Simpler System Monitoring:
How to Offload Multiple Functions to an MSP430 MCU

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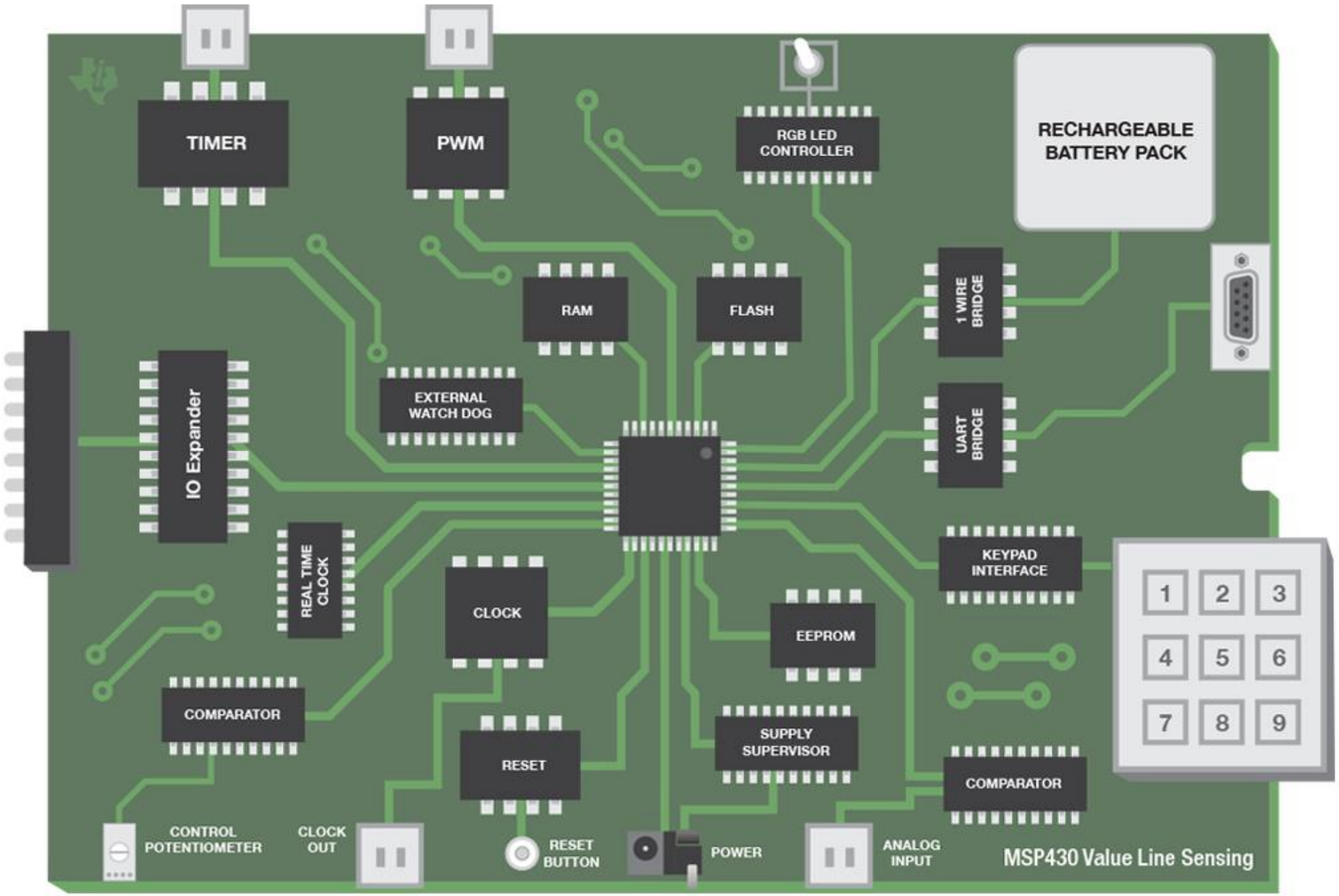
Agenda

