



TI France Innovation Day

Stellaris® Solution overview

Stellaris® in TI picture

TI Embedded Processors

Microcontrollers (MCUs)

ARM®-Based Processors

Digital Signal Processors (DSPs)

16-bit ultra-low power MCUs

32-bit real-time MCUs

32-bit ARM® MCUs

32-bit ARM® MPUs

DSP
DSP+ARM®

Multi-core DSPs

Ultra Low power DSPs

MSP430™

Up to 25 MHz

Flash
1 KB to 256 KB

Analog I/O, ADC
LCD, USB

Measurement,
sensing, general
purpose

\$0.25 to \$9.00



**C2000™
Delfino™
Piccolo™**

40 MHz to 300 MHz

Flash, RAM
16 KB to 512 KB

PWM, ADC,
CAN, SPI, I²C

Motor control,
digital power,
lighting, ren. energy

\$1.50 to \$20.00



**Stellaris®
ARM® Cortex™-M3**

Up to 80 MHz

Flash
8 KB to 256 KB

USB, ENET
MAC+PHY, CAN,
ADC, PWM, SPI

Motion control,
HMI, industrial
automation

\$1.00 to \$8.00



**Sitara™
ARM® Cortex™-A8
& ARM9**

Value line to 500 MHz
Perf. Line to 1GHz

Cache,
RAM, ROM

USB2.0, OTG,
CAN, PCIe,
EMAC, LPDDR1

Industrial computing,
POS & portable
data terminals

\$5.00 to \$20.00



**C6000™
Integra™
DaVinci™**

Video processors
300 MHz to >1Ghz
+ Accelerator
Floating/fixed point

Cache
RAM, ROM

USB, ENET,
PCIe, SATA, SPI,
McBSP, McASP

Video, audio, voice,
security, conferencing

\$5.00 to \$200.00



C6000™

24,000
MMACS

Cache
RAM, ROM

SRIO, EMAC
DMA, PCIe

Telecom test & meas,
media gateways,
base stations

\$40 to \$200.00



C5000™

Up to 300 MHz
+ Accelerator

Up to 320 KB RAM
Up to 128 KB ROM

USB, ADC
McBSP, SPI, I²C

Audio, voice,
medical,
biometrics

\$3.00 to \$10.00



TEXAS
INSTRUMENTS
Developer Network



Software & Dev. Tools



TEXAS
INSTRUMENTS
eXpressDSP™

MPUs – Microprocessors

Stellaris[®] value proposition

High performance Features

20-80 MHz ARM-M3 CPU

- Optimized for single-cycle flash usage
- Integrated 32-ch DMA for ease of use & high data rate without CPU overhead
- Thumb-2 ISA with high code density
- Flexible clock system sources up to 8 timers
- Single-cycle multiply and hardware divide
- Three power modes and battery-backed hibernation with non-volatile memory

Connectivity

- Ethernet MAC & PHY with 1588 PTP support
- USB Host, Device, or On-The-Go
- CAN 2.0 A/B with 32 mailboxes
- External Peripheral Interface supporting SRAM, SDRAM, M2M, FPGA, CPLD
- Integrated UART, I2C, SSI module
- Integrated I2S master or slave



Broad Portfolio

- ***Largest ARM MCU portfolio in the world with 167 devices***
- 8KB to 256KB Flash and up to 96KB RAM
- Up to 8 advanced PWM modules
- RTC, and integrated LDO
- Analog comparators and temp sensor
- 28 to 108 pin from SOIC to BGA
- 10-bit, 8ch ADCs from 250ksps-1MSPS

Speed to Market

- StellarisWare on ROM includes driver and peripheral libraries to ease development
- C friendly IDE and compilers from industry leaders
- Low cost development tools
- Application specific and advanced development kits
- Production-ready application modules



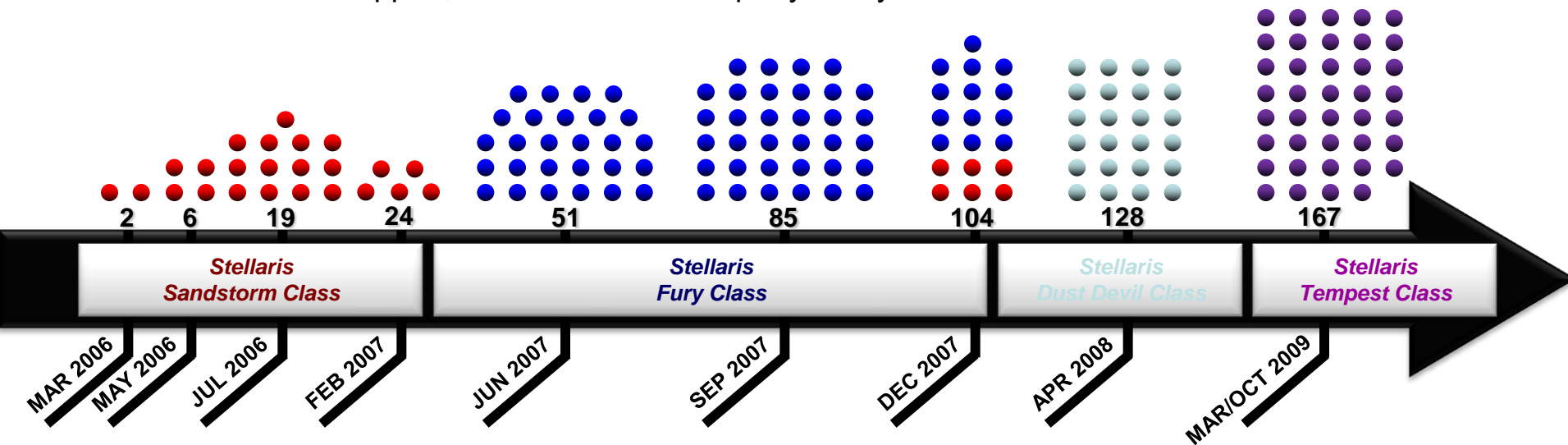
Stellaris® broad portfolio

First in ARM Cortex-M3 uC



Cortex
Intelligent Processors by ARM

- TI MCU (Austin,TX): Stellaris MCU Design, Systems, Software, Product, and Applications Engineering
- **Stellaris® family has over 160 microcontrollers!**
 - ✓ Broad line card of mixed-signal microcontrollers focused on applications in energy, security, and connectivity markets
 - ✓ Unique IP for motion control applications, real time connectivity (Ethernet, Controller Area Network, and USB), intelligent analog functionality, and power conservation
 - ✓ Experience fastest time-to-market for the most cost effective, standardized, market-leading solutions through extensive Stellaris hardware tools, StellarisWare® software, documentation, technical support, and ARM's vast 3rd party ecosystem



Stellaris® Family Overview

Over 160 family members
20, 25, 50, and 80 MHz
8K to 256K Flash
2K to 96K SRAM

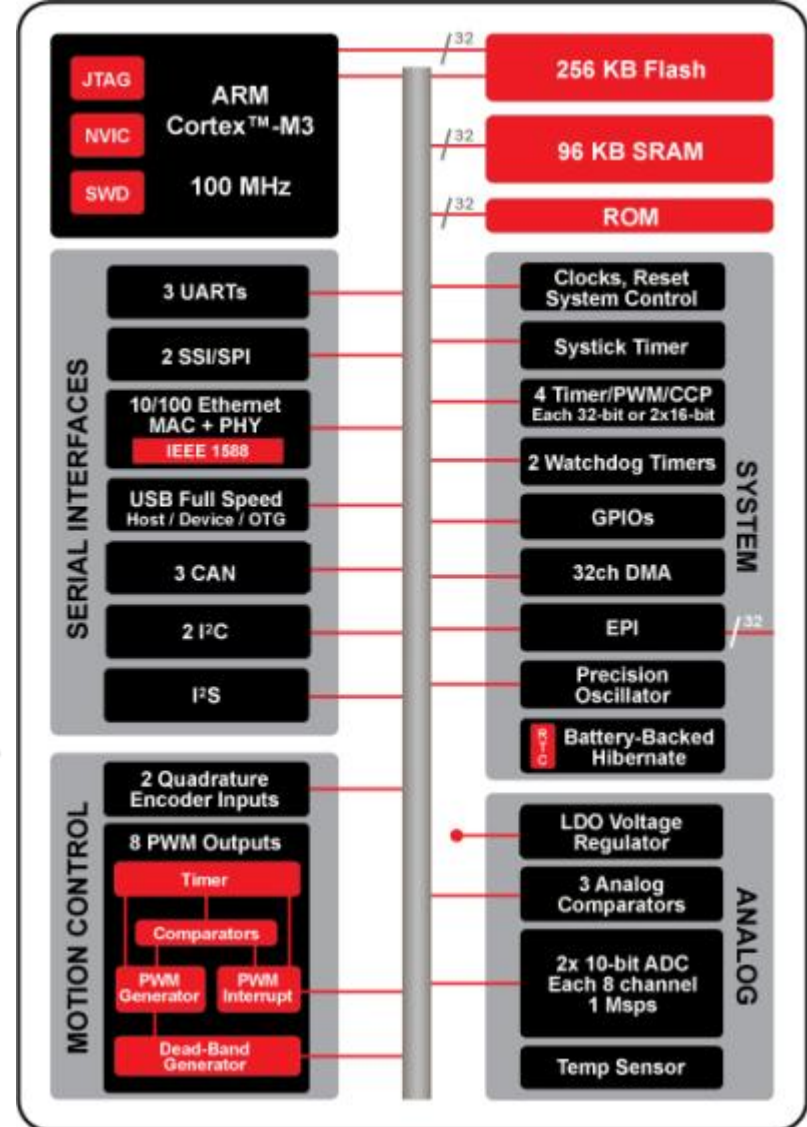
48-LQFP

64-LQFP

100-LQFP

and 108-BGA

Industrial & Extended Temperature



Interactive Product Selection Guide

<http://www.ti.com/mcu>



Samples 8

MCU Selection Tool - TI

MCU Selection Tool

All Microcontrollers (403) [Reset All Criteria](#) [Hide Criteria](#)

MCU Core Type:

Program Memory Type:

Program Memory (KB):

RAM (KB):

Max Speed (MHz):

CPU Features:

Standby Current (µA):

Active Current (µA/MHz):

Pins:

Package Type:

Package area (mm²):

Price (US\$) 1ku:

Timers:

PWM Channels:

Capture Pins:

Quad Encoder:

ADC Channels:

ADC Resolution (bits):

ADC Sample Rate:

Other Analog:

Temp. Range:

SPI:

CAN:

Buffered Serial Port:

UART:

I2C:

Ethernet: ☒

IEEE 1588: ☒

I2S: ☒

Hibernation Module: ☒

EPI/EMIF: ☒

Memory Protection Unit: ☒

Flexray: ☒

USB:

403 Results found

To sort/re-order/resize columns, drag-&-drop or click column headers.

[Compare Selected](#) [Export to Spreadsheet](#)

	Part Number	Flash	ROM	RAM	Max Speed	MPY	DMA	Standby Current	Active Current	MAX GPIO	Pin/Package	Package area	Timers	PWM	Capture Pins	QEP	LCD Segments	ADC Channels	ADC Resolution	Op Amp	CAN	Buffered Serial Port	UART	SPI	I2C	Price	Temp Range	ADC Sample Rate	Ethernet	IEEE 1588	EPI/EMIF	USB
<input type="checkbox"/>	LM3S101	8	0	2	20	0	0	0	0	18	28SOIC,48L	49,134.6,13	4	0	1	0	0	0	0	0	0		1	1	0	2.05	T,I	0	0	0	0	0
<input type="checkbox"/>	LM3S102	8	0	2	20	0	0	0	0	18	48LQFP,48V	49	4	0	2	0	0	0	0	0	0		1	1	1	2.05	T,I	0	0	0	0	0
<input type="checkbox"/>	LM3S1110	64	0	16	25	0	0	0	0	41	100LQFP,10	100,196	5	0	2	0	0	0	0	0	0		2	1	0	2.75	T,I	0	0	0	0	0
<input type="checkbox"/>	LM3S1133	64	0	16	50	0	0	0	0	44	100LQFP,10	100,196	6	2	8	0	0	2	10	0	0		3	2	1	3.15	T,I	250	0	0	0	0
<input type="checkbox"/>	LM3S1138	64	0	16	50	0	0	0	0	46	100LQFP,10	100,196	6	0	6	0	0	8	10	0	0		3	2	2	2.85	T,I	100	0	0	0	0

Stellaris® Roadmap

Production

Sampling

Development

Note: Complete peripheral set not shown for each device. All devices include mix of Timers, UART, I2C, SPI, USB, I2S, EPI, Ethernet, CAN, PWM, ADCs, DMA.

Performance



Fury class

- 50MHz
- 256K Flash
- 64K SRAM
- 10/100 EMAC w/PHY
- CAN 2.0 A/B MACs

Dustdevil class

- 50MHz
- 128K Flash
- 64K SRAM
- Motion control enh.
- USB D/H/OTG w/PHY

Sandstorm class

- 50MHz
- 64K Flash
- 8K SRAM

Tempest class

- 80 MHz
- 256K Flash
- 96K SRAM
- 10/100 EMAC w/PHY
- USB H/D/OTG w/PHY
- CAN 2.0 A/B MACs
- Ext Peripheral Inter.
- I2S

Firestorm class

- 80 MHz
- 512K Flash
- 96K SRAM
- 10/100 EMAC w/PHY
- USB H/D/OTG w/PHY
- 12-bit ADCs

Blizzard class

- Cortex-M4F
- 50 to 80 MHz
- 256K Flash
- 32K SRAM
- USB D/H/OTG w/PHY
- Ext Peripheral Inter

Brainstorm class

- Cortex-M4F
- 120+MHz
- 2MB Flash
- 256K SRAM
- Dual Ethernet
- ULP HIB
- Tamper Prevention

Whiteout class

- Cortex-M4F
- 50 to 80 MHz
- 32K Flash
- 8K SRAM
- USB Device

Now

2010

2011

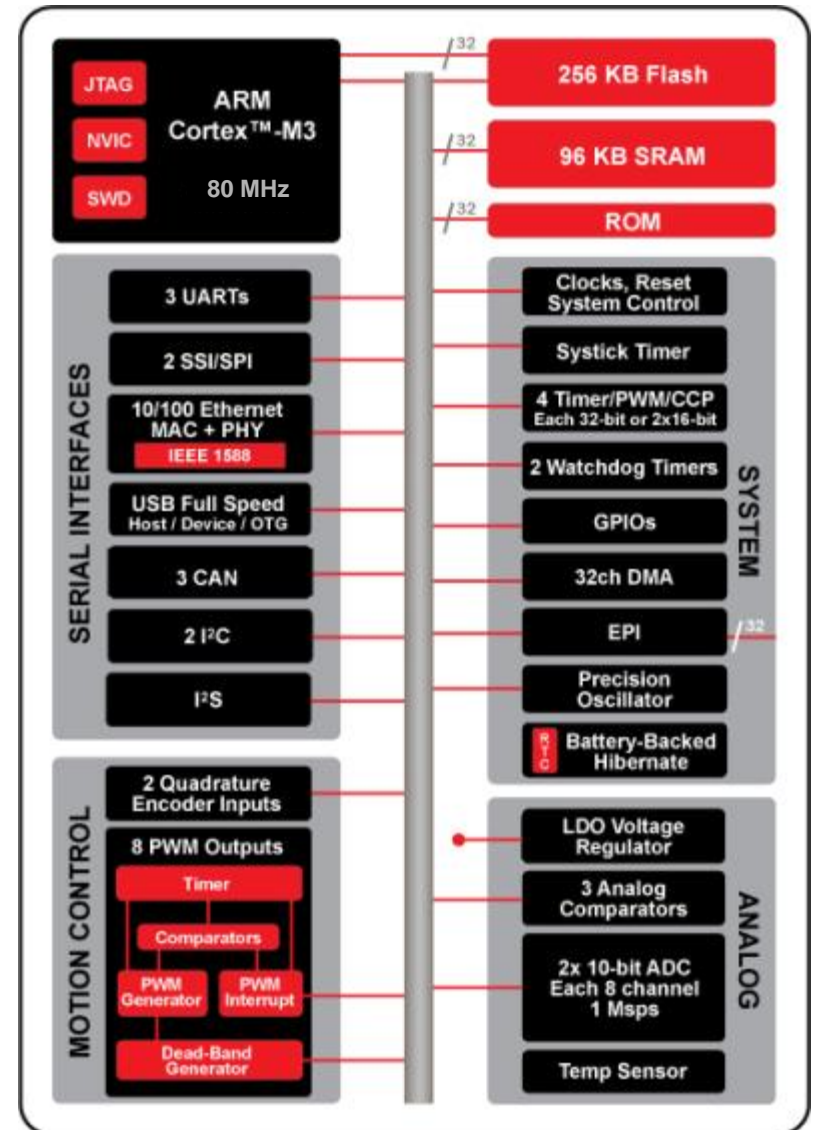
2012



Stellaris® High perf. features

Stellaris® modules

- **ARM® Cortex™-M3 Processor Core**
 - ✓ Up to 80 MHz
- **On-chip Memory**
 - ✓ 256 KB Flash, 96 KB SRAM
 - ✓ **ROM** loaded with Stellaris DriverLib, BootLoader, AES tables, and CRC
- **External Peripheral Interface (EPI)**
 - ✓ 32-bit dedicated parallel bus for external peripherals
 - ✓ Supports SDRAM, SRAM/Flash, M2M
- **Advanced Serial Integration**
 - ✓ 10/100 **Ethernet MAC and PHY**
 - ✓ 3 CAN 2.0 A/B Controllers
 - ✓ USB (full speed) OTG / Host / Device
 - ✓ 3 UARTs with IrDA and ISO 7816 support*
 - ✓ 2 I2Cs
 - ✓ 2 Synchronous Serial Interfaces (SSI)
 - ✓ Integrated Interchip Sound (I2S)
- **System Integration**
 - ✓ 32-channel DMA Controller
 - ✓ Internal Precision 16MHz Oscillator
 - ✓ Two watchdog timers with separate clock domains
 - ✓ ARM Cortex Systick Timer
 - ✓ 4 **32-bit timers** (up to 8 16-bit) with RTC capability
 - ✓ Lower-power battery-backed hibernation module
- **Flexible pin-muxing capability**
- **Advanced Motion Control**
 - ✓ 8 advanced PWM outputs for motion and energy applications
 - ✓ **2 Quadrature Encoder** Inputs (QEI)
- **Analog**
 - ✓ 2x 8-ch 10-bit ADC (for a total of 16 channels)
 - ✓ 3 **analog comparators**
 - ✓ **On-chip voltage regulator** (1.2V internal operation)

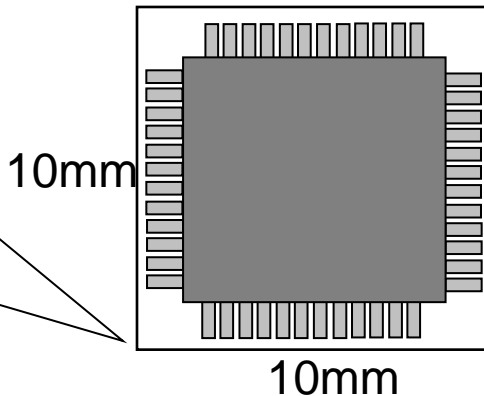


Ethernet MAC+PHY

- **The only ARM MCU with 10/100 Ethernet MAC / PHY**

- ✓ Enables network connectivity and embedded web servers
- ✓ Lower external power budget requirements than solutions using an external PHY
- ✓ Savings in board space and system cost

The Stellaris MCU in a BGA package is just slightly larger than a standard Ethernet PHY in a 48 pin TQFP package



MCU + PHY + More Stellaris Features in an area the size of an Industry standard PHY!

- ✓ Hardware support for Precision Time Protocol (IEEE 1588 PTP)

Motion control



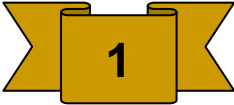


Meticulous Motion Control...

- Up to 8 general-purpose PWMs **AND**
- Up to 8 channels of motion control PWMs.
- General-purpose PWMs
 - ✓ Stellaris 16-bit timer simple PWM mode with programmable output negation.
- Motion-control PWM Module
 - ✓ Can generate simple PWM signals for a simple charge pump.
 - ✓ Can generate paired PWM signals with dead-band delays for a half-H bridge driver.
 - ✓ Can generate the full six channels of gate controls for a 3-Phase inverter bridge.
 - ✓ Dead-band generator providing shoot-through protection.
 - ✓ Synchronization of timers enables precise alignment of ***all*** edges.
- Up to 4 fault-condition handling inputs in hardware quickly provide low-latency shutdown.
- Up to 2 Quadrature Encoder Inputs provide accurate positioning for closed-feedback control

Low Flash access cycle

- **Single-Cycle Flash memory up to 50MHz!**

- ✓ Core speeds does not count if the flash is not single-cycle

Vendor	MCU Line	Flash Access Time 20MHz CPU	Flash Access Time 25MHz CPU	Flash Access Time 50MHz CPU	Unit of Measure
TI	Stellaris				Cycle

- **Prefetch buffer enabled when CPU > 50 MHz.**

- ✓ Prefetches two 32-bit words per clock allowing Flash memory to be read with no wait states while code is executing linearly

Flash access specifications from published datasheets



Stellaris® Speed to market

StellarisWare

- Free license and royalty-free source code:
 - ✓ Peripheral Driver Library
 - ✓ Graphics Library
 - ✓ USB Library
 - ✓ Boot Loader
 - ✓ IEC 60730 Library
- ✓ Code examples for each kit
- ✓ Supports different compilers and IDEs

Enabling our customers with the ability to rapidly develop and deploy their products at competitive costs yielding a higher overall value for the Stellaris solution!

Stellaris® Ecosystem

Compilers, Debuggers



Rowley Associates



RTOS



Micrium



Stacks, Specialty



Willert Software Tools
Pioneers in Embedded Software Engineering



interniche
technologies, inc.



Micrium



Programmers



Stellaris® Evaluation Kits

- Start in 10 minutes or less
- Evaluation board packages includes:
 - ✓ Cables
 - ✓ A choice of evaluation tools suites for popular development tools
 - ✓ Documentation (QuickStart guide, User's guide, ...)
 - ✓ StellarisWare® software
 - ✓ Applications notes



EK-LM3S811
Low pin count
49 USD



EK-LM3S1968
High pin count
59 USD



EK-LM3S2965
CAN Functionality
79 USD



EK-LM3S3748
USB Host/Device
109 USD



EK-LM3S6965
Ethernet MAC+PHY
69 USD



EK-LM3S8962
Ethernet+CAN
89 USD



EK-LM3S9B90
Ethernet+USB OTG
99 USD



EK-LM3S9B92
Ethernet+OTG+MC
99 USD

- Function both as an evaluation platform and as a serial in-circuit debug interface for any Stellaris microcontroller-based target board

Stellaris® RDK - Open-Tool Motor

RDK-ACIM
\$379



AC Induction Motor Controller Design

Example applications:

- White goods
- Residential and light commercial HVAC
- 3-ph Industrial Motor Drives

RDK-STEPPER
\$199



Stepper Motor Controller Design

Example applications:

- 2 and 3 axis CNC equipment
- Sorting and grading equipment
- Specialized printers and scanners

RDK-BLDC
\$219



Brushless DC Motor Controller with CAN/Ethernet

Example applications:

- Small appliances
- Electric wheelchairs and mobility devices
- Pumping and ventilation systems

RDK-BDC
\$219



Brush DC Motor Controller with CAN

Example applications:

- Small appliances
- Electric wheelchairs and mobility devices
- Pumping and ventilation systems



Official FIRST KoP Speed
Controller – FRC 2009

Stellaris® RDK - Open-Tool

RDK-IDM
\$219



Touch-screen Intelligent Display Module with PoE

Example applications:

- Security Systems & Building Access Controllers
- White Goods and other Home Appliances
- Factory Automation (System Status and Configuration)

RDK-IDM-L35
\$219



Landscape-oriented Touch-screen Intelligent Display Module

Example applications:

- Security Systems & Building Access Controllers
- White Goods and other Home Appliances
- Factory Automation (System Status and Configuration)

RDK-IDM-SBC
\$299



Stellaris 3.5" Landscape IDM Single Board Computer

Example applications:

- Security Systems & Building Access Controllers
- White Goods and other Home Appliances
- Factory Automation (System Status and Configuration)

RDK-S2E
\$139



Tiny Footprint Serial-to-Ethernet Module

Example applications:

- SCADA Remote Terminal Units (RTUs)
- Electronic Flow Meters (EFMs)
- CCTV RS-232 Recorders

Stellaris® Development Kits



**Only
\$249!**

■ DK-LM3S1xx/3xx/8xx Development Kits

- ✓ Development Board with a choice of daughtercard
- ✓ UART transceiver and DB9 male connector
- ✓ All I/O available on headers
- ✓ One potentiometer and one photocell for driving the comparator inputs
- ✓ Eight user LEDs and one pushbutton for use with the Stellaris™ GPIOs
- ✓ Standard ARM® 20-pin JTAG debug connector
- ✓ USB 2.0 full-speed interface allows JTAG/SWD debug
- ✓ 1 Mbit SPI-based flash memory
- ✓ One buzzer for PWM use
- ✓ User-prototype area



**Only
\$425!**

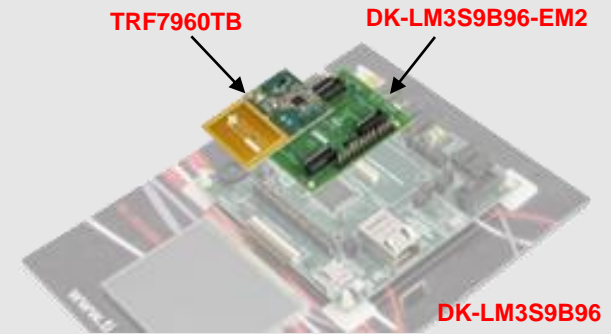
■ DK-LM3S9B96 Development Kit

- ✓ 80 MHz Stellaris LM3S9B96 MCU with fully-integrated Ethernet, CAN, and USB OTG/Host/Device
- ✓ Bright 3.5" QVGA LCD touch-screen display
- ✓ Navigation POT switch and select pushbuttons
- ✓ Integrated Interchip Sound (I2S) Audio Interface
- ✓ EPI cards: I/O break-out board and 8 MB SDR SDRAM module
- ✓ MicroSD card interface
- ✓ LM3S9B96 I/O available on labeled break-out pads
- ✓ ARM® 10-pin JTAG debug connector with input and output modes

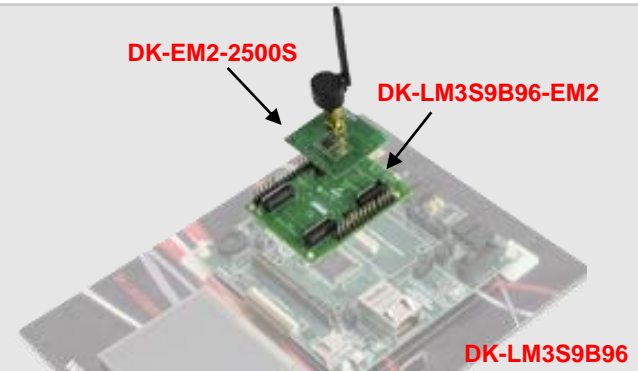


Complete, modular wireless solutions

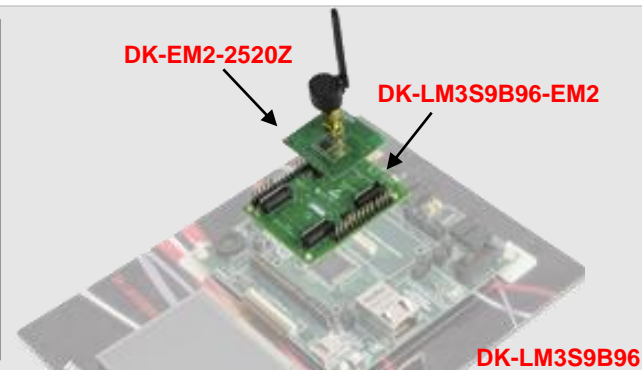
Stellaris 13.56MHz RFID Wireless Kit



Stellaris 2.4 GHz SimpliciTI Wireless Kit

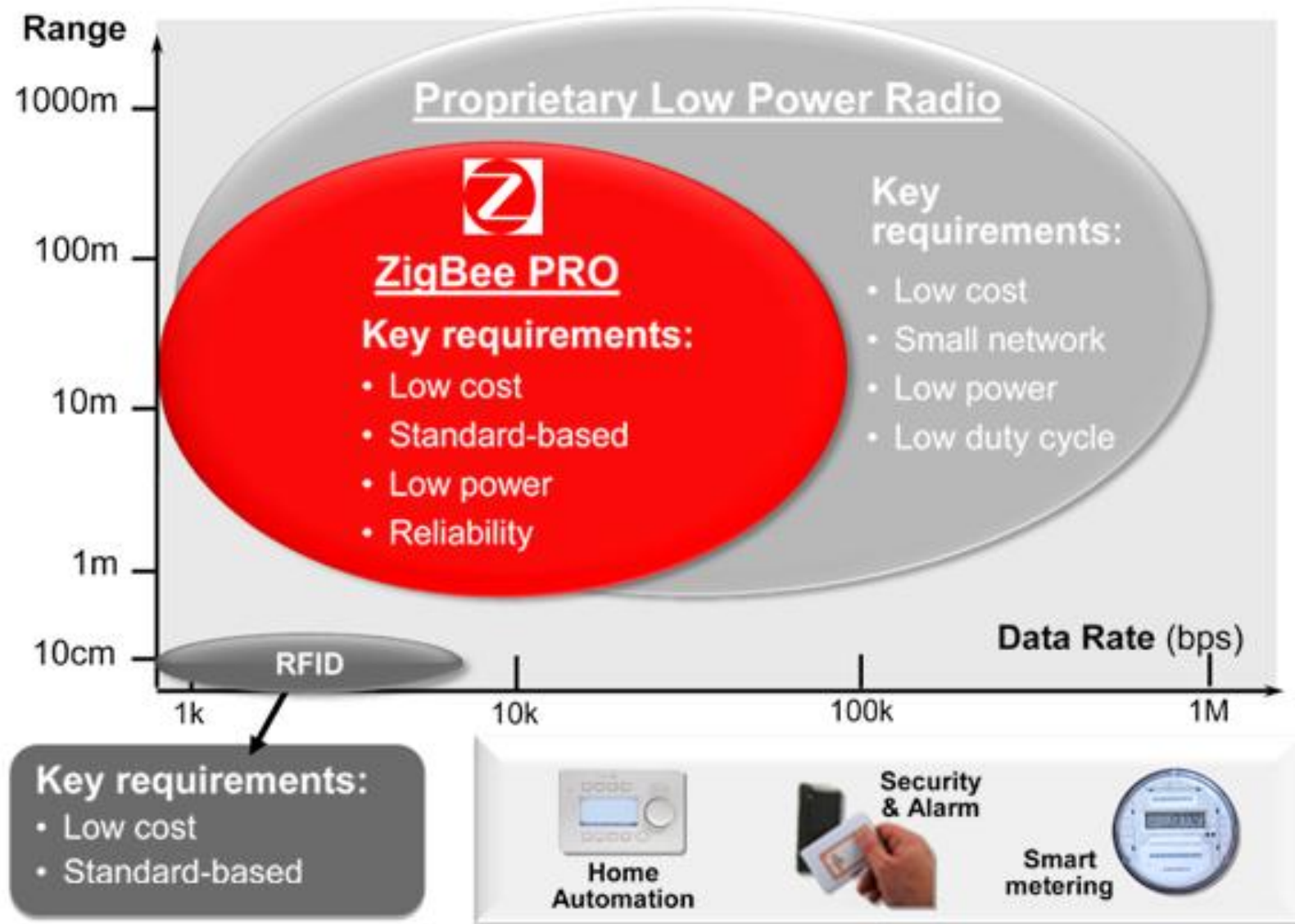


Stellaris ZigBee® Networking Kit



Stellaris[®] and the Wireless World

Multiple wireless solutions address diverse application needs



Three kits accelerate innovation in wireless networking applications

Connectivity options for varying needs

- Software & reference design solutions for adding RFID, low-power RF and ZigBee® capabilities
- Complete signal chain from TI simplifies development

Bandwidth for advancing functionality

- 32-bit performance executes wireless stacks, leaving headroom for additional communication & application functions
- Additional advanced connectivity via integrated Ethernet MAC and PHY, CAN and USB On-the-Go /Host/Device

Get started in less than 10 minutes

- Multiple network nodes and quickstart application to create full network in less than 10 minutes
- StellarisWare® support for each protocol
- Full documentation and complete source code

Stellaris[®] / SimpliCI™

Design reference

Stellaris 2.4 GHz SimpliCI™ Wireless Kit DK-EM2-2500S

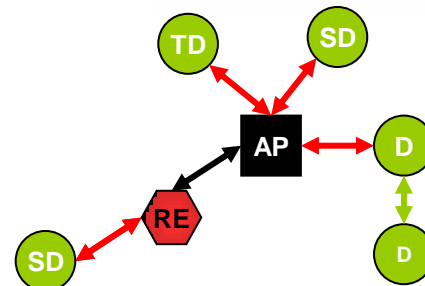
Key features

- Multiple heterogeneous network nodes via TI's eZ430-RF2500 kit and CC2500 evaluation module
- Multi-platform software support including access to binaries for low-power RF solutions from sub-1 GHz to 2.4 GHz
- Firmware, documentation and example SimpliCI application supporting simple star network and point-to-point configuration
- Stellaris DK-LM3S9B96-EM2 Expansion Board

Performance advantages



- In-home networking and bridge to smart meters
- Scalable access control and alarm for home and commercial



\$125 USD

What is SimpliTI?

SimpliTI is:

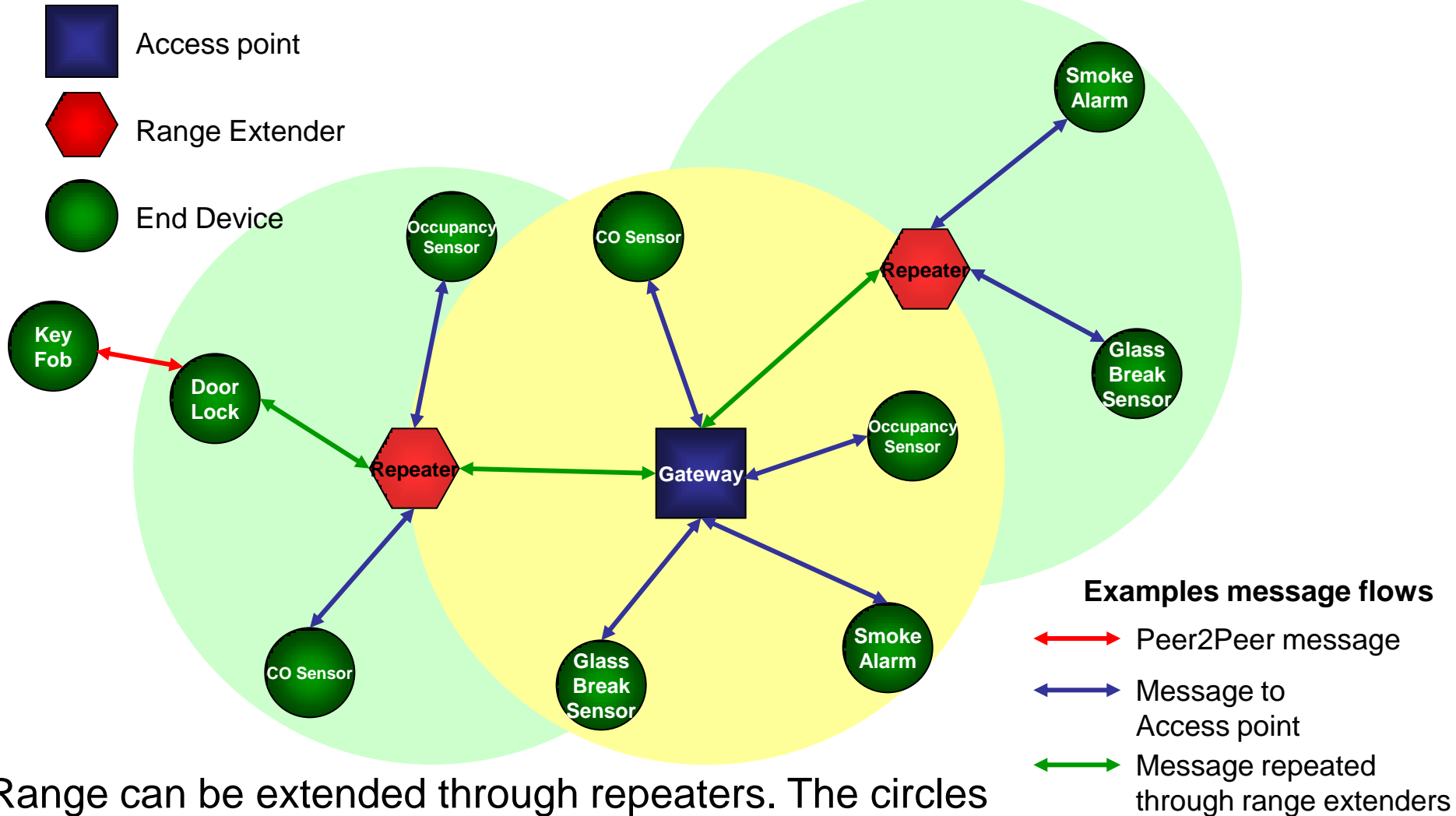
- ✓ A TI proprietary **low-power RF** network protocol
- ✓ Low Cost: uses < 8K FLASH, 1K RAM depending on configuration
- ✓ Flexible: simple **star** w/ extendor and/or **p2p** communication
- ✓ Simple: Utilizes a very **basic** core API
- ✓ Versatile: **STELLARIS+CC110x/2500**, MSP430+CC110x/2500, CC1110/2510, CC1111/CC2511, CC2430, CC2520,
- ✓ Low Power: Supports **sleeping** devices

Application Areas

SimpliciTI supports:

