

microvg

*User Manual*



**MICROEJ<sup>®</sup>**

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# Chapter 1. Data Structure Documentation

## 1.1. MICROUI\_FontVG Struct Reference

Represents a MicroUI Font extended by MicroVG.

### Data Fields

- MICROUI\_Font ui\_font  
The MicroUI Font header.
- jint vg\_font\_handle  
The identifier of the MicroVG Font.
- jint vg\_font\_size  
The size to apply on the MicroVG Font.

#### 1.1.1. Detailed Description

Represents a MicroUI Font extended by MicroVG.

See also. `getFont(int size)` in `VectorFont.java`

Definition at line 67 of file `ui_font_drawing_vg.c`.

The documentation for this struct was generated from the following file:  
`bsp/vg/src/ui_font_drawing_vg.c`

## 1.2. MICROVG\_PATH\_HEADER Struct Reference

### Data Fields

- uint32\_t
- uint8\_t
- uint8\_t
- uint8\_t
- uint8\_t
- float
- float
- float

- float

## 1.2.1. Detailed Description

Definition at line 54 of file `vg_path.h`.

The documentation for this struct was generated from the following file:  
`bsp/vg/inc/vg_path.h`

---

# Chapter 2. File Documentation

## 2.1. bsp/vg/inc/vg\_configuration.h File Reference

MicroEJ MicroVG library low level API: enable some features according to the hardware capacities.

```
#include "ui_configuration.h"
```

### Macros

- #define MICROVG\_CONFIGURATION\_VERSION (4)

Compatibility sanity check value. This define value is checked in the implementation to validate that the version of this configuration is compatible with the implementation.

- #define (1)
- #define (2)
- #define (1)
- #define (2)
- #define (1)
- #define (2)
- #define VG\_FEATURE\_PATH\_SINGLE\_ARRAY
- #define VG\_FEATURE\_GRADIENT\_FULL
- #define VG\_FEATURE\_FONT\_FREETYPE\_VECTOR
- #define
- #define
- #define
- #define
- #define
- #define (80 \* 1024)
- #define (80 \* 1024)

### 2.1.1. Detailed Description

MicroEJ MicroVG library low level API: enable some features according to the hardware capacities.

Author. MicroEJ Developer Team

## 2.1.2. Macro Definition Documentation

### 2.1.2.1. MICROVG\_CONFIGURATION\_VERSION

```
#define MICROVG_CONFIGURATION_VERSION (4)
```

Compatibility sanity check value. This define value is checked in the implementation to validate that the version of this configuration is compatible with the implementation.

This value must not be changed by the user of the CCO. This value must be incremented by the implementor of the CCO when a configuration define is added, deleted or modified.

Definition at line 34 of file vg\_configuration.h.

## 2.2. bsp/vg/inc/vg\_freetype.h File Reference

MicroEJ MicroVG library low level API: implementation over FreeType.

```
#include "vg_configuration.h"
#include "vg_path.h"
```

## Typedefs

- typedef jint(\*) (VG\_PATH\_HEADER\_t \*path, jfloat \*matrix, uint32\_t color, bool fill\_rule\_even\_odd, void \*user\_data)

## Functions

- void (void)
- jfloat (jchar \*text, jint length, jint face\_handle, jfloat size, jfloat letter\_spacing)
- jint (VG\_FREETYPE\_draw\_glyph\_t drawer, const jchar \*text, jint length, jint face\_handle, jfloat size, const jfloat \*matrix, uint32\_t color, jfloat letter\_spacing, jfloat radius, jint direction, void \*user\_data)
- jint (jint color)

### 2.2.1. Detailed Description

MicroEJ MicroVG library low level API: implementation over FreeType.

Author. MicroEJ Developer Team

Version. 7.0.0



## 2.3. bsp/vg/inc/vg\_helper.h File Reference

MicroEJ MicroVG library low level API: helper to implement library natives methods.

```
#include <stdio.h>
#include <sni.h>
#include "mej_log.h"
```

### Macros

- `#define (fmt, ...)`
- `#define (fmt, ...) MEJ_LOG(ERROR, MICROVG, fmt, ## __VA_ARGS__)`
- `#define VG_HELPER_NULL_GRADIENT 0`

Set this define to monitor freetype heap evolution. It needs `MEJ_LOG_MICROVG` and `MEJ_LOG_INFO_LEVEL` defines to print the heap logs.