- A System Level Approach to Microcontroller selection
  - Adding a secondary MCU to your design
  - Example Design Scenario
- MSP430 Product Offering
- Live demonstration of MSP430 software examples & TI Cloud Tools

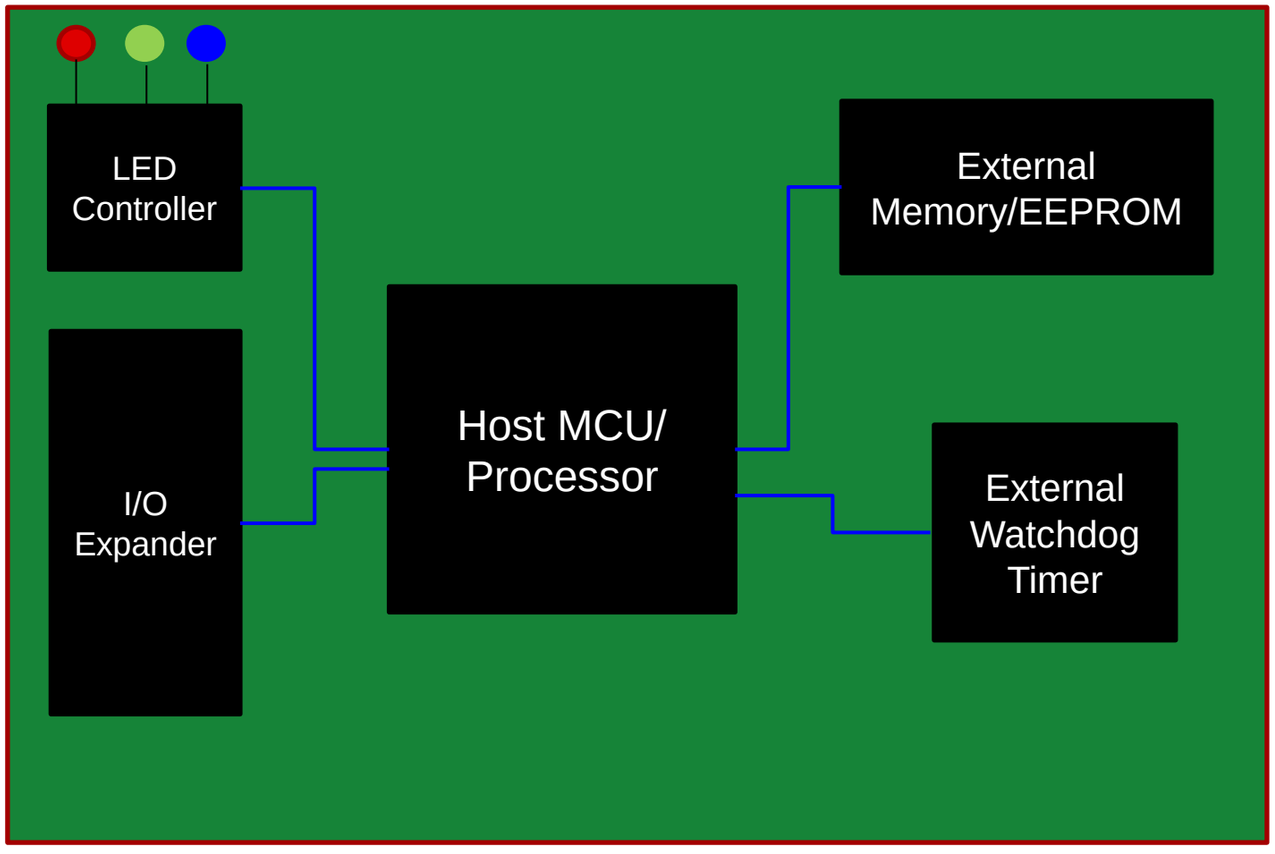
A System Level Approach to Microcontroller selection



- Systems are getting more complicated
- MCUs are becoming lower cost, easier to use
- Customers are starting to integrate discrete components into software

Starting a new system design

A discrete component approach

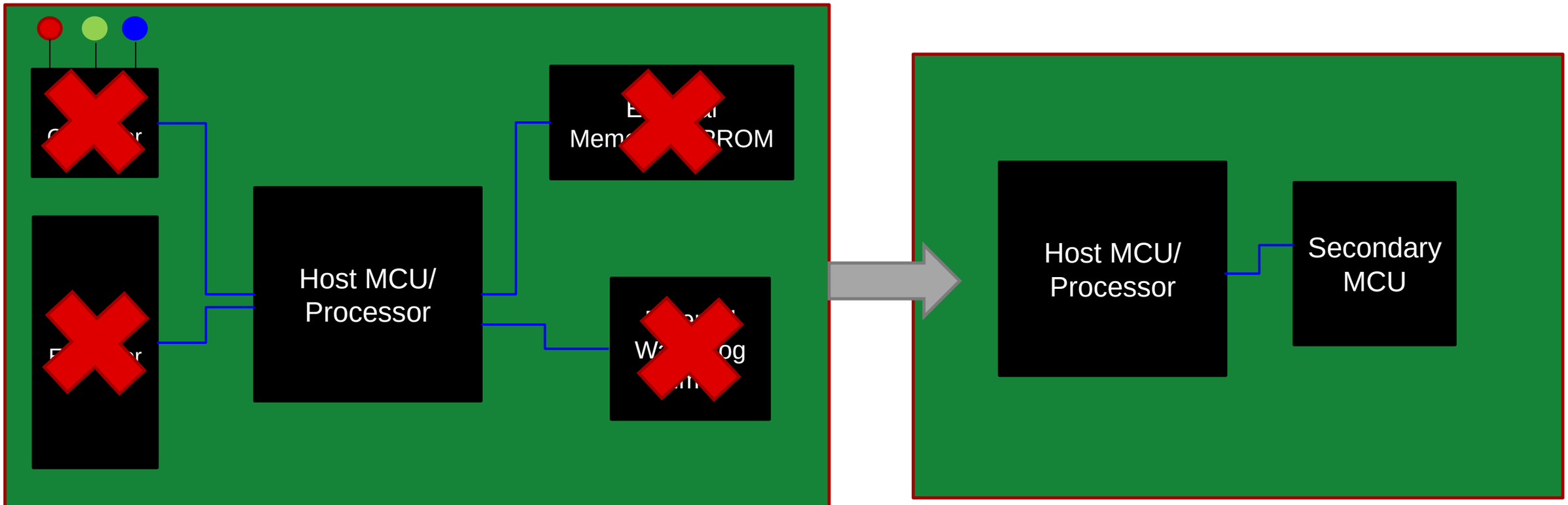


Total System Bill-of-materials (BOM):

- LED Controller
- I/O Expander IC
- EEPROM IC
- External Watchdog Timer
- Microcontroller

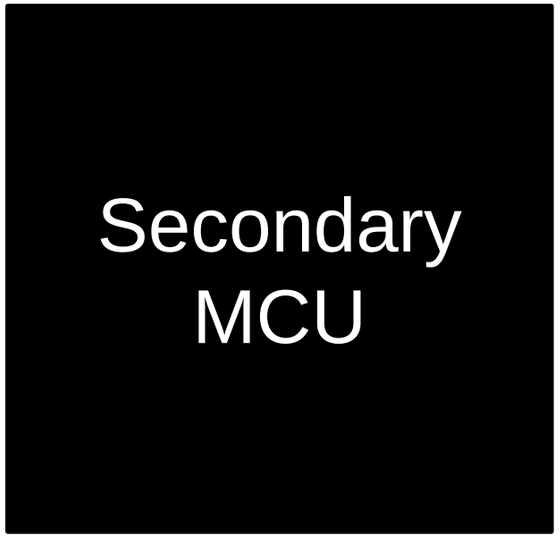
Starting a new system design

An integrated approach



Integrate your discrete system level functions into software on your microcontroller!

