SNAZZY EMBEDDED GUI APPLICATIONS DEVELOPMENT USING LOW-RESOURCE TECHNIQUES

Mike Susen
MCU Ecosystem

MARCH 2023

SECURE CONNECTIONS FOR A SMARTER WORLD

PUBLIC

TRENDS IN LOW-RESOURCE TECHNIQUES

More Products Include Graphical UIs

- Consumer goods are becoming smarter and a growing number are boasting complex user interfaces
- As new solutions evolve and advance, so does the need for high performance and power-efficiency

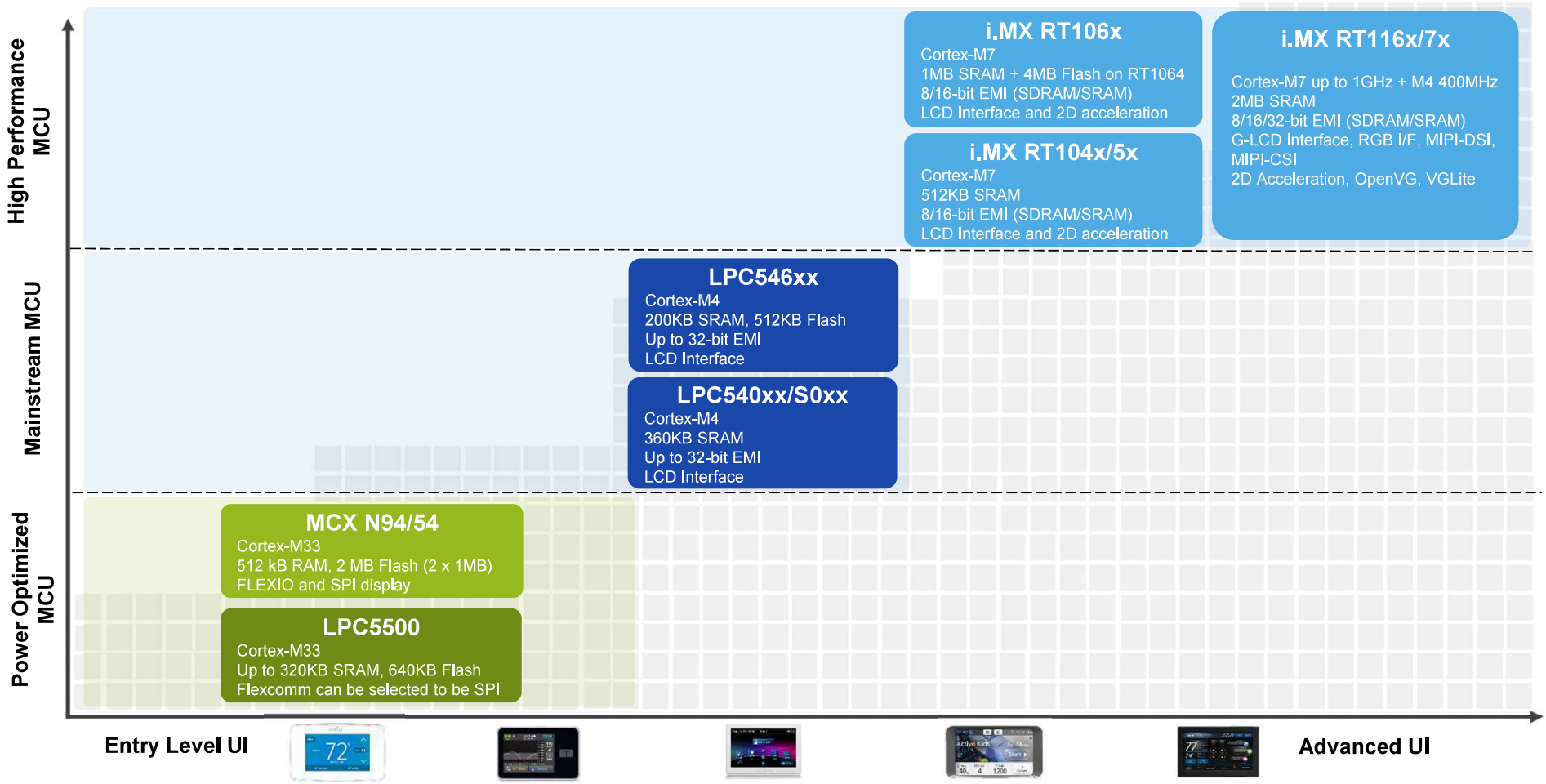
Hardware and Software Challenges

- External memories routing requires advanced skills and knowledge also as a layout design of PCB
- Configuring software and developing special drivers makes a high demands on developers

Resources Reduction

- Using internal RAM and optimizing graphics assets in application reduces BOM cost and PCB size
- No external memory consumpts no power, there is high energy reduction in final application

NXP MCUS OPTIMIZED FOR GRAPHICAL INTERFACES



RECOMMENDED NXP MCU FAMILIES FOR GRAPHICAL USER INTERFACES

		Core	Frequency	Memory	Graphics Acceleration	Display Interface / Controller	Resolutions
High Performance	i.MX RT1170	Cortex-M7 and Cortex-M4	1 GHz / 400 MHz	2 MB SRAM 2x Quad/Octal Mem Interface 8/16/32-bit EMI	PXP GPU	eLCDIF LCDIFv2 MIPI-DSI	Up to WXGA 1366x768
	i.MX RT1160	Cortex-M7 and Cortex-M4	600 MHz / 240 MHz	1 MB SRAM 2x Quad Mem Interface 8/16/32-bit EMI	PXP GPU	eLCDIF LCDIFv2 MIPI-DSI	Up to WXGA 1366x768
	i.MX RT500	Cortex-M33 and Fusion F1 DSP	275 MHz / 275 MHz	5 MB SRAM 2x Quad/Octal Mem Interface	PXP GPU	MIPI-DSI	Up to XGA 1024x768
	i.MX RT106x	Cortex-M7	600 MHz	512 KB SRAM 8/16-bit EMI	PXP	eLCDIF	Up to WXGA 1366x768
Mainstream	i.MX RT104x/5x	Cortex-M7	600 MHz	512 KB SRAM 8/16-bit EMI	PXP	eLCDIF	Up to WXGA 1366x768
	LPC546xx	Cortex-M4	220 MHz	512 KB Flash, 200 KB RAM Up to 32-bit EMI	–	LCDIF	Up to XGA 1024x768
	LPC54S/540xx	Cortex-M4	180 MHz	360 KB RAM Up to 32-bit EMI	–	LCDIF	Up to XGA 1024x768
Entry	LPC55S69	Cortex-M33	150 MHz	320 KB RAM, 640 KB Flash	–	SPI	Up to FWVGA 854x480
	MCX N	Cortex-M33	150 MHz	512 KB RAM, 2 MB Flash	–	SPI or 8080 parallel with FlexIO	Up to FWVGA 854x480

Note: - LCDIF, eLCDIF, and LCDIFv2 include parallel RGB display interface.
- This is not a comprehensive list of NXP microcontrollers capable of supporting GUI applications

SECURE CONNECTIONS
FOR A SMARTER WORLD

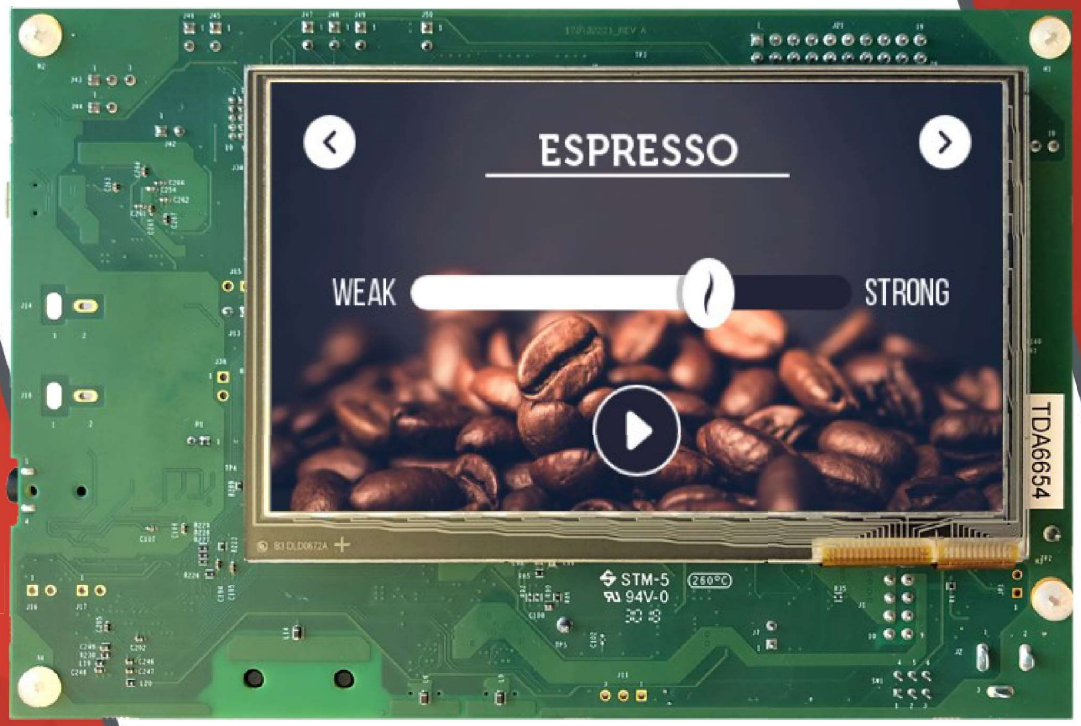
Simplify Your GUI Development without External Memories

Lean. Versatile. Scalable. Fast.

Manuel Melic, TARA Systems

Embedded Wizard
GUI Solutions by TARA Systems

GOLD PARTNER
NXP

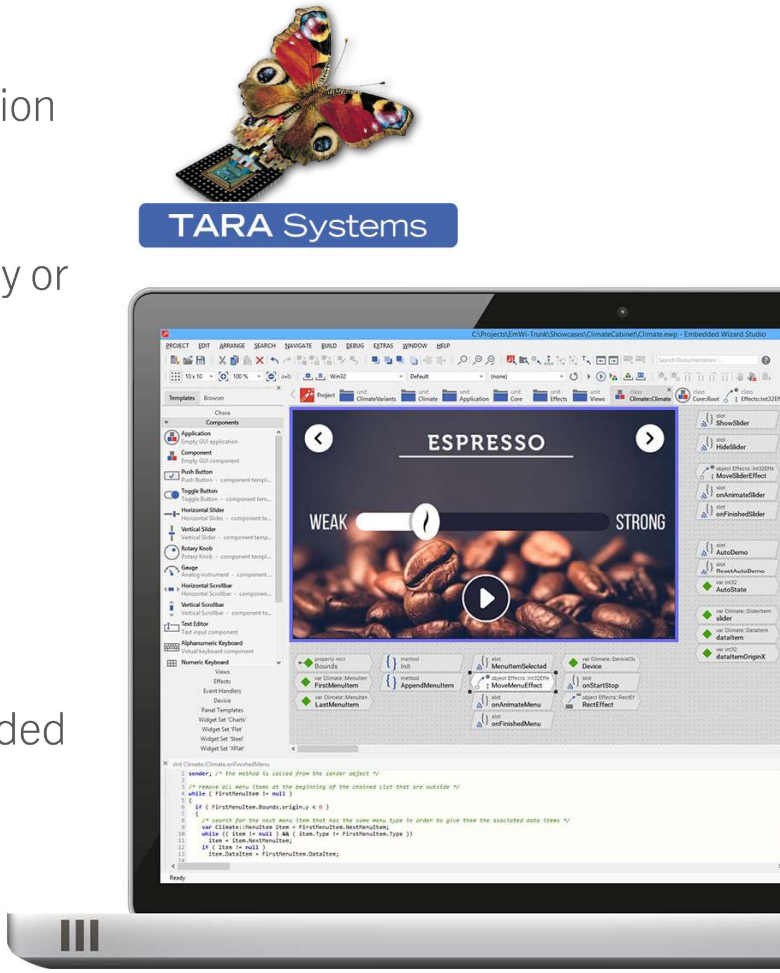


Agenda

- About Embedded Wizard
- GUI Triangle of Tension
- The Big Five – What impacts the memory consumption of GUIs most?
- Demo on i.MXRT1064 EVK
- Missing Links: Download Resources & Contact
- Q&A

About Embedded Wizard

- Embedded Wizard by TARA Systems is an **independent** GUI solution
- GUI **development** and instant **prototyping** tool
- Follows a **code generation** model – not just a pure graphics library or runtime interpreter
- **MCU** and **MPU** type target hardware
- Evolved over **25 years** – company has a strong **engineering background** in embedded systems
- **No external dependencies**, open source or other 3rd party stacks
- Customers **worldwide**, >500 Mio. devices deployed using Embedded Wizard technology



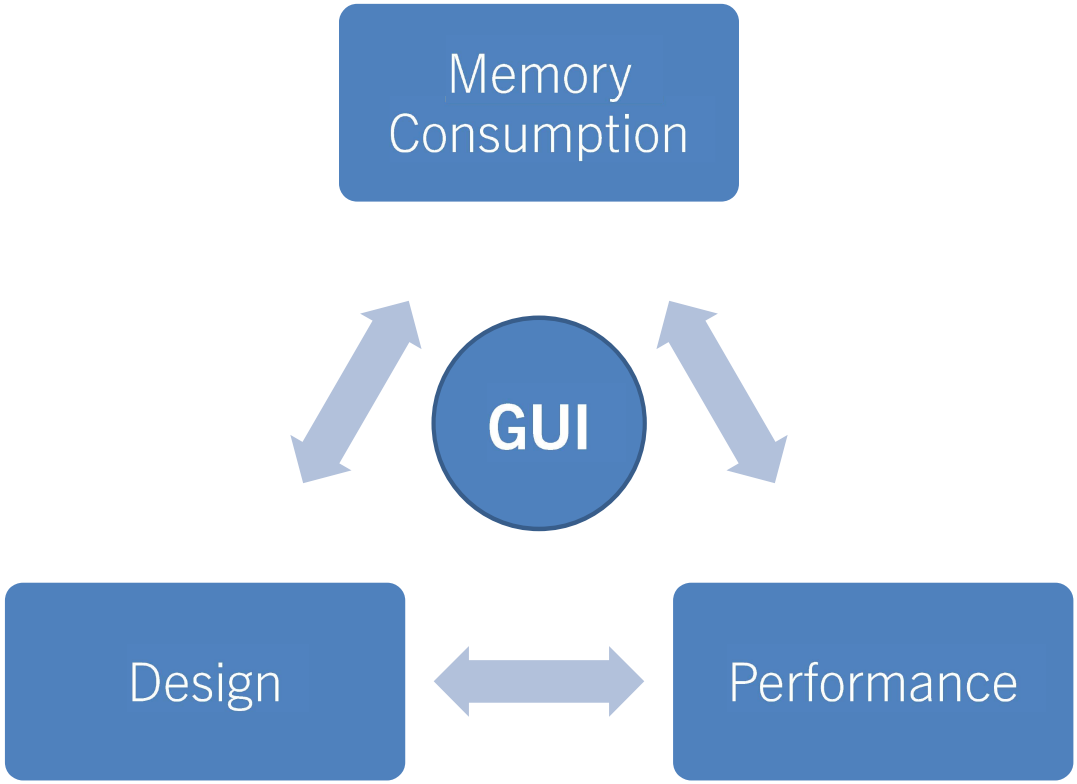
Embedded Wizard

Benefits for NXP MCUs & MPUs

- Full-featured **IDE** to develop HMIs (incl. prototyping, debugging, profiling)
- Utilizing available **GPUs** to achieve high FPS with low CPU load (e.g. PxP, OpenGL, ...)
- Smartphone-like GUIs with **high-performance** animations and transitions
- Generation of **pure ANSI C** source code with no further dependencies
- Very **low** RAM and flash **footprint**
- HMIs run even on **bare metal** or with **any** (RT)OS
- **Reasonable** business model - no royalty fees per device!

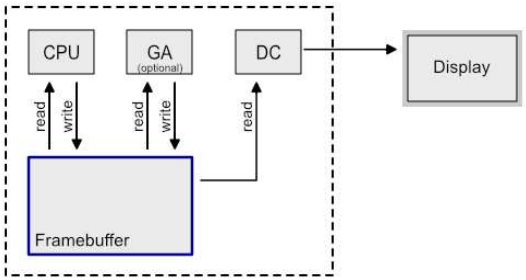
Embedded Wizard

GUI Triangle of Tension

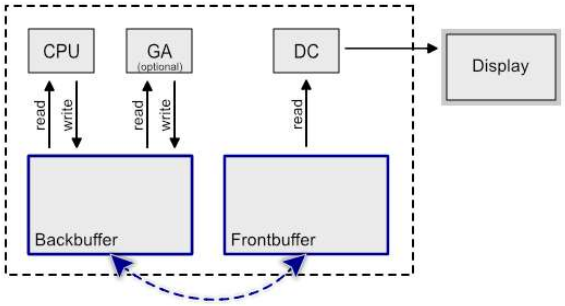


The Big Five – What impacts the memory consumption of GUIs most?

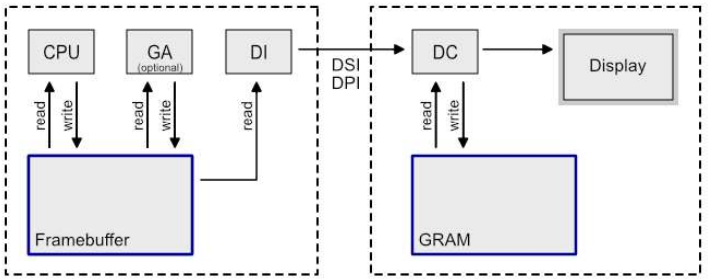
- 1. Framebuffer concepts



(synchronized) Single-Buffer



Double-Buffer



external Display-Controller w/ GRAM

The Big Five – What impacts the memory consumption of GUIs most?

- 2. Used Color Formats

4 Bytes/Pixel

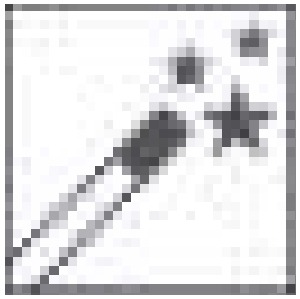
2 Bytes/Pixel

1 Byte/Pixel
+ CLUT

Embedded Wizard

The Big Five – What impacts the memory consumption of GUIs most?

- 3. Bitmaps
  - Compressed vs Direct Access
  - Rasterized bitmaps vs vector graphics
  - Reduced Color Formats (dithering)



```
/* Bitmap resource used per default by the Widgets customized for the medium size. */
EW_DEFINE_BITMAP_RES( WidgetSetGaugeNeedleMedium )
  EW_BITMAP_FRAMES( WidgetSetGaugeNeedleMedium, Default, EW_DRIVER_VARIANT_RGBA8888, 31, 24, 0 )
    EW_BITMAP_FRAME( 2, 6, 19, 12, 0x00000000, 0x00000000 )
    EW_BITMAP_MAPPING( WidgetSetGaugeNeedleMedium, Default )

  EW_BITMAP_PIXEL( WidgetSetGaugeNeedleMedium, Default )          /* ratio 24.87 % */
    0x1C080100, 0xAB205048, 0x1C148A754, 0x6169053C, 0x16E885AF, 0x6B485BA6, 0x4A859FE1,
    0xC8285616, 0x8FC7A381, 0x148A4320, 0xC2C07089, 0x2DEF0B3C, 0x2172B7FC, 0x5AFA85BF,
    0x53396422, 0x08702F6E, 0x833C2D57, 0x9FC8C290, 0x5C728340, 0x3E66C788, 0x856EC284,
    0x170CF33B, 0x66D3203E, 0x4D21E3FD, 0x0D303FD6, 0x83FBE96E, 0x44B8974C, 0x8A9DC349,
    0xC2DB6ADS, 0x9E69367C, 0xD71087DA, 0x1F083042, 0x72389D08, 0xF6858BA1, 0xC7AC2156,
    0x695E60D4, 0x0686FF5E, 0x61704FC6, 0x131386C2, 0x960D123B, 0x72CA483F, 0x4B850385,
    0xAA55B696, 0xDB40B14E, 0x5B42DF16, 0x542C8100, 0xC2E85740, 0xFD312B47, 0xF140F5B2,
    0x6187D7E0, 0x7B4D8E8B, 0x73C20E86, 0x079AE99A, 0x6DAC972A, 0xE3C54F7A, 0x42DE90BC,
    0x2C9D0B54, 0xE89A502C, 0x8B285DC2, 0x6FB5C344, 0xD8C475B6, 0xBDAF6765, 0xA954367D,
    0xA4D3BD5C, 0x675B4AF5, 0x22224762, 0x42F0B43C, 0x5CE685D0, 0x5DCAA8F6, 0xF8FAFD80,
    0xFFD7DFAF, 0xC734892F, 0x0E932088, 0xCE80AE3A, 0x2CF87ADD, 0x1E4946E4, 0x3BDC14A0,
    0xDDDB46FC, 0x9851FB84, 0xC586B59F, 0xF42E4CE1, 0x2ACAF2A8, 0xA4A7A0DD, 0x283D3383,
    0x5E2885G1, 0x2AB9E298, 0x3307C6D2, 0x1983BCB9, 0xA25DEA2A, 0x95CE2096, 0x18841008,
    0x8FA2B8F6, 0x22C3822D, 0x92E4D010, 0xD0F57047, 0x3823B1C4, 0x91A40900, 0xE419463F,
    0x42F49B76, 0x21358848, 0xA7930564, 0x942528F0, 0x24F97E59, 0xF5747E90, 0x70974D8E,
    0x6C9B65E9, 0x98E6E982, 0x95E995F7, 0xF9A8984D, 0xB67898A6, 0x9A6D2709, 0x4DA572FB,
    0xE789D859, 0xC9E67A9D, 0x6ED018E2, 0x36716472, 0xA1A820E5, 0x290A46E3, 0xE5747D6C,
    0xD8E79CCE, 0x36BE4834, 0xA1692894, 0x87241240, 0x93D0BA33, 0xDA5827C5, 0x24295368,
    0x4229929E, 0x6937CCFC, 0x61A9FA8, 0x1202801F, 0x8B022068, 0x4760C181, 0x45B4AD0E,
    0x43F0B734, 0xFE16B1E8, 0x72540D28, 0x795E33BE, 0xA59679C1, 0x48D508AA, 0x21EF7B48,
    0x964AC934, 0x3808E304, 0x21AACEC8, 0x2E899F87, 0x4E097058, 0x089256AB, 0x72DC929D,
    0xD0B40DCD, 0x37056709, 0xE6B9188F, 0x4560ZE13, 0xA54FF7FC, 0xAE76F55E, 0x83A84824,
    0xC9085A1E, 0x08A05B02, 0x5CEF102D, 0x25C2050B, 0x730C923E, 0xE17D388E, 0xB434C413,
    0x3FEB23FC, 0x958A2461, 0x752948A5, 0x9BAD2C8A, 0xD4B49087, 0x42CFDCB6, 0xC6342CBC,
    0x6C3C1142, 0x45CB4173, 0x2F7A167C, 0xCB70B421, 0x10BD056A, 0x8588A78B, 0x6108B2D0,
    0xCCD2F378, 0x42C2942D, 0x08E42C9A, 0x87DDB845, 0xB9B83418, 0x8826D0B2, 0x8198B181,
    0x542D874C, 0x00000048, 0x00000000

  EW_BITMAP_CLUT_EMPTY( WidgetSetGaugeNeedleMedium, Default )

  EW_BITMAPS_TABLE( WidgetSetGaugeNeedleMedium )
    EW_BITMAP( WidgetSetGaugeNeedleMedium, Default )
EW_END_OF_BITMAP_RES( WidgetSetGaugeNeedleMedium )

/* Embedded Wizard */
```

```
/* Bitmap resource used per default by the Widgets customized for the medium size. */
EW_DEFINE_BITMAP_RES( WidgetSetGaugeNeedleMedium )
  EW_BITMAP_FRAMES( WidgetSetGaugeNeedleMedium, Default, EW_DRIVER_VARIANT_RGBA8888, 31, 24, 0 )
    EW_BITMAP_FRAME( 2, 6, 19, 12, 0x00000000, 0x00000000 )
    EW_BITMAP_MAPPING( WidgetSetGaugeNeedleMedium, Default )

  EW_BITMAP_PIXEL_U32( WidgetSetGaugeNeedleMedium, Default )
    0x00600210, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,
    0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,
    0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,
    0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,
    0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,
    0x00000000, 0x00000000, 0x00000000, 0x24A7A9AC, 0x90A7A9AC, 0xBDA7A9AC, 0xE8A7A9AC,
    0xE9A7A9AC, 0xB4A7A9AC, 0x7FA7A9AC, 0x4AA7A9AC, 0x1SA7A9AC, 0x00000000, 0x00000000,
    0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,
    0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,
    0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x03A7A9AC,
    0x79A7A9AC, 0xF7A7A9AC, 0xFFA7A9AC, 0xFFA7A9AC, 0xFCA7A9AC, 0xFAA7A9AC, 0xFFA7A9AC,
    0xFFA7A9AC, 0xFFA7A9AC, 0xFFA7A9AC, 0xE0A7A9AC, 0xABA7A9AC, 0x67A7A9AC, 0x14A7A9AC,
    0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,
    0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,
    0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x78A7A9AC, 0xFFA7A9AC, 0xF9A7A9AC,
    0x0E1B7C294, 0xF8B8CF67, 0xFFB3D340, 0xFFB2D23C, 0xFAB7D060, 0xEEBACB7F, 0xE1B7C295,
    0xDBADB1A7, 0xF9A7A9AC, 0xFFA7A9AC, 0xFFA7A9AC, 0xFBA7A9AC, 0xB8A7A9AC, 0x60A7A9AC,
    0x0FA7A9AC, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,
    0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,
    0x00000000, 0x22A7A9AC, 0xFGA7A9AC, 0xFSA7A9AB, 0xF8B8CF67, 0xFFB2D339, 0xFFB2D339,
    0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFEB4D146,
    0xEDB9CA80, 0xDAB2B8A0, 0xECA7AAAB, 0xFFA7A9AC, 0xFFA7A9AC, 0xF8A7A9AC, 0xB0A7A9AC,
    0x58A7A9AC, 0x0AA7A9AC, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,
    0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x08A7A9AC,
    0xFFA7A9AC, 0xDFB6BF98, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D33A, 0xF3BACD73, 0xDBB2B9A0, 0xF1A7A9AB, 0xFFA7A9AC, 0xFFA7A9AC, 0xF4A7A9AC,
    0xA8A7A9AC, 0x4EA7A9AC, 0x05A7A9AC, 0x00000000, 0x00000000, 0x00000000, 0x00000000,
    0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0xBBA7A9AC, 0xFFA7A9AC, 0xFB8BD15D,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D340, 0xEEEBACB7F, 0xDAAFB5A4, 0xF8A7A9AC, 0xFFA7A9AC, 0xFFA7A9AC,
    0xE8A7A9AC, 0x87A7A9AC, 0x17A7A9AC, 0x00000000, 0x00000000, 0x00000000, 0x00000000,
    0x00000000, 0x00000000, 0xE6A7A9AC, 0xFCA7A9AC, 0xFFB2D23D, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFEB4D249, 0xE8B9C888, 0xDCACB0A8, 0xFFA7A9AC, 0xFFA7A9AC,
    0xF0A7A9AC, 0x6EA7A9AC, 0x03A7A9AC, 0x00000000, 0x00000000, 0x00000000, 0x00000000,
    0xFFFA7A9AC, 0xEFA7A9AB, 0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xF4B9CE71, 0xDDDABAFA8, 0xFFA7A9AC, 0xFFA7A9AC,
    0xA0A7A9AC, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0xFFA7A9AC, 0xEFA7A9AB,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xEFB9CC7C, 0xE8A8AAAB, 0xFFA7A9AC, 0x82A7A9AC,
    0x00000000, 0x00000000, 0x00000000, 0xFFA7A9AC, 0xEFA7A9AB, 0xFFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xF9B9D064, 0xF5A7A9AB, 0xFFA7A9AC, 0x16A7A9AC, 0x00000000,
    0x00000000, 0xFFA7A9AC, 0xEFA7A9AB, 0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xDDB4BD98, 0xFFA7A9AC, 0xSGA7A9AC, 0x00000000, 0x00000000, 0xFFA7A9AC,
    0xEFA7A9AB, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339,
    0xFFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xFFB2D339, 0xEFBACB7E,
    0xFFFA7A9AC, 0xS7A7A9AC, 0x00000000, 0x00000000, 0xFFA7A9AC, 0xEFA7A9AB, 0xFFFB2D339,
```

The Big Five – What impacts the memory consumption of GUIs most?

- 4. Fonts
  - Pre-Rendered Bitmap Glyphs vs TrueType Font Engine
  - Font Ranges & Quality

FontName	Segoe UI
Height	32
HeightMode	Compatible
Italic	false
Kerning	true
Quality	High
Ranges	'0'-'9','a'-'z','A'-'Z','°','%'
RowDistance	

The Big Five – What impacts the memory consumption of GUIs most?

- 5. Strings
  - Compressed vs Direct Access

```
/* Compressed strings for the language 'English'. */
EW_CONST_STRING_PRAGMA static const unsigned int _StringsDefault0[] =
{
  0x000001A4, /* ratio 58.10 % */
  0xB8001300, 0x8009A452, 0x00DC0037, 0x0C200320, 0x22003C80, 0x8458182A, 0x003A800A,
  0xB39800CA, 0x88C3E1B0, 0xBC501800, 0x42A3B192, 0x3A191C8D, 0x01711884, 0x2E688B45,
  0xB1B39002, 0x02904AE3, 0x09991A09, 0x8FCD8D20, 0xF14E292D, 0x4D264748, 0xE4014095,
  0xA314322C, 0x012CA442, 0xC448A04C, 0x208E4423, 0x0330020E, 0x98D16B20, 0x29DEB31A,
  0xC80D71A9, 0x248B0489, 0x00067004, 0x63359E9B, 0xA47A5C46, 0x1E36CD24, 0x0A144A15,
  0xB85E4E00, 0xA52AE51C, 0x43A78418, 0xE0C77031, 0x24A488A4, 0xC71A9A62, 0xB1404446,
  0x6692E42E, 0x229412F7, 0x9F472393, 0x4002F50E, 0x0028D15B, 0x83033EB3, 0x89504974,
  0x4BA1BF47, 0x9738D472, 0x97AD12E2, 0x322E6B63, 0x9F4C4004, 0x06D26B27, 0x15A280D0,
  0x2A8B1AB8, 0x65178874, 0x03209049, 0x00000002, 0x00000000
};
```

```
/* Strings for the language 'English'. */
EW_CONST_STRING_PRAGMA static const unsigned short _StringsDefault0[] =
{
  0xFFFF, 0xFFFF, 0xC557, 0x004D, 0x006F, 0x006E, 0x0064, 0x0061, 0x0079, 0x0000,
  0xC557, 0x0054, 0x0075, 0x0065, 0x0073, 0x0064, 0x0061, 0x0079, 0x0000, 0xC557,
  0x0057, 0x0065, 0x0064, 0x006E, 0x0065, 0x0073, 0x0064, 0x0061, 0x0079, 0x0000,
  0xC557, 0x0054, 0x0068, 0x0075, 0x0072, 0x0073, 0x0064, 0x0061, 0x0079, 0x0000,
  0xC557, 0x0046, 0x0072, 0x0069, 0x0064, 0x0061, 0x0079, 0x0000, 0xC557, 0x0053,
  0x0061, 0x0074, 0x0075, 0x0072, 0x0064, 0x0061, 0x0079, 0x0000, 0xC557, 0x0053,
  0x0075, 0x006E, 0x0064, 0x0061, 0x0079, 0x0000, 0xC557, 0x0044, 0x0061, 0x0079,
  0x0073, 0x0020, 0x006F, 0x0066, 0x0020, 0x0074, 0x0068, 0x0065, 0x0020, 0x0077,
  0x0065, 0x0065, 0x006B, 0x0000, 0xC557, 0x0045, 0x006E, 0x0067, 0x006C, 0x0069,
  0x0073, 0x0068, 0x0000, 0xC557, 0x0047, 0x0065, 0x0072, 0x006D, 0x0061, 0x006E,
  0x0000, 0xC557, 0x0053, 0x0070, 0x0061, 0x006E, 0x0069, 0x0073, 0x0068, 0x0000,
  0xC557, 0x0041, 0x0072, 0x0061, 0x0062, 0x0069, 0x0063, 0x0000, 0xC557, 0x0048,
  0x0065, 0x0062, 0x0072, 0x0065, 0x0077, 0x0000, 0xC557, 0x0047, 0x0072, 0x0065,
  0x0065, 0x006B, 0x0000, 0xC557, 0x0052, 0x0075, 0x0073, 0x0073, 0x0069, 0x0061,
  0x006E, 0x0000, 0xC557, 0x0054, 0x0075, 0x0072, 0x006B, 0x0069, 0x0073, 0x0068,
  0x0000, 0xC557, 0x004A, 0x0061, 0x0070, 0x0061, 0x006E, 0x0065, 0x0073, 0x0065,
  0x0000, 0xC557, 0x004B, 0x006F, 0x0072, 0x0065, 0x0061, 0x006E, 0x0000, 0xC557,
  0x0043, 0x0068, 0x0069, 0x006E, 0x0065, 0x0073, 0x0065, 0x0000, 0xC557, 0x0056,
  0x0069, 0x0065, 0x0074, 0x006E, 0x0061, 0x006D, 0x0065, 0x0073, 0x0065, 0x0000
};
```

Embedded Wizard

Demo on i.MXRT1064 EVK

Missing Links: Download Resources & Contact

Get more details on:

- Embedded Wizard
  www.embedded-wizard.de
- Free Edition
  www.embedded-wizard.de/download
- Showcases and demos
  www.embedded-wizard.de/demo
- Online knowledge base
  doc.embedded-wizard.de
- Open community support forum
  ask.embedded-wizard.de

Get more details from NXP:

About TARA Systems

Contact

TARA Systems GmbH

Gmunder Str. 53 | 81379 Munich | Germany

Phone: +49 89 7471 21-0

Email: contact@embedded-wizard.de

Learn more about out latest developments

Twitter | LinkedIn | YouTube | Newsletter

Embedded Wizard

Q&A