- `#define FT_FACE_FLAG_COMPLEX_LAYOUT (((uint32_t)1) << 31)`

Freetype supplementary flag for complex layout Uses a free bit in freetype face flags to convey the complex layout mode information with the freetype face. freetype.h must be checked on freetype update to ensure that this bit is still free.

- `#define 3.1415926535`
- `#define (r) ((r) * (180.0f / M_PI))`
- `#define (d) (((d) * M_PI) / 180.0f)`
- `#define (f) (*(uint32_t *)&(f))`
- `#define (i) *(float *)&(i)`

### Functions

- `void (void)`
- `int VG_HELPER_get_utf (const unsigned short *text, int length, int *offset)`

Gets the UTF character from a text buffer at the given offset and updates the offset to point to the next character.

- `void (int faceHandle, const unsigned short *text, int length)`
- `bool (int *glyph_idx, int *x_advance, int *y_advance, int *x_offset, int *y_offset)`
- `const jfloat * (const jfloat *matrix)`
- `uint32_t (uint32_t color, uint32_t alpha)`
- `void (jfloat *dest, jfloat x, jfloat y, const jfloat *matrix)`

## 2.3.1. Detailed Description

MicroEJ MicroVG library low level API: helper to implement library natives methods.

Author.    MicroEJ Developer Team

Version.    7.0.0

## 2.3.2. Macro Definition Documentation

### 2.3.2.1. VG\_HELPER\_NULL\_GRADIENT

```
#define VG_HELPER_NULL_GRADIENT 0
```

Set this define to monitor freetype heap evolution. It needs MEJ\_LOG\_MICROVG and MEJ\_LOG\_INFO\_LEVEL defines to print the heap logs.

NULL Gradient value

Definition at line 57 of file vg\_helper.h.

## 2.3.3. Function Documentation

### 2.3.3.1. VG\_HELPER\_get\_utf()

```
int VG_HELPER_get_utf (const unsigned short * text, int length, int *  
offset)
```

Gets the UTF character from a text buffer at the given offset and updates the offset to point to the next character.

Some characters have some special values; they are made up of two Unicode characters in two specific ranges such that the first Unicode character is in one range (for example 0xD800-0xD8FF) and the second Unicode character is in the second range (for example 0xDC00-0xDCFF). This is called a surrogate pair.

If a surrogate pair is incomplete (missing second character), this function returns "0" (error) and does not update the offset.

Parameters .

Table 2.1.

in	text	text buffer encoded in UTF16 where to read UTF character.
in	length	length of the text buffer.
	[in/out]	offset: offset in the text buffer where to read UTF character. Updated to the next character position.

Returns.    The decoded UTF character.

Definition at line 164 of file vg\_helper.c.

```
164
    {
165        highPart = GET_NEXT_CHARACTER(textCharRam, length, *offset);
166        ret = 0;
167
168        ((highPart >= MIN_HIGH_SURROGATE) && (highPart <=
            MAX_HIGH_SURROGATE)) {
169            (*offset < (length - 1)) {
170                lowPart = GET_NEXT_CHARACTER(textCharRam, length,
                    *(offset) + 1);
171
172                ((lowPart >= MIN_LOW_SURROGATE) && (lowPart <=
                    MAX_LOW_SURROGATE)) {
173                    *offset += 2;
174
175                    ret = 0;
176                    ret += ((int)highPart - ()MIN_HIGH_SURROGATE);
177                    ret <= (int)10;
178                    ret += ((int)lowPart - ()MIN_LOW_SURROGATE);
179                    ret += (int)MIN_SUPPLEMENTARY_CODE_POINT;
180                }
181            }
182        }
183    } {
184        *offset += 1;
185
186
187        ret = 0x0000FFFF & (int)highPart;
188    }
189
190    ret;
191
192 }
```

## 2.4. bsp/vg/inc/vg\_path.h File Reference

MicroEJ MicroVG library low level API: implementation of Path.

```
#include "vg_configuration.h"
#include <sni.h>
#include <stddef.h>
```

## Data Structures

- struct MICROVG\_PATH\_HEADER

## Typedefs

- typedef struct MICROVG\_PATH\_HEADER

## Functions

- uint8\_t (void)
- uint32\_t (jint command)
- void (void)
- uint32\_t (void)
- uint32\_t (jint command, uint32\_t nbParams)
- uint32\_t (jbyte \*path, jint array\_length, jint cmd)
- uint32\_t (jbyte \*path, jint array\_length, jint cmd, jfloat x, jfloat y)
- uint32\_t (jbyte \*path, jint array\_length, jint cmd, jfloat x1, jfloat y1, jfloat x2, jfloat y2)
- uint32\_t (jbyte \*path, jint array\_length, jint cmd, jfloat x1, jfloat y1, jfloat x2, jfloat y2, jfloat x3, jfloat y3)
- uint32\_t (jint command)

### 2.4.1. Detailed Description

MicroEJ MicroVG library low level API: implementation of Path.

