** (*str or None*) – P.O. box (address information).
- **roomno** (*str or None*) – Room number (address information).
- **houseno** (*str or None*) – House number (address information).
- **city** (*str or None*) – City (address information).
- **prefecture** (*str or None*) – Prefecture (address information).
- **zipcode** (*str or None*) – Zip code (address information).
- **country** (*str or None*) – Country (address information).

Return type str

segno.helpers.**make_vcard**(*name*, *displayname*, *email=None*, *phone=None*, *fax=None*, *videophone=None*, *memo=None*, *nickname=None*, *birthday=None*, *url=None*, *pobox=None*, *street=None*, *city=None*, *region=None*, *zipcode=None*, *country=None*, *org=None*, *lat=None*, *lng=None*, *source=None*, *rev=None*, *title=None*, *photo_uri=None*)

Creates a QR Code which encodes a vCard version 3.0.

Only a subset of available *vCard 3.0 properties <https://tools.ietf.org/html/rfc2426>* is supported.

Parameters

- **name** (*str*) – The name. If it contains a semicolon, , the first part is treated as lastname and the second part is treated as forename.
- **displayname** (*str*) – Common name.

- **email** (*str, iterable of strings, or None*) – E-mail address. Multiple values are allowed.
- **phone** (*str, iterable of strings, or None*) – Phone number. Multiple values are allowed.
- **fax** (*str, iterable of strings, or None*) – Fax number. Multiple values are allowed.
- **videophone** (*str, iterable of strings, or None*) – Phone number for video calls. Multiple values are allowed.
- **memo** (*str or None*) – A notice for the contact.
- **nickname** (*str or None*) – Nickname.
- **birthday** (*str, datetime.date or None*) – Birthday. If a string is provided, it should encode the date as `YYYY-MM-DD` value.
- **url** (*str, iterable of strings, or None*) – Homepage. Multiple values are allowed.
- **pobox** (*str or None*) – P.O. box (address information).
- **street** (*str or None*) – Street address.
- **city** (*str or None*) – City (address information).
- **region** (*str or None*) – Region (address information).
- **zipcode** (*str or None*) – Zip code (address information).
- **country** (*str or None*) – Country (address information).
- **org** (*str or None*) – Company / organization name.
- **lat** (*float or None*) – Latitude.
- **lng** (*float or None*) – Longitude.
- **source** (*str or None*) – URL where to obtain the vCard.
- **rev** (*str, datetime.date or None*) – Revision of the vCard / last modification date.
- **title** (*str, iterable of strings, or None*) – Job Title. Multiple values are allowed.
- **photo_uri** (*str, iterable of strings, or None*) – Photo URI. Multiple values are allowed.

Return type *segno.QRCode*

segno.helpers.**make_vcard_data**(*name*, *displayname*, *email=None*, *phone=None*, *fax=None*, *videophone=None*, *memo=None*, *nickname=None*, *birthday=None*, *url=None*, *pobox=None*, *street=None*, *city=None*, *region=None*, *zipcode=None*, *country=None*, *org=None*, *lat=None*, *lng=None*, *source=None*, *rev=None*, *title=None*, *photo_uri=None*)

Creates a string encoding the contact information as vCard 3.0.

Only a subset of available *vCard 3.0 properties <https://tools.ietf.org/html/rfc2426>* is supported.

Parameters

- **name** (*str*) – The name. If it contains a semicolon, , the first part is treated as lastname and the second part is treated as forename.

- **displayname** (*str*) – Common name.
- **email** (*str, iterable of strings, or None*) – E-mail address. Multiple values are allowed.
- **phone** (*str, iterable of strings, or None*) – Phone number. Multiple values are allowed.
- **fax** (*str, iterable of strings, or None*) – Fax number. Multiple values are allowed.
- **videophone** (*str, iterable of strings, or None*) – Phone number for video calls. Multiple values are allowed.
- **memo** (*str or None*) – A notice for the contact.
- **nickname** (*str or None*) – Nickname.
- **birthday** (*str, datetime.date or None*) – Birthday. If a string is provided, it should encode the date as `YYYY-MM-DD` value.
- **url** (*str, iterable of strings, or None*) – Homepage. Multiple values are allowed.
- **pobox** (*str or None*) – P.O. box (address information).
- **street** (*str or None*) – Street address.
- **city** (*str or None*) – City (address information).
- **region** (*str or None*) – Region (address information).
- **zipcode** (*str or None*) – Zip code (address information).
- **country** (*str or None*) – Country (address information).
- **org** (*str or None*) – Company / organization name.
- **lat** (*float or None*) – Latitude.
- **lng** (*float or None*) – Longitude.
- **source** (*str or None*) – URL where to obtain the vCard.
- **rev** (*str, datetime.date or None*) – Revision of the vCard / last modification date.
- **title** (*str, iterable of strings, or None*) – Job Title. Multiple values are allowed.
- **photo_uri** (*str, iterable of strings, or None*) – Photo URI. Multiple values are allowed.

