Session Overview

- **Intended Audience**
  - Embedded Systems Design Engineers, Engineering Management, Supply Chain
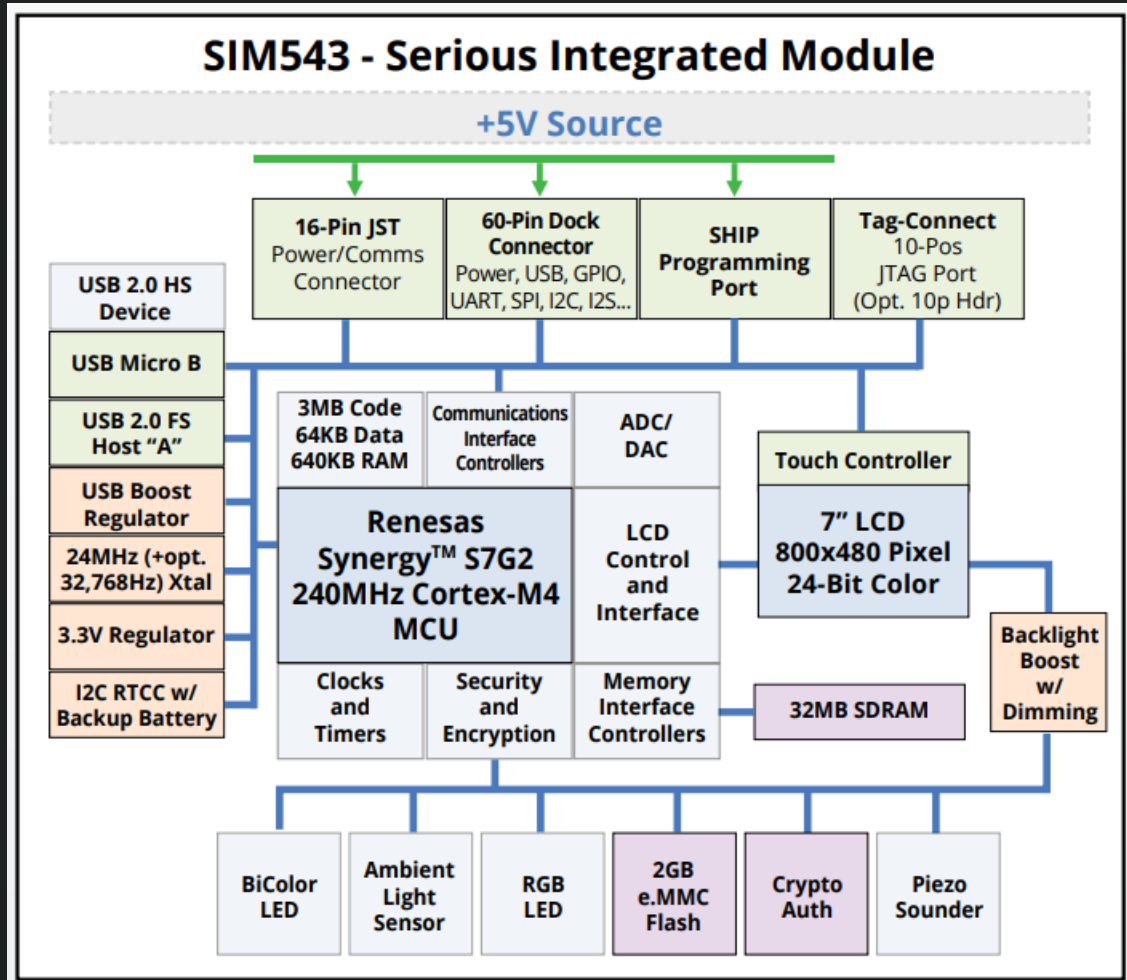- **Objective**
  - Equip you with some key things to think about as you embark on your HMI-enabling project
- **Agenda**
  - HMI building blocks
  - New "inputs" to the engineering process
  - Watching out for "free"
  - Essential HMI decisions

HMI Platform
HW Anatomy

SIM543 - Serious Integrated Module
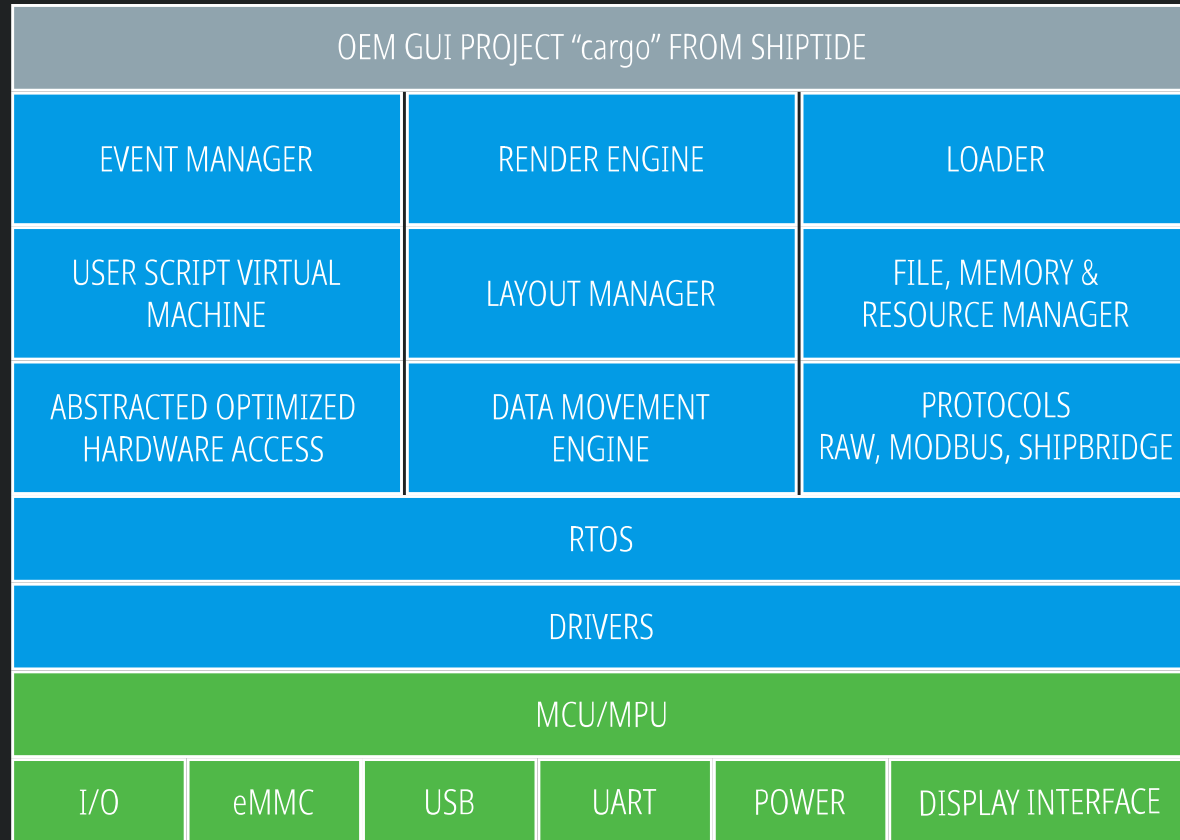
Not including comms...

- MCU
- Runtime RAM: on chip, off chip, frame buffers
- Storage: Executable Flash, Storage Flash
- LCD & LCD Related
  - Ambient light sensor
  - Touch controller
  - Backlight power supply
  - Video controller & accelerators
- Embedded peripherals
  - SPI I2C UART I2S...
  - ADC/DAC's & audio support
  - RAM/FLASH controllers
  - USB
- Support peripherals
  - Piezo or Audio
  - LEDs
  - RTCC
- Security/encryption engines

HMI Platform
SW Anatomy

OEM GUI PROJECT "cargo" FROM SHIPTIDE		
EVENT MANAGER	RENDER ENGINE	LOADER
USER SCRIPT VIRTUAL MACHINE	LAYOUT MANAGER	FILE, MEMORY & RESOURCE MANAGER
ABSTRACTED OPTIMIZED HARDWARE ACCESS	DATA MOVEMENT ENGINE	PROTOCOLS RAW, MODBUS, SHIPBRIDGE
RTOS		
DRIVERS		
MCU/MPU		

I/O	eMMC	USB	UART	POWER	DISPLAY INTERFACE

SHIPEngine Major Building Blocks
(Serious Human Interface™ Platform HMI Engine)

- Embedded OS
- MCU Peripheral Drivers
  - RAM, On-chip FLASH, Clocks, SPI, SD/e.MMC, GPIO, Timers, Video, I2C, I2S, Interrupts, PWM, DMA, USB, ADC/DAC, Crypto)
- Peripheral Chip Drivers
  - Flash (Serial NOR, NAND, e.MMC etc.)
  - Ambient Light Sensor
  - Touch Controller
  - Real Time Clock/Calendar (RTCC)
- High Level Stacks (File System, USB Stacks)
- HMI Infrastructure
  - Event system
  - Asset Management
  - Layout Management
  - Media decoders
  - GUI file format builder/decoder
  - Messaging backplane

...and that does not include comms...

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Continuous Change
Continuous Evolution

- HMI radically changes the way you develop & deploy embedded systems

- Change & evolution become the new normal

- Many new development process challenges

Requirements

- No crystal ball
- Many opinions
- Many time horizons

Disruptions

- Expect ongoing requirement changes from management, marketing, sales...
- **Be flexible** with flexible HW, SW, Tools

Evolution

- Can you leverage others' technology roadmaps?
- Can you adopt, adapt, deploy quickly?
- Can you maintain your cost vs. feature scalability?

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Requirements Changes Often Include...

- **Adding disruptive HMI features**
  - Animations, Video, font selections, multi-language, runtime image swapping...
- **Changing LCD requirements**
  - Touch technologies, LCD specifications,
  - LCD size/resolution changes or "need-to-span" very common mid/late/after project!
- **Much more complex UX than ever expected**
- **UX Look and Feel continuous churn**
- **Upgradability in the field often disastrously deferred**

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The "Free" Trap

Support

- Your usage model is rarely consistent with the intended usage of the "free" code
- Community support unreliable
- Often no roadmap/bugfixes available

- Free is never free – always more work than you ever expected with less support

- Replace the word "free" with *as is & unsupported*

Disjointed

- Initial and ongoing cost of aggregating code from many different sources?

- Many side effects of "free"

Side Effects

- Locked into an MCU family that cannot scale?
- Unexpected HW cost? Unscalable?
- Legal quagmires and unintended consequences
- Are you embarking on a "base distribution" nightmare?

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7 Key Defining Decisions for HMI Projects

Hardware — Do I have the right hardware to accomplish my current and future HMI design goals, and how quickly can I develop a prototype to prove it?

Software — Does our organization have the firmware expertise and capacity to integrate and sustain all of the subsystems that will interact with our HMI, including codebases for communications, control, power, and I/O?

UX — Do we have the personnel, expertise, processes and tools required to develop a compelling graphical user interface (GUI) that delivers an optimal user experience (UX)?

Connectivity — Will our device need to be connected, either now or in the future, and are we prepared to support evolving communications technologies?

Scalability — Is my HMI platform extensible enough to meet the demands my different product lines, from low cost to full-featured, using a common infrastructure, as well as the anticipated feature creep & evolution?

Updatability — What is my in-field update strategy? How hard will it be to evolve and augment this in the future?

Changeability — How does my HW/SW/Tools architecture support ever-changing, ever-evolving requirements?

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But most importantly..

Platforms   Am I basing my products on commercially supported, scalable, sustainable platforms from my technology partners so I can focus on my product?

Partners   Are my technology partner(s) able to help me get this done and stay out of the traps now and in the future?

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Industrial 4.0 Cyber Physical Systems

FUEL SUPPLY SYSTEM

SYSTEMS OK

84%

UNIT 11

STATUS: SYSTEM OK

84%

PROFILE
7553-2V

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Human Connected Machines

Automation
machine

010165656
56513174
25413
8231151
1548412
1843748
81982
34651864

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