Author.    MicroEJ Developer Team

Version.    7.0.0

## 2.5. bsp/vg/src/LLVG\_BVI\_impl\_stub.c File Reference

MicroVG library low level API: stubbed implementation of LLVG\_BVI\_impl.h.

```
#include "vg_configuration.h"
#include <LLVG_BVI_impl.h>
```

## Functions

- void (MICROUI\_Image \*ui, MICROVG\_Image \*vg)
- void (MICROUI\_GraphicsContext \*gc)

### 2.5.1. Detailed Description

MicroVG library low level API: stubbed implementation of LLVG\_BVI\_impl.h.

Author.    MicroEJ Developer Team

Version. 7.0.0

## 2.6. bsp/vg/src/LLVG\_FONT\_impl\_freetype.c File Reference

MicroEJ MicroVG library low level API: implementation over FreeType.

```
#include "vg_configuration.h"
```

### 2.6.1. Detailed Description

MicroEJ MicroVG library low level API: implementation over FreeType.

Author. MicroEJ Developer Team

Version. 7.0.0

## 2.7. bsp/vg/src/LLVG\_FONT\_impl\_stub.c File Reference

MicroEJ MicroVG library low level API: implementation over FreeType.

```
#include "vg_configuration.h"  
#include <LLVG_FONT_impl.h>  
#include <LLVG_PAINTER_impl.h>
```

## Functions

- jint (jchar \*font\_name, jboolean complex\_layout)
- jfloat (jchar \*text, jint faceHandle, jfloat size, jfloat letterSpacing)
- jfloat (jchar \*text, jint faceHandle, jfloat size)
- jfloat (jint faceHandle, jfloat size)
- jfloat (jint faceHandle, jfloat size)
- void (jint faceHandle)
- bool (void)

### 2.7.1. Detailed Description

MicroEJ MicroVG library low level API: implementation over FreeType.

Author. MicroEJ Developer Team

Version. 7.0.0

## 2.8. bsp/vg/src/LLVG\_GRADIENT\_impl\_stub.c File Reference

MicroVG library low level API: stub of the linear gradient implementation.

```
#include "vg_configuration.h"
```

### 2.8.1. Detailed Description

MicroVG library low level API: stub of the linear gradient implementation.

This implementation is only compatible with the configuration VG\_FEATURE\_GRADIENT\_FIRST\_COLOR. It only stores the very first gradient's color as current color.

Author. MicroEJ Developer Team

Version. 7.0.0

## 2.9. bsp/vg/src/LLVG\_MATRIX\_impl.c File Reference

MicroEJ MicroVG library low level API: basic implementation of matrix APIs.

```
#include <math.h>
#include <string.h>
#include <LLVG_MATRIX_impl.h>
#include "vg_helper.h"
```

## Functions

- void (jfloat \*matrix)
- void (jfloat \*dest, const jfloat \*src)
- void (jfloat \*dest, const jfloat \*a, const jfloat \*b)
- void (jfloat \*matrix, jfloat x, jfloat y)
- void (jfloat \*matrix, jfloat sx, jfloat sy)
- void (jfloat \*matrix, jfloat degrees)
- void (jfloat \*dest, const jfloat \*a, const jfloat \*b)
- void (jfloat \*matrix, jfloat x, jfloat y)

- void (jfloat \*matrix, jfloat scaleX, jfloat scaleY)
- void (jfloat \*matrix, jfloat angleDegrees)
- void (jfloat \*matrix, const jfloat \*other)
- void (jfloat \*matrix, jfloat dx, jfloat dy)
- void (jfloat \*matrix, jfloat sx, jfloat sy)
- void (jfloat \*matrix, jfloat degrees)
- void (jfloat \*matrix, const jfloat \*other)
- void (jfloat \*x, jfloat \*y, const jfloat \*matrix)

### 2.9.1. Detailed Description

MicroEJ MicroVG library low level API: basic implementation of matrix APIs.