Return type str

segno.helpers.**make_wifi**(*ssid*, *password*, *security*, *hidden=False*)

Creates a WIFI configuration QR Code.

Parameters

- **ssid** (*str*) – The SSID of the network.
- **password** (*str or None*) – The password.
- **security** (*str or None*) – Authentication type; the value should be "WEP" or "WPA". Set to `None` to omit the value. "nopass" is equivalent to setting the value to `None` but in the former case, the value is not omitted.

- **hidden** (*bool*) – Indicates if the network is hidden (default: `False`)

Return type *segno.QRCode*

`segno.helpers.`**make_wifi_data**(*ssid*, *password*, *security*, *hidden=False*)

Creates WIFI configuration string.

Parameters

- **ssid** (*str*) – The SSID of the network.
- **password** (*str or None*) – The password.
- **security** (*str or None*) – Authentication type; the value should be "WEP" or "WPA". Set to `None` to omit the value. "nopass" is equivalent to setting the value to `None` but in the former case, the value is not omitted.
- **hidden** (*bool*) – Indicates if the network is hidden (default: `False`)

Return type str

CHAPTER 15

Segno's low level API

segno.make(), *segno.make_qr()*, and *segno.make_micro()* return a *segno.QRCode* instance which implements almost no logic but uses the result of *segno.encoder.encode()* glued together with the functionality of *segno.writers* to provide a simple, user-friendly API.

A completely different API is possible by utilizing *segno.encoder.encode()* which returns just a tuple: `(matrix, version, error, mask, segments)`.

The module *segno.writers* (expecting just a matrix) is independent of the *segno.encoder* module and vice versa.

15.1 segno.encoder

QR Code and Micro QR Code encoder.

"QR Code" and "Micro QR Code" are registered trademarks of DENSO WAVE INCORPORATED.

exception segno.encoder.**QRCodeError**
Generic QR Code error.

exception segno.encoder.**VersionError**
Indicates errors related to the QR Code version.

exception segno.encoder.**ModeError**
Indicates errors related to QR Code mode.

exception segno.encoder.**ErrorLevelError**
Indicates errors related to QR Code error correction level.

exception segno.encoder.**MaskError**
Indicates errors related to QR Code data mask.

exception segno.encoder.**DataOverflowError**
Indicates a problem that the provided data does not fit into the provided QR Code version or the data is too large in general.

segno.encoder.**encode**(*content*, *error=None*, *version=None*, *mode=None*, *mask=None*, *encoding=None*, *eci=False*, *micro=None*, *boost_error=True*)

Creates a (Micro) QR Code.

See *segno.make()* for a detailed description of the parameters.

Contrary to `make` this function returns a named tuple: `(matrix, version, error, mask, segments)`

Note that `version` is always an integer referring to the values of the `segno.consts` constants. `error` is `None` iff a M1 QR Code was generated, otherwise it is always an integer.

Return type namedtuple

segno.encoder.**encode_sequence**(*content*, *error=None*, *version=None*, *mode=None*, *mask=None*, *encoding=None*, *eci=False*, *boost_error=True*, *symbol_count=None*)

EXPERIMENTAL: Creates a sequence of QR Codes in Structured Append mode.

Returns Iterable of named tuples, see *encode()* for details.

15.2 segno.writers

Standard serializers and utility functions for serializers.

The serializers are independent of the *segno.QRCode* (and the `segno.encoder.Code`) class; they just need a matrix (tuple of bytearrays) and the version constant.

segno.writers.**writable**(**args*, ***kwds*)

Returns a writable file-like object.

