



SERIOUS™
Human Connected Machines

DOING AN EMBEDDED "STEVE AUSTIN"

Re-Engineering your Embedded Platform for the next Decade

Embedded Online Conference May 22nd, 2018
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Evolved HMI + IoT Solutions

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Session Overview

■ Intended Audience

- Embedded Systems Design Engineers, Engineering Management, Supply Chain

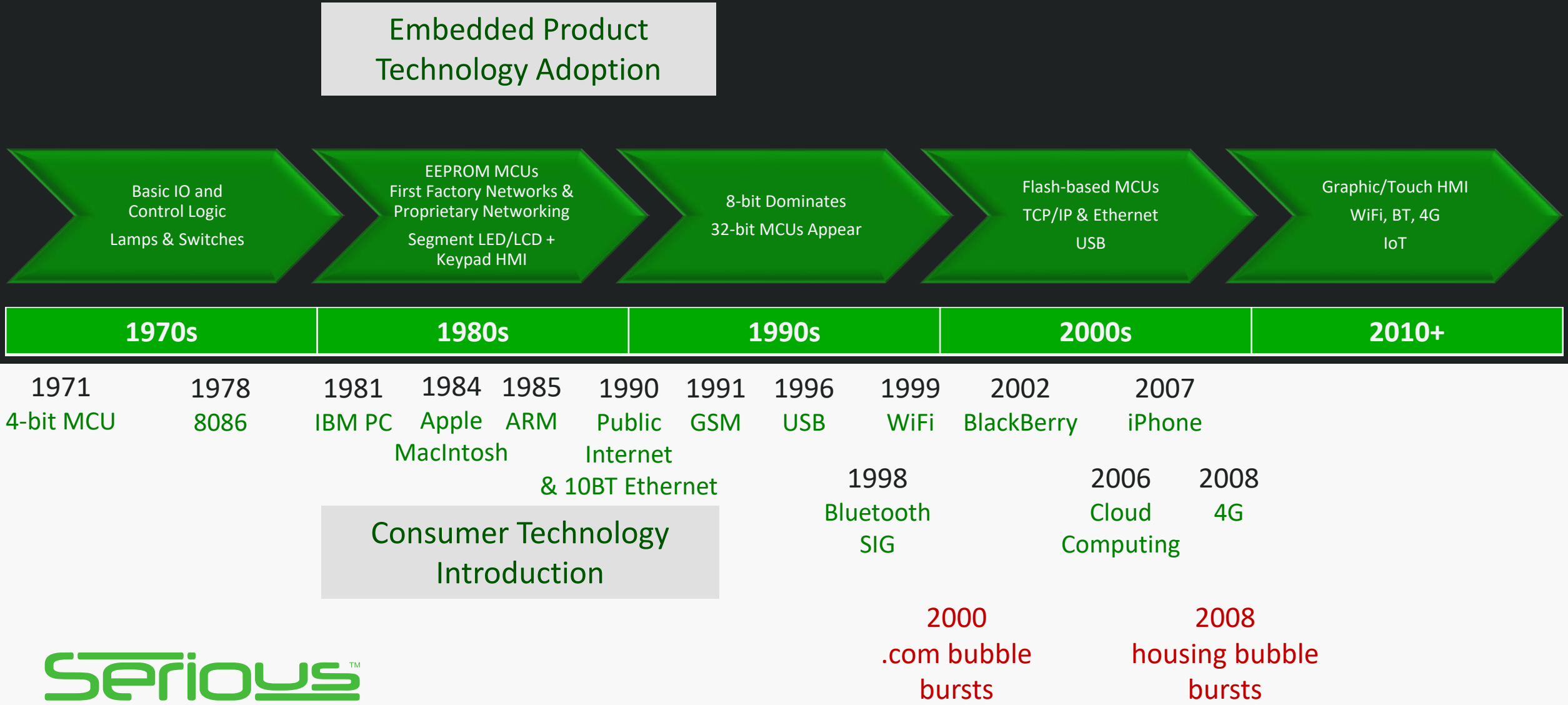
■ Objective

- Explore new ways of “re-engineering engineering” of embedded products using platform solutions

■ Agenda

- Navigating marketing requirements
- Building blocks of a modern embedded system
- Starting points: levels of integration
- Watching out for “free” and unaligned solutions

Embedded Products are Evolving Quickly



When Irresistible Forces hit Immovable Objects

- **Consumer obvious requirements win over embedded traditions**
 - Marketing/business teams don't care about embedded engineering constraints
 - What do you mean you can't do X ???
- **The big "Xs"**
 - Graphic/Touch HMI
 - Connectivity (BT, WiFi, Ethernet, 4G)
 - IoT roadmap with desktop, tablet and mobile access
 - Easy over-the-air/wire/local updates
- **Oh, of course, without increasing cost across the product line**

Modern Embedded

BASELINE SOFTWARE

- Super loops fading fast to OSs
 - Modern lightweight & capable embedded (RT)OSs
 - Big-Iron Linux/Windows wedged into embedded
- Advanced HMI
 - Graphic/Touch LCDs dominate new products
 - Graphic libraries fade; GUI tools are baseline
 - Qt having some success in embedded, but leaner solutions more prevalent
- Off-the-shelf stacks
 - TCP/IP w/TLS, Web Servers, FTP, etc.
 - File Systems (FAT, Embedded, exFAT)
 - USB Host & Device
- Constant updates in the field
- Still many hard problems:
 - Non-big-iron comms drivers can be tricky
 - Software “infrastructure” stuck in the 80s
 - Security and vulnerability an increasing problem
 - Cross-MCU/MPU portability and scalability

Platform Anatomy

BASELINE HARDWARE

- Powerful but cheap computing & storage
 - 32-bit MCU(s)
 - On-chip RAM, Flash, Clocks, SPI, SD/eMMC, GPIO, Timers, Video, I2C, I2S, Interrupts, PWM, DMA, USB, ADC/DAC, Crypto, LCD controller,....
 - DRAM.. 8MB < \$2
 - NOR/NAND Flash... 128MB < \$2, \$4GB < \$6
- Advanced HMI
 - Graphic/Touch LCD
 - Audio & Video playback support
- Multiple comms..
 - WiFi, BT5 Thread/Mesh, 4G, Ethernet, RS485...
- Distributed Processing
 - Multiple localized MCUs for purpose-driven application development

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The Real Problem

SOFTWARE

- #1 cost of product development, product sustaining, and product evolution
- 100x – 100,000x more lines of code
- Linux is 20MM lines of code and growing
 - Now with “dynamically built distributions”
- Licensing continues to get more complex and treacherous to IP holders
- Complexity of new “simple consumer features” much higher than ever

Baseline Complexity

HARDWARE

- MPUs beyond usable by mere mortals?
 - data sheets >10,000 pages
 - high density BGAs
 - multi-power supply sequencing, thermal management
 - high density PCB technologies
- Swiss Army Knives MCUs
 - creating incredible software challenges
- Bifurcation of Power/Sensor/IO hardware and computing hardware
 - distributed computing helps.. but creates even more software challenges

The Push to “Platforms”

Q: What is a “platform”?

A: Depends who’s selling you!

The real answer:

- the **most** you can buy off-the-shelf with the **least total effort and cost** to **develop, deploy, maintain, and evolve** your **differentiated product lines**

Old School

Chips

+ Reference Designs

+ Free & Ecosystem Software

= an unsustainable nightmare

Nouveau Silicon

Chips

w/pre-ported/licensed OS & frameworks

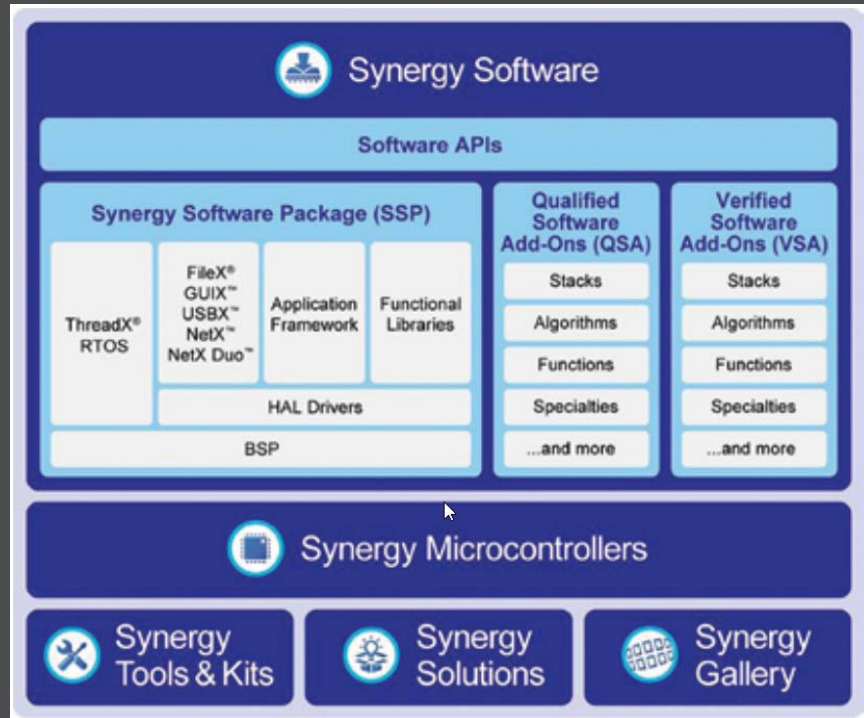
+ Reference Designs or MCU-modules

= flexible, powerful, but be careful

The Future?

- Complete HW+SW app-ready scalable platforms
- SW abstraction for price/performance scalability
- Mix-and-match off-the-shelf HMI + Comms + Control

Best-in-Class Nouveau Silicon Platform

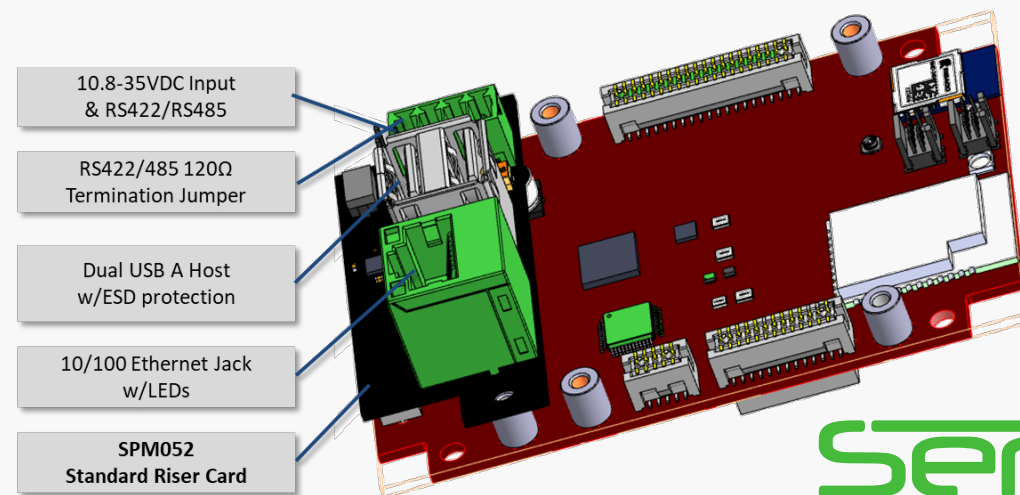
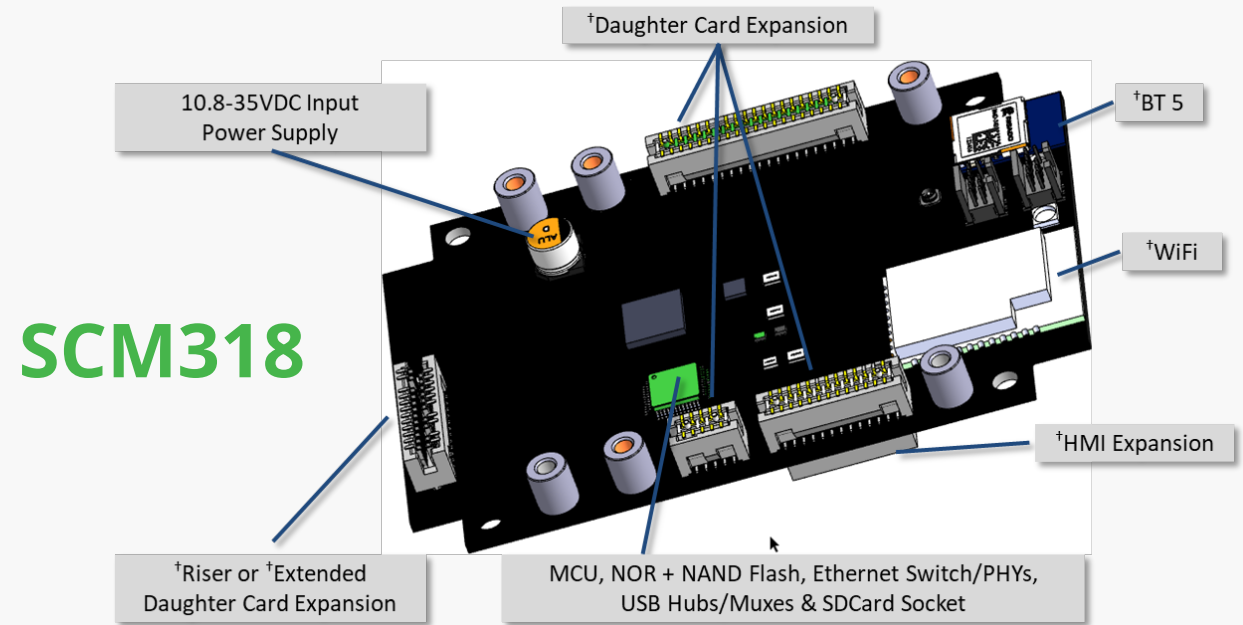


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SCM318 Family Preview

- Powerful off-the-shelf embedded **HW+SW platform** for communications and system control applications
 - Renesas 400MHz RZ/A1LC ARM Cortex A9 MCU w/2MB RAM
 - *WiFi, *BT5, *Dual Ethernet, USB Host/Device, RS422/485, ...
- Complete licensed/porting/supported Segger + Serious **commercial software**
 - OS, Drivers, Stacks, frameworks all ready-to-use
 - TCP/IP, MQTT, CoAP, Crypto, USB, File System and more
- **Highly expandable** with custom daughter cards and *HMI connectivity
 - Direct dock to Serious Generation 5 *HMI modules
 - 50+ MCU GPIOs accessible w/many peripherals (I2C, SPI, UARTs, CAN, ADC, etc.)
- **Robust** power and environmental
 - 10.8-35VDC input, -40 to +85C operation, *PoE/PoE+ option

*optional features or expansion capabilities



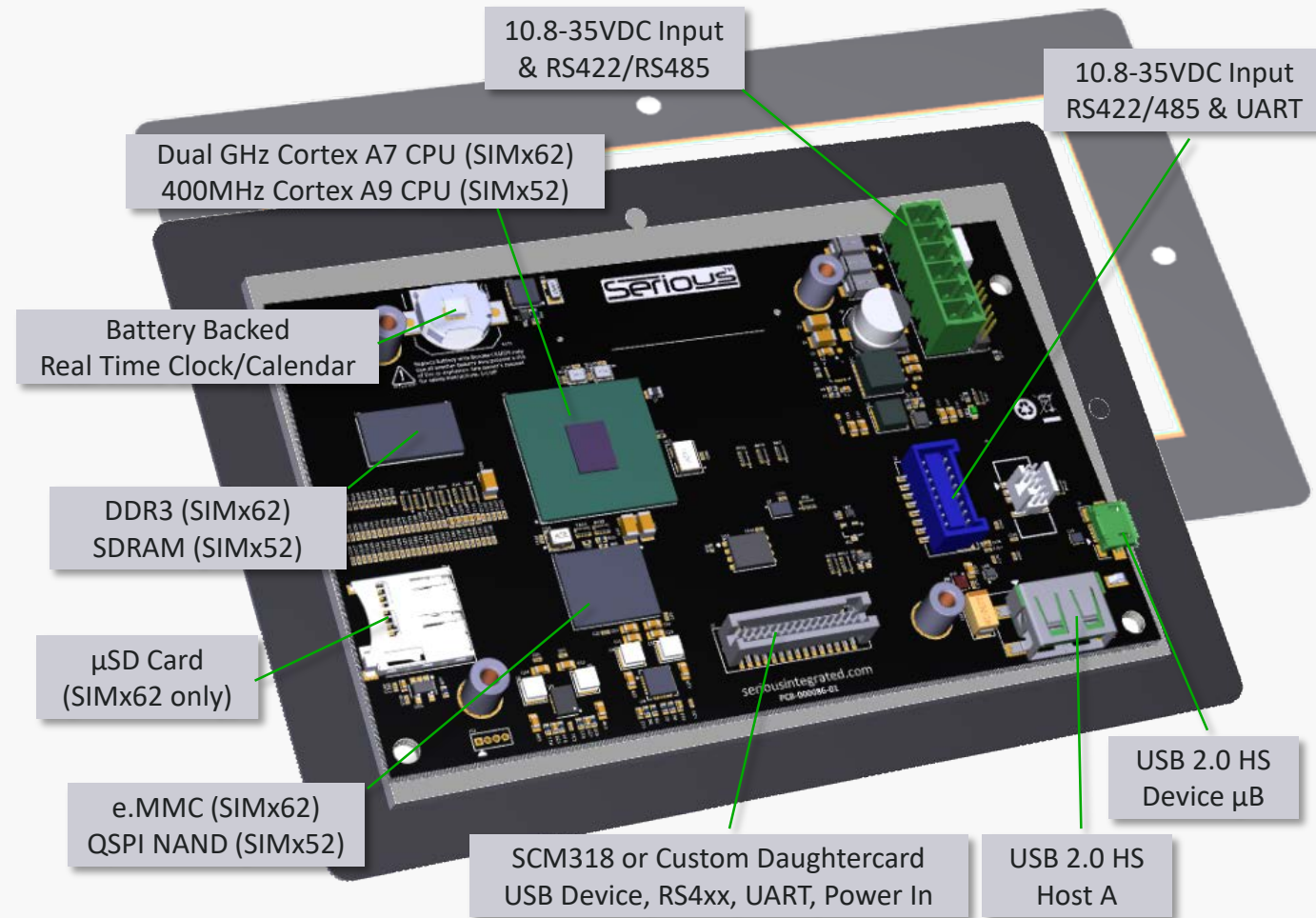
SCM318
with Standard
SPM052 Comms
Riser Card

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SIMx52/x62 HMI Modules Preview

- Scalable off-the-shelf **HMI HW+SW platform**
 - 3.5" to 10.1" integrated LCDs plus HDMI-only 720p option
 - Cap touch, resistive, no-touch, sunlight readable LCDs
 - RS485, UART, and USB device connectivity to external systems
 - USBH thumb drive port for upgrades, file transfer
 - I2S interface for audio output
 - Connect via USB Micro B, 16-pin wire harness, or 30 pin header
 - 10.8-35VDC powered, up to -40 to 85C operation (LCD limited)
- SIMx62: **Performance & Video Playback**
 - Renesas Dual GHz ARM Cortex A9 CPU
 - 4GB e.MMC, 128MB DDR3, Micro SDCard
- SIMx52: **Cost Effective Modern HMI**
 - Renesas 400MHz ARM Cortex A7 CPU
 - 128MB SPI NAND, 16MB+ SDRAM

SIMx62/x52 HMI Modules



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Big Iron can be Great



- “Instant” adoption of consumer technologies
- Highly flexible software
- Powerful connectivity out-of-the-box

Focus & Support

- Embedded is not their target usage model
- Should you pay for distributions & support?

Cost

- Big Iron Software == Big Iron Hardware
- Don't underestimate the software team needed to support the distribution

Key Questions

- What about your low end products?
- Legal quagmires and unintended consequences
- What is your strategy to stay secure?

The “Free” Trap

- Free is never free – always more work than you ever expected with less support
- Replace the word “free” with *as is & unsupported*
- Many side effects of “free”

Support

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

Disjointed

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

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?

Can you rebuild it? Better, Stronger, Faster?

Platforms

Can I leverage commercially supported, scalable, sustainable platforms so I can focus on my product?

Partners

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



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FUEL SUPPLY SYSTEM

84%

PROFILE
7553-2V

WATER SYSTEM OK

SETTINGS
HISTORY



DOCUMENTS
MORE D

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