Author.    MicroEJ Developer Team

Version.   7.0.0

## 2.10. bsp/vg/src/LLVG\_PAINTER\_impl.c File Reference

This file implements all MicroVG drawing native functions.

```
#include <LLVG_PAINTER_impl.h>
#include <LLUI_DISPLAY.h>
#include <LLVG_FONT_impl.h>
#include <LLVG_MATRIX_impl.h>
#include "vg_drawing.h"
#include "vg_helper.h"
#include "vg_trace.h"
```

### Macros

- #define                    (fn)                    LOG\_MICROVG\_START(LOG\_MICROVG\_DRAWING\_ID, CONCAT\_DEFINES(LOG\_MICROVG\_DRAW\_, fn))
- #define                    (fn)                    LOG\_MICROVG\_END(LOG\_MICROVG\_DRAWING\_ID, CONCAT\_DEFINES(LOG\_MICROVG\_DRAW\_, fn))

### Functions

- jint (MICROUI\_GraphicsContext \*gc, jbyte \*pathData, jint x, jint y, jfloat \*matrix, jint fillRule, jint blend, jint color)
- jint (MICROUI\_GraphicsContext \*gc, jbyte \*pathData, jint x, jint y, jfloat \*matrix, jint fillRule, jint alpha, jint blend, jint \*gradientData, jfloat \*gradientMatrix)

- jint (MICROUI\_GraphicsContext \*gc, jchar \*text, jint faceHandle, jfloat size, jfloat x, jfloat y, jfloat \*matrix, jint alpha, jint blend, jfloat letterSpacing)
- jint (MICROUI\_GraphicsContext \*gc, jchar \*text, jint faceHandle, jfloat size, jfloat x, jfloat y, jfloat \*matrix, jint alpha, jint blend, jfloat letterSpacing, jint \*gradientData, jfloat \*gradientMatrix)
- jint (MICROUI\_GraphicsContext \*gc, jchar \*text, jint faceHandle, jfloat size, jint x, jint y, jfloat \*matrix, jint alpha, jint blend, jfloat letterSpacing, jfloat radius, jint direction)
- jint (MICROUI\_GraphicsContext \*gc, jchar \*text, jint faceHandle, jfloat size, jint x, jint y, jfloat \*matrix, jint alpha, jint blend, jfloat letterSpacing, jfloat radius, jint direction, jint \*gradientData, jfloat \*gradientMatrix)
- jint (MICROUI\_GraphicsContext \*gc, MICROVG\_Image \*image, jint x, jint y, jfloat \*matrix, jint alpha, jlong elapsed, const float color\_matrix[])

### 2.10.1. Detailed Description

This file implements all MicroVG drawing native functions.

See also.    LLVG\_PAINTER\_impl.h file comment

Author.    MicroEJ Developer Team

Version.    7.0.0

## 2.11. bsp/vg/src/LLVG\_PATH\_impl\_dual.c File Reference

MicroVG library low level API: implementation of path.

```
#include "vg_configuration.h"
```

### 2.11.1. Detailed Description

MicroVG library low level API: implementation of path.

This implementation uses a 32-bit "integer" value to store a path command and a 32-bit "float" value to store each command parameter.

The encoding can be overridden, see "[optional]: weak functions" in "vg\_path.h"

Author.    MicroEJ Developer Team

Version.    7.0.0

## 2.12. bsp/vg/src/LLVG\_PATH\_impl\_single.c File Reference



MicroVG library low level API: implementation of path.

```
#include "vg_configuration.h"
```

## 2.12.1. Detailed Description

MicroVG library low level API: implementation of path.

This implementation uses a 32-bit "integer" value to store a path command and a 32-bit "float" value to store each command parameter.