Usage:

```
with writable(file_name_or_path, 'wb') as f:
    ...
```

Parameters

- **file_or_path** – Either a file-like object or a filename.
- **mode** (*str*) – String indicating the writing mode (i.e. `'wb'`)

segno.writers.**write_svg**(*matrix*, *version*, *out*, *scale=1*, *border=None*, *color=u'#000'*, *background=None*, *xmldecl=True*, *svgns=True*, *title=None*, *desc=None*, *svgid=None*, *svgclass=u'segno'*, *lineclass=u'qrline'*, *omitsize=False*, *unit=None*, *encoding=u'utf-8'*, *svgversion=None*, *nl=True*)

Serializes the QR Code as SVG document.

Parameters

- **matrix** – The matrix to serialize.
- **version** (*int*) – The (Micro) QR code version
- **out** – Filename or a file-like object supporting to write bytes.
- **scale** – Indicates the size of a single module (default: 1 which corresponds to 1 x 1 pixel per module).
- **border** (*int*) – Integer indicating the size of the quiet zone. If set to `None` (default), the recommended border size will be used (`4` for QR Codes, `2` for a Micro QR Codes).

- **color** – Color of the modules (default: `#000`). Any value which is supported by SVG can be used. In addition, `None` is a valid value. The resulting path won't have a `stroke` attribute.
- **background** – Optional background color (default: `None` = no background color). See *color* for valid values.
- **xmldecl** (*bool*) – Inidcates if the XML declaration header should be written (default: `True`)
- **svgns** (*bool*) – Indicates if the SVG namespace should be written (default: `True`).
- **title** (*str*) – Optional title of the generated SVG document.
- **desc** (*str*) – Optional description of the generated SVG document.
- **svgid** – The ID of the SVG document (if set to `None` (default), the SVG element won't have an ID).
- **svgclass** – The CSS class of the SVG document (if set to `None`, the SVG element won't have a class).
- **lineclass** – The CSS class of the path element (which draws the "black" modules (if set to `None`, the path won't have a class).
- **omitsize** (*bool*) – Indicates if width and height attributes should be omitted (default: `False`). If these attributes are omitted, a `viewBox` attribute will be added to the document.
- **unit** (*str*) – Unit for width / height and other coordinates. By default, the unit is unspecified and all values are in the user space. Valid values: em, ex, px, pt, pc, cm, mm, in, and percentages
- **encoding** (*str*) – Encoding of the XML document. "utf-8" by default.
- **svgversion** (*float*) – SVG version (default: None)
- **nl** (*bool*) – Indicates if the document should have a trailing newline (default: `True`)

segno.writers.**write_png**(*matrix*, *version*, *out*, *scale=1*, *border=None*, *color=u'#000'*, *background=u'#fff'*, *compresslevel=9*, *dpi=None*, *addad=True*, *colormap=None*)

Serializes the QR Code as PNG image.

By default, the generated PNG will be a greyscale image with a bitdepth of 1. If different colors are provided, an indexed-color image with the same bitdepth is generated.

Parameters

- **matrix** – The matrix to serialize.
- **version** (*int*) – The (Micro) QR code version
- **out** – Filename or a file-like object supporting to write bytes.
- **scale** – Indicates the size of a single module (default: 1 which corresponds to 1 x 1 pixel per module).
- **border** (*int*) – Integer indicating the size of the quiet zone. If set to `None` (default), the recommended border size will be used (`4` for QR Codes, `2` for a Micro QR Codes).
- **color** – Color of the modules (default: black). The color can be provided as `(R, G, B)` tuple, as web color name (like "red") or in hexadecimal format (`#RGB` or `#RRGGBB`).
- **background** – Optional background color (default: white). See *color* for valid values. In addition, `None` is accepted which indicates a transparent background.

- **dpi** (*int*) – Optional DPI setting. By default (`None`), the PNG won't have any DPI information. Note that the DPI value is converted into meters since PNG does not support any DPI information.
- **compresslevel** (*int*) – Integer indicating the compression level (default: 9). 1 is fastest and produces the least compression, 9 is slowest and produces the most. 0 is no compression.
- **colormap** (*dict*) – Optional module type -> color mapping. If provided, the *color* and *background* arguments are ignored. All undefined module types will have the default colors (light: white, dark: black). See *color* for valid color values. `None` is accepted as valid color value as well (becomes transparent).

`segno.writers.`**write_eps**(*matrix*, *version*, *out*, *scale=1*, *border=None*, *color=u'#000'*, *background=None*)

Serializes the QR Code as EPS document.

Parameters

- **matrix** – The matrix to serialize.
- **version** (*int*) – The (Micro) QR code version
- **out** – Filename or a file-like object supporting to write strings.
- **scale** – Indicates the size of a single module (default: 1 which corresponds to 1 point (1/72 inch) per module).
- **border** (*int*) – Integer indicating the size of the quiet zone. If set to `None` (default), the recommended border size will be used (`4` for QR Codes, `2` for a Micro QR Codes).
- **color** – Color of the modules (default: black). The color can be provided as `(R, G, B)` tuple (this method acceppts floats as R, G, B values), as web color name (like "red") or in hexadecimal format (`#RGB` or `#RRGGBB`).
- **background** – Optional background color (default: `None` = no background color). See *color* for valid values.

`segno.writers.`**write_pdf**(*matrix*, *version*, *out*, *scale=1*, *border=None*, *color=u'#000'*, *background=None*, *compresslevel=9*)

Serializes the QR Code as PDF document.

Parameters

- **matrix** – The matrix to serialize.
- **version** (*int*) – The (Micro) QR code version
- **out** – Filename or a file-like object supporting to write bytes.
- **scale** – Indicates the size of a single module (default: 1 which corresponds to 1 x 1 pixel per module).
- **border** (*int*) – Integer indicating the size of the quiet zone. If set to `None` (default), the recommended border size will be used (`4` for QR Codes, `2` for a Micro QR Codes).
- **color** – Color of the modules (default: black). The color can be provided as `(R, G, B)` tuple, as web color name (like "red") or in hexadecimal format (`#RGB` or `#RRGGBB`).
- **background** – Optional background color (default: `None` = no background color). See *color* for valid values.
- **compresslevel** (*int*) – Integer indicating the compression level (default: 9). 1 is fastest and produces the least compression, 9 is slowest and produces the most. 0 is no compression.

segno.writers.**write_txt**(*matrix*, *version*, *out*, *border=None*, *color=u'1'*, *background=u'0'*)
Serializes QR code in a text format.

Parameters

- **matrix** – The matrix to serialize.
- **version** (*int*) – The (Micro) QR code version
- **out** – Filename or a file-like object supporting to write text.
- **border** (*int*) – Integer indicating the size of the quiet zone. If set to `None` (default), the recommended border size will be used (`4` for QR Codes, `2` for a Micro QR Codes).
- **color** – Character to use for the black modules (default: '1')
- **background** – Character to use for the white modules (default: '0')

segno.writers.**write_pbm**(*matrix*, *version*, *out*, *scale=1*, *border=None*, *plain=False*)
Serializes the matrix as PBM image.

Parameters

- **matrix** – The matrix to serialize.
- **version** (*int*) – The (Micro) QR code version
- **out** – Filename or a file-like object supporting to write binary data.
- **scale** – Indicates the size of a single module (default: 1 which corresponds to 1 x 1 pixel per module).
- **border** (*int*) – Integer indicating the size of the quiet zone. If set to `None` (default), the recommended border size will be used (`4` for QR Codes, `2` for a Micro QR Codes).
- **plain** (*bool*) – Indicates if a P1 (ASCII encoding) image should be created (default: False). By default a (binary) P4 image is created.

segno.writers.**write_pam**(*matrix*, *version*, *out*, *scale=1*, *border=None*, *color=u'#000'*, *background=u'#fff'*)
Serializes the matrix as PAM image.

Parameters

- **matrix** – The matrix to serialize.
- **version** (*int*) – The (Micro) QR code version
- **out** – Filename or a file-like object supporting to write binary data.
- **scale** – Indicates the size of a single module (default: 1 which corresponds to 1 x 1 pixel per module).
- **border** (*int*) – Integer indicating the size of the quiet zone. If set to `None` (default), the recommended border size will be used (`4` for QR Codes, `2` for a Micro QR Codes).
- **color** – Color of the modules (default: black). The color can be provided as `(R, G, B)` tuple, as web color name (like "red") or in hexadecimal format (`#RGB` or `#RRGGBB`).
- **background** – Optional background color (default: white). See *color* for valid values. In addition, `None` is accepted which indicates a transparent background.

segno.writers.**write_xpm**(*matrix*, *version*, *out*, *scale=1*, *border=None*, *color=u'#000'*, *background=u'#fff'*, *name=u'img'*)
Serializes the matrix as XPM image.

Parameters

- **matrix** – The matrix to serialize.
- **version** (*int*) – The (Micro) QR code version
- **out** – Filename or a file-like object supporting to write binary data.
- **scale** – Indicates the size of a single module (default: 1 which corresponds to 1 x 1 pixel per module).
- **border** (*int*) – Integer indicating the size of the quiet zone. If set to `None` (default), the recommended border size will be used (`4` for QR Codes, `2` for a Micro QR Codes).
- **color** – Color of the modules (default: black). The color can be provided as `(R, G, B)` tuple, as web color name (like "red") or in hexadecimal format (`#RGB` or `#RRGGBB`).
- **background** – Optional background color (default: white). See *color* for valid values. `None` indicates a transparent background.
- **name** (*str*) – Name of the image (must be a valid C-identifier). Default: "img".

segno.writers.**write_xbm**(*matrix*, *version*, *out*, *scale=1*, *border=None*, *name=u'img'*)

Serializes the matrix as XBM image.

Parameters

- **matrix** – The matrix to serialize.
- **version** (*int*) – The (Micro) QR code version
- **out** – Filename or a file-like object supporting to write text data.
- **scale** – Indicates the size of a single module (default: 1 which corresponds to 1 x 1 in the provided unit per module).
- **border** (*int*) – Integer indicating the size of the quiet zone. If set to `None` (default), the recommended border size will be used (`4` for QR Codes, `2` for a Micro QR Codes).
- **name** – Prefix for the variable names. Default: "img". The prefix is used to construct the variable names: `` `#define <prefix>_width` `static unsigned char <prefix>_bits[]` ``

segno.writers.**write_tex**(*matrix*, *version*, *out*, *scale=1*, *border=None*, *color=u'black'*, *unit=u'pt'*, *url=None*)

Serializes the matrix as LaTeX PGF picture.

Requires the PGF/TikZ package (i.e. `\usepackage{pgf}`) in the LaTeX source.

Parameters

- **matrix** – The matrix to serialize.
- **version** (*int*) – The (Micro) QR code version
- **out** – Filename or a file-like object supporting to write text data.
- **scale** – Indicates the size of a single module (default: 1 which corresponds to 1 x 1 in the provided unit per module).
- **border** (*int*) – Integer indicating the size of the quiet zone. If set to `None` (default), the recommended border size will be used (`4` for QR Codes, `2` for a Micro QR Codes).
- **color** (*str*) – LaTeX color name. The color name is taken at it is, so ensure that it refers either to a default color name or that the color was defined previously.
- **unit** – Unit of the drawing (default: `pt`)

- **url** – Optional URL where the QR Code should point to. Requires the "hyperref" package. Default: `None`.

`segno.writers.`**write_terminal**(*matrix*, *version*, *out*, *border=None*)

Function to write to a terminal which supports ANSI escape codes.

Parameters

- **matrix** – The matrix to serialize.
- **version** (*int*) – The (Micro) QR code version.
- **out** – Filename or a file-like object supporting to write text.
- **border** (*int*) – Integer indicating the size of the quiet zone. If set to `None` (default), the recommended border size will be used (`4` for QR Codes, `2` for a Micro QR Codes).

CHAPTER 16

Python 2 Statement

While Segno becomes a Python 3-first package, Python 2.7 is still supported after January 2020.

There are no plans to drop support for Python 2, Segno supports it as long as technically possible.

CHAPTER 17

Changes

17.1 0.3.4 – 2020-01-02

- Fixed issue #54: After last change (see 0.3.3), white background with transparent QR Code did not work. Enhanced test suite to cover all possible inputs for PNG grayscale mode
- Removed interpretation of `addad` from PNG serializer. Contradicts the claim to create small images by default. It still belongs to the function signature but will be removed in release 0.4.0
- The option `--no-ad` (CLI) is still available but ignored and will be removed in release 0.4.0. Removed the option from man page.
- Added option to PNG serializer to provide more than two colors. Each module type may have its own color.
- Added support for EPC QR Codes.
- Fixed bug in `helpers.make_vcard_data` function (the "source" URL was not used, but the usual URL was added to the SOURCE field)
- Better test coverage for the `segno.helpers` module

17.2 0.3.3 – 2019-12-29

- Fixed issue #54: PNGs with white color and transparent background were rendered as transparent PNG with a *black* QR Code.
- Removed test environments CPython 3.4 and 3.6 from tox
- Improved documentation
- Refactored source code
- Added test cases
- Fixed bugs in `helpers.make_vcard_data` function (superfluous semicolon in birthday line, check geo coordinates)

- Renamed `utils.matrix_iter_detail` into `utils.matrix_iter_verbose`. Kept `matrix_iter_detail` for backwards compatibility (deprecated)
- Moved module constants from `segno.utils` into `segno.moduletypes`, Constants from `segno.utils` will be removed within the next release.
- Added option `verbose` (default: `False`) to `segno.QRCode.matrix_iter()` which returns an iterator which provides information about the module type (i.e. quiet zone, dark data module, light data module).

17.3 0.3.2 – 2019-07-15

- Performance improvements
- Added man page for the CLI (fixes #41)
- Added more documentation and examples
- Fixed missing charts of <https://segno.readthedocs.io/en/stable/comparison-qrcode-libs.html>
- Added PyQRCodeNG <https://pypi.org/project/PyQRCodeNG/> to comparison table
- Updated CSS for a better layout of tables with a lot of content
- Removed deprecated functions `encoder.score_n1`, `encoder.score_n2`, `encoder.score_n3`, and `encoder.score_n4` (they didn't belong to the public API anyway)
- Fixed Read the Docs build

17.4 0.3.1 – 2019-07-15

- See 0.3.2

17.5 0.3.0 – 2019-06-25

- Performance improvements (evaluation of mask scores)
- Faster PNG output
- Faster `utils.matrix_iter` (which improves several writers, i.e. PNG)
- Deprecation of `encoder.score_n1`, `encoder.score_n2`, `encoder.score_n3`, and `encoder.score_n4`. Use `encoder.mask_scores` or `encoder.evaluate_mask`.

17.6 0.2.9 – 2019-04-24

- Fixed typos
- PDF serializer: Added support for stroke and background color, initial code contributed by Serge Morel (pr #52).

17.7 0.2.8 – 2018-10-17

- Fixed #45: CLI does not raise exceptions but indicates errors with return code 1 and writes the error message to `sys.stderr`
- Added experimental `utils.matrix_iter_detail()` function which returns an iterator over the matrix to distinguish different dark and light modules by their function (i.e. separator, finder pattern etc.)
- Minor performance improvements
- Removed Python 2.6 from test environment
- Added support for vCard TITLE attribute, contributed by Stefano Borini
- Added support for vCard PHOTO URI attribute, suggested by Arthur Reinhart

17.8 0.2.7 – 2018-02-18

- Fixed dist package

17.9 0.2.6 – 2018-02-18

- Updated and fixed docs
- Added PyPy 3 to test environment

17.10 0.2.5 – 2017-02-14

- Added experimental support for Structured Append (divide content into max. 16 QR Code symbols)
- Internal refactoring (i.e. segno/scripts/cmd.py -> segno/cli.py)
- Added `-s` shortcut to Segno's command line interface to provide the scaling factor
- Added `-b` shortcut to Segno's command line interface to provide the border / quiet zone
- CLI accepts unquoted, whitespace separated content: `segno "Comfortably Numb"` can be written as `segno Comfortably Numb`

17.11 0.2.4 – 2017-01-31

- Fixed #33: Some Micro QR Codes may be unreadable due to wrong format information. Further, M1 and M3 codes may be wrong due to wrong encoding of final data symbol character (8 bits instead of (correct) 4 bits). Thanks to Nicolas Boullis for the bug report, initial fix, tests and patience.
- Fixed #34: Change default error level from "M" to "L" to avoid surprises that the content does not fit into the provided version. This change is somewhat backwards incompatible.
- Fixed #35: Check of user supplied mask pattern index was wrong.
- Fixed #36: Wrong placement of codeword in M1 and M3 symbols.
- Fixed #37: Generation of M1 / M3 symbols fail if the data modules are completely filled.

- Fixed #38: Optimized mask pattern choosing algorithm: If the user supplied a preferred mask, the mask evaluation step is skipped and the preferred mask is chosen
- Added more internal checks to ensure correct (Micro) QR Codes; provided helpful exceptions
- Removed `writers.get_writable` (replaced by `writers.writable`)
- Added support for serializing QR Codes as XBM (X BitMap) (supports black / white images)
- Added support for serializing QR Codes as XPM (X PixMap) (supports colors and transparency)
- Added support for encoding contact information as vCard version 3.0 (`segno.helpers`)
- Added -V shortcut to Segno's command line script to show version information
- Better test coverage for command line script
- Better test coverage for M1 and M3 symbols

17.12 0.2.3 – 2016-10-17

- Fixed #27: Email URI is wrong if CC or BCC is used.
- Fixed #32: Don't add version attribute if SVG >= 2.0
- Deprecated `writers.get_writable`; use `writers.writable` `writers.writable` closes file-like objects automatically (if necessary); replace `writable, must_close = writers.get_writable(filename_or_buffer, mode)` with `with writers.writable(filename_or_buffer, mode) as f`
- Added option to PNG serializer to specify an optional DPI value (thanks to Markus Ueberall for support)
- Added PAM (Portable Arbitrary Map) as serialization format (supports colors and transparency)

17.13 0.2.2 – 2016-09-21

- Command line script reports Segno's version (`--ver`) and the version is also mentioned in the help message (`-h`) (#24)
- Support for creating email addresses or complete messages (`segno.helpers`)
- Internal optimizations and more correct minimal version finding (#26)

17.14 0.2.1 – 2016-09-15

- Fixed Python packaging (source distribution did not work), again

17.15 0.2.0 – 2016-09-15

- Fixed Python packaging

17.16 0.1.9 – 2016-09-15

- Added "color" parameter to the LaTeX serializer to define the color of the dark modules.
- Fixed serious issue #23: Segno creates invalid QR Codes if boost_error is not disabled (enabled by default)

17.17 0.1.8 – 2016-09-14

- Removed `utils.matrix_with_border_iter`
- Fixed #21 (type error while writing to terminal under Windows)
- Added option to serialize QR Codes as LaTeX vector graphic
- Added module `segno.helpers` which provides additional factory funcitons to create common QR Codes like a WIFI configuration, a geo location or MeCard

17.18 0.1.7 – 2016-09-04

- Changed API: Added a feature to increase the error correction level if it fits. Disable this feature via `boost_error=False` (#16)
- Added `--no-error-boost` to the command line script to disable error correction level incrementation (#17)
- Command line script: Internal changes and better test coverage
- Added tests for issue #18
- Added PBM (P1 and P4) serialization.
- Deprecated `utils.matrix_with_border_iter`, use `utils.matrix_iter`
- `utils.matrix_with_border_iter` will be removed in the next release
- API change: `QRCode.matrix_iter(border)` -> `QRCode.matrix_iter(scale=1, border=None)`

17.19 0.1.6 – 2016-08-25

- Fixed setup

17.20 0.1.5 – 2016-08-24

- Added QRCode.matrix_iter(border) which returns an iterator over the matrix and includes the border (as light modules).
- Invalid (empty) SVG identifiers / class names are ignored and do not result into an invalid SVG document (issue #8).
- SVG serializer: If `unit` was set to `None`, an invalid SVG document was generated (issue #14).
- Better command line support:
  - The command line script recognizes all SVG options (#9)

  - Added `--mode`/`-m`, renamed `--mask`/`-m` to `--pattern`/`-p` (issue #10)
  - The script used an empty string as default value for the data to encode. The data to encode has no default value anymore (issue #11)
  - Added `--no-ad` to omit the comment `Software` in PNG images (issue #12)

17.21 0.1.4 – 2016-08-21

- Better terminal output
- Fixed issue #5: QRCode.terminal() uses a special output function (if it detects Windows) to support MS Windows which may not support ANSI escape codes.

17.22 0.1.3 – 2016-08-20

- Added command line script "segno"
- Registered new file extension "ans" which serializes the QR Code as ANSI escape code (same output as QRCode.terminal())
- Removed deprecated methods "eps", "svg", "png", "pdf", and "txt" from segno.QRCode
- Switched from nose tests to py.test

17.23 0.1.2 – 2016-08-17

- Updated docs
- Backwards incompatible change: Deprecated "eps", "svg", "png", "pdf", and "txt" methods from QRCode. Use QRCode.save. Methods will be removed in 0.1.3
- Fixed issue #3 (M1 and M3 codes may have undefined areas)
- Fixed issue #4 (wrong 'error' default value for encoder.encode(), factory function segno.make() wasn't affected)

17.24 0.1.1 – 2016-08-14

- Initial release

CHAPTER 18

Indices and tables

- genindex
- modindex
- search

Python Module Index

S

Index

Symbols

C

D

E

V

W