

microvg

User Manual



MICROEJ[®]

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

Macros

- #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 VG_FEATURE_FREETYPE_TTF (0)

Set this define to 1 to enable the support of TTF font files (disabled by default).

- #define VG_FEATURE_FREETYPE_OTF (0)

Set this define to 1 to enable the support of OTF font files (disabled by default).

- #define (0)
- #define (0)
- #define (0)
- #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

2.2. 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. 8.0.0

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))`
- `#define REGISTERDESC(desc, buf, buf_len) if ((buf_len) >= sizeof(desc)) { (void)memcpy((buf), (desc), sizeof(desc)); }`

Registers the description of a SNI close function.

Functions

- `void LLUI_DISPLAY_waitAsynchronousDrawingEnd (void)`

Waits until the end of current asynchronous drawing.

- `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 (uint32_t *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. 8.0.0

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. LLUI_DISPLAY_waitAsynchronousDrawingEnd()

```
void LLUI_DISPLAY_waitAsynchronousDrawingEnd (void )
```

Waits until the end of current asynchronous drawing.

To avoid potential side effects from the release of objects (images, fonts) retained by a feature during the killing of that feature, ensure that no third-party components (e.g., GPU) are using these objects at the time of the kill.

UI packs with versions higher than 14.5.1 provide the blocking API `LLUI_DISPLAY_waitAsynchronousDrawingEnd()`. This API is stubbed on the VG Pack for backward compatibility issues between VG Pack 1.8.0 and UI Packs [14.4.0, 14.5.1]. However, it is highly recommended to use a UI Pack version greater than 14.5.1.

Definition at line 150 of file vg_helper.c.

```
150
    {
151
152 }
```

2.3.3.2. 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 159 of file vg_helper.c.

```

159
160     {
161         highPart = GET_NEXT_CHARACTER(textCharRam, length, *offset);
162         ret = 0;
163         ((highPart >= MIN_HIGH_SURROGATE) && (highPart <=
164             MAX_HIGH_SURROGATE)) {
165             (*offset < (length - 1)) {
166                 lowPart = GET_NEXT_CHARACTER(textCharRam, length,
167                     *(offset) + 1);
168                 ((lowPart >= MIN_LOW_SURROGATE) && (lowPart <=
169                     MAX_LOW_SURROGATE)) {
170                     *offset += 2;
171                     ret = 0;
172                     ret += ((int)highPart - (int)MIN_HIGH_SURROGATE);
173                     ret <= (int)10;
174                     ret += ((int)lowPart - (int)MIN_LOW_SURROGATE);
175                     ret += (int)MIN_SUPPLEMENTARY_CODE_POINT;
176                 }
177             }
178         } {
179             *offset += 1;
180         }
181         ret = 0x0000FFFF & (int)highPart;
182     }
183     ret;
184 }

```

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. 8.0.0

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"
```

2.5.1. Detailed Description

MicroVG library low level API: stubbed implementation of LLVG_BVI_impl.h.

Author. MicroEJ Developer Team

Version. 8.0.0

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. 8.0.0

2.7. bsp/vg/src/LLVG_FONT_impl_stub.c File Reference

MicroEJ MicroVG library low level API: stub implementation of LLVG_FONT_IMPL_xxx().

```
#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: stub implementation of LLVG_FONT_IMPL_xxx().

Author. MicroEJ Developer Team

Version. 8.0.0

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. 8.0.0

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. 8.0.0

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"
```

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. 8.0.0

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. 8.0.0

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. 8.0.0

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. 8.0.0

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. 8.0.0

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"
#include "bsp_util.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 (jint trace_group)
- BSP_DECLARE_WEAK_FCNT void LLUI_DISPLAY_waitAsynchronousDrawingEnd (void)
Waits until the end of current asynchronous drawing.
- 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. 8.0.0

2.15.2. Function Documentation

2.15.2.1. `LLUI_DISPLAY_waitAsynchronousDrawingEnd()`

```
BSP_DECLARE_WEAK_FCNT    void    LLUI_DISPLAY_waitAsynchronousDrawingEnd
(void )
```

Waits until the end of current asynchronous drawing.

To avoid potential side effects from the release of objects (images, fonts) retained by a feature during the killing of that feature, ensure that no third-party components (e.g., GPU) are using these objects at the time of the kill.

UI packs with versions higher than 14.5.1 provide the blocking API `LLUI_DISPLAY_waitAsynchronousDrawingEnd()`. This API is stubbed on the VG Pack for backward compatibility issues between VG Pack 1.8.0 and UI Packs [14.4.0, 14.5.1]. However, it is highly recommended to use a UI Pack version greater than 14.5.1.

Definition at line 150 of file `vg_helper.c`.

```
150        {
151
152 } }
```

2.15.2.2. `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 sec-

and 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 159 of file vg_helper.c.

```

159
    {
160        highPart = GET_NEXT_CHARACTER(textCharRam, length, *offset);
161        ret = 0;
162
163        ((highPart >= MIN_HIGH_SURROGATE) && (highPart <=
            MAX_HIGH_SURROGATE)) {
164            (*offset < (length - 1)) {
165                lowPart = GET_NEXT_CHARACTER(textCharRam, length,
                    *(offset) + 1);
166
167                ((lowPart >= MIN_LOW_SURROGATE) && (lowPart <=
                    MAX_LOW_SURROGATE)) {
168                    *offset += 2;
169
170                    ret = 0;
171                    ret += ((int)highPart - (int)MIN_HIGH_SURROGATE);
172                    ret <= (int)10;
173                    ret += ((int)lowPart - (int)MIN_LOW_SURROGATE);
174                    ret += (int)MIN_SUPPLEMENTARY_CODE_POINT;
175                }
176            }
177        }
178    } {
179        *offset += 1;
180
181
182
183        ret = 0x0000FFFF & (int)highPart;
184    }
185
186    ret;
187 }

```

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