The encoding can be overridden, see "[optional]: weak functions" in "vg\_path.h"

Author. MicroEJ Developer Team

Version. 7.0.0

## 2.13. bsp/vg/src/LLVG\_PATH\_impl\_stub.c File Reference

MicroVG library low level API: stubbed implementation of LLVG\_PATH\_impl.h and LLVG\_PATH\_PAINTER\_impl.h.

```
#include "vg_configuration.h"
#include <LLVG_PATH_impl.h>
```

## Functions

- jint (jbyte \*jpath, jint length)
- jint (jbyte \*jpath, jint length, jint cmd, jfloat x, jfloat y)
- jint (jbyte \*jpath, jint length, jint cmd, jfloat x1, jfloat y1, jfloat x2, jfloat y2)
- jint (jbyte \*jpath, jint length, jint cmd, jfloat x1, jfloat y1, jfloat x2, jfloat y2, jfloat x3, jfloat y3)
- void (jbyte \*jpath)

## 2.13.1. Detailed Description

MicroVG library low level API: stubbed implementation of LLVG\_PATH\_impl.h and LLVG\_PATH\_PAINTER\_impl.h.

Author. MicroEJ Developer Team

Version. 7.0.0

## 2.14. bsp/vg/src/vg\_freetype\_path.c File Reference

MicroEJ MicroVG library low level API: implementation over Freetype.

```
#include "vg_configuration.h"
```

### 2.14.1. Detailed Description

MicroEJ MicroVG library low level API: implementation over Freetype.

Author. MicroEJ Developer Team

Version. 7.0.0

## 2.15. bsp/vg/src/vg\_helper.c File Reference

MicroEJ MicroVG library low level API: helper to implement library natives methods.

```
#include "vg_configuration.h"
#include <LLVG_MATRIX_impl.h>
#include "vg_helper.h"
#include "vg_trace.h"
#include "vg_drawing.h"
```

## Macros

- #define ((unsigned short)0xD800)
- #define ((unsigned short)0xDBFF)
- #define ((unsigned short)0xDC00)
- #define ((unsigned short)0xDFFF)
- #define 0x010000
- #define (t, l, o) ((o) >= (l) ? (unsigned short)0 : (t)[o])
- #define true

## Functions

- void (void)
- int VG\_HELPER\_get\_utf (const unsigned short \*textCharRam, int length, int \*offset)

Gets the UTF character from a text buffer at the given offset and updates the offset to point to the next character.

- `const jfloat * (const jfloat *matrix)`
- `uint32_t (uint32_t color, uint32_t alpha)`
- `void (jfloat *dest, jfloat x, jfloat y, const jfloat *matrix)`

## Variables

- `int32_t`

### 2.15.1. Detailed Description

MicroEJ MicroVG library low level API: helper to implement library natives methods.

Author.    MicroEJ Developer Team

Version.    7.0.0

### 2.15.2. Function Documentation

#### 2.15.2.1. VG\_HELPER\_get\_utf()

```
int VG_HELPER_get_utf (const unsigned short * text, int length, int *  
offset)
```

Gets the UTF character from a text buffer at the given offset and updates the offset to point to the next character.

Some characters have some special values; they are made up of two Unicode characters in two specific ranges such that the first Unicode character is in one range (for example 0xD800-0xD8FF) and the second Unicode character is in the second range (for example 0xDC00-0xDCFF). This is called a surrogate pair.

If a surrogate pair is incomplete (missing second character), this function returns "0" (error) and does not update the offset.

Parameters .

Table 2.2.

in	text	text buffer encoded in UTF16 where to read UTF character.
in	length	length of the text buffer.
	[in/out]	offset: offset in the text buffer where to read UTF character. Updated to the next character position.

Returns.    The decoded UTF character.

Definition at line 164 of file `vg_helper.c`.

```
164      {
165          highPart = GET_NEXT_CHARACTER(textCharRam, length, *offset);
166          ret = 0;
167
168          ((highPart >= MIN_HIGH_SURROGATE) && (highPart <=
169              MAX_HIGH_SURROGATE)) {
170              (*offset < (length - 1)) {
171                  lowPart = GET_NEXT_CHARACTER(textCharRam, length,
172                      *(offset) + 1);
173
174                  ((lowPart >= MIN_LOW_SURROGATE) && (lowPart <=
175                      MAX_LOW_SURROGATE)) {
176                      *offset += 2;
177
178                      ret = 0;
179                      ret += ((int)highPart - ()MIN_HIGH_SURROGATE);
180                      ret <= (int)10;
181                      ret += ((int)lowPart - ()MIN_LOW_SURROGATE);
182                      ret += (int)MIN_SUPPLEMENTARY_CODE_POINT;
183                  }
184              }
185          } {
186              *offset += 1;
187
188              ret = 0x0000FFFF & (int)highPart;
189          }
190
191          ret;
192 }
```

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