Implementing discrete component functionality in a secondary MCU



Memory Footprint

- LED Controller (x3 LEDs): **0.9kB**
- I/O Expander via SPI: **0.36kB**
- EEPROM Emulation: **0.33kB + 4kB of EEPROM**
- External Watchdog Timer: **0.37kB**

Total Memory Footprint: ~5.96kB

Implementing discrete component functionality in a secondary MCU

Secondary MCU

- ✓Save BOM costs
- ✓Save board space
- ✓Simplify design

Cost Breakdown (web pricing)

- LED Controller IC (3 channels): **~ $0.20**
- 5 channel I/O Expander IC: **~$0.25**
- Serial EEPROM (4kB) : **~$0.20**
- External Watchdog Timer: **~$0.31**

Total Cost for all 4 chips: ~ $0.96

Cost for an 8kB MSP430 device: $0.23

MSP430 cost-optimized MCUs for all applications

Memory	Part Number	1ku TI.com pricing ($)
0.5kB	MSP430FR2000	$0.17
1kB	MSP430FR2100	$0.18
2KB	MSP430FR2110	$0.24
4KB	MSP430FR2111	$0.30
8KB	MSP430FR2422	$0.23 (on discount!)
16KB	MSP430FR2433	$0.50
32KB	MSP430FR2155	$0.83
64KB	MSP430FR2476	$0.83 (on discount!)

MSP430-FUNCTION-CODE-EXAMPLES 1_00_00_00

Title	Description	Size
Communication Functions		
Single-Wire_Host.zip	Single Wire Communication Host (SLAA768)	376kB
SPI_IO_EXPANDER.zip	SPI IO Expander (SLAA807)	360kB
UART-to-UART_Bridge.zip	UART to UART Bridge (SLAA796)	384kB
uart-to-spi_bridge.zip	UART to SPI Bridge (SLAA797)	376kB
Pulse Width Modulation (PWM) Functions		
FR2000_ANALOG_PWM.zip	Analog Input to PWM Output (SLAA803)	252kB
PWM_DAC_Software.zip	Dual output 8-bit PWM DAC (SLAA804)	232kB
Servo_Motor_Control.zip	Servo Motor Controller (SLAA784)	196kB
Stepper_Motor_Control.zip	Stepper Motor Controller (SLAA785)	256kB
UART_SW_Controlled_RGB_LED_Color_Mixing.zip	UART Software -Controlled RGB LED Color Mixing (SLAA766)	306kB
System and Housekeeping Functions		
ADC_report_on_threshold.zip	ADC Wake and Transmit on Threshold (SLAA802)	310kB
SPI_EEPROM.zip	EEPROM Emulation (SLAA769)	336kB
Low_Power_Keypad.zip	Low Power Keypad (SLAA773)	342kB
Quadrature_Encoder.zip	Quadrature Encoder Position Counter(SLAA795)	354kB
Hysteresis_Comparator_with_UART.zip	Hysteresis Comparator with UART (SLAA805)	292kB
Reset_Controller.zip	Multi-Function Reset Controller (SLAA794)	310kB
slope-adc.zip	Single Slope Analog-to-Digital Conversion Technique (SLAA806)	384kB
Tamper_Detect.zip	Tamper Detection (SLAA813)	296kB
Programmable_Clock_Source.zip	Programmable Clock Source (SLAA774)	344kB
Programmable_FLL.zip	Programmable Frequency-locked Loop (SLAA791)	866kB

- 25 different examples of functions that can be easily implemented in your system
- Link to this software offering

Live Demonstration of MSP430 Software Examples & TI Cloud Tools

Links and more information

- Link to code examples for system level functions: https://www.ti.com/lit/wp/swab003b/swab003b.pdf?ts=1598381135707
- Get the MSP430FR2433 Launchpad: https://www.ti.com/tool/MSP-EXP430FR2433
- TI's Cloud Tools ecosystem: https://dev.ti.com/tirex/explore
- Explore MSP430™ devices: https://www.ti.com/microcontrollers/msp430-ultra-low-power-mcus/products.html
- How to get started with MSP430™ Guide Book: https://e2e.ti.com/support/microcontrollers/msp430/f/166/t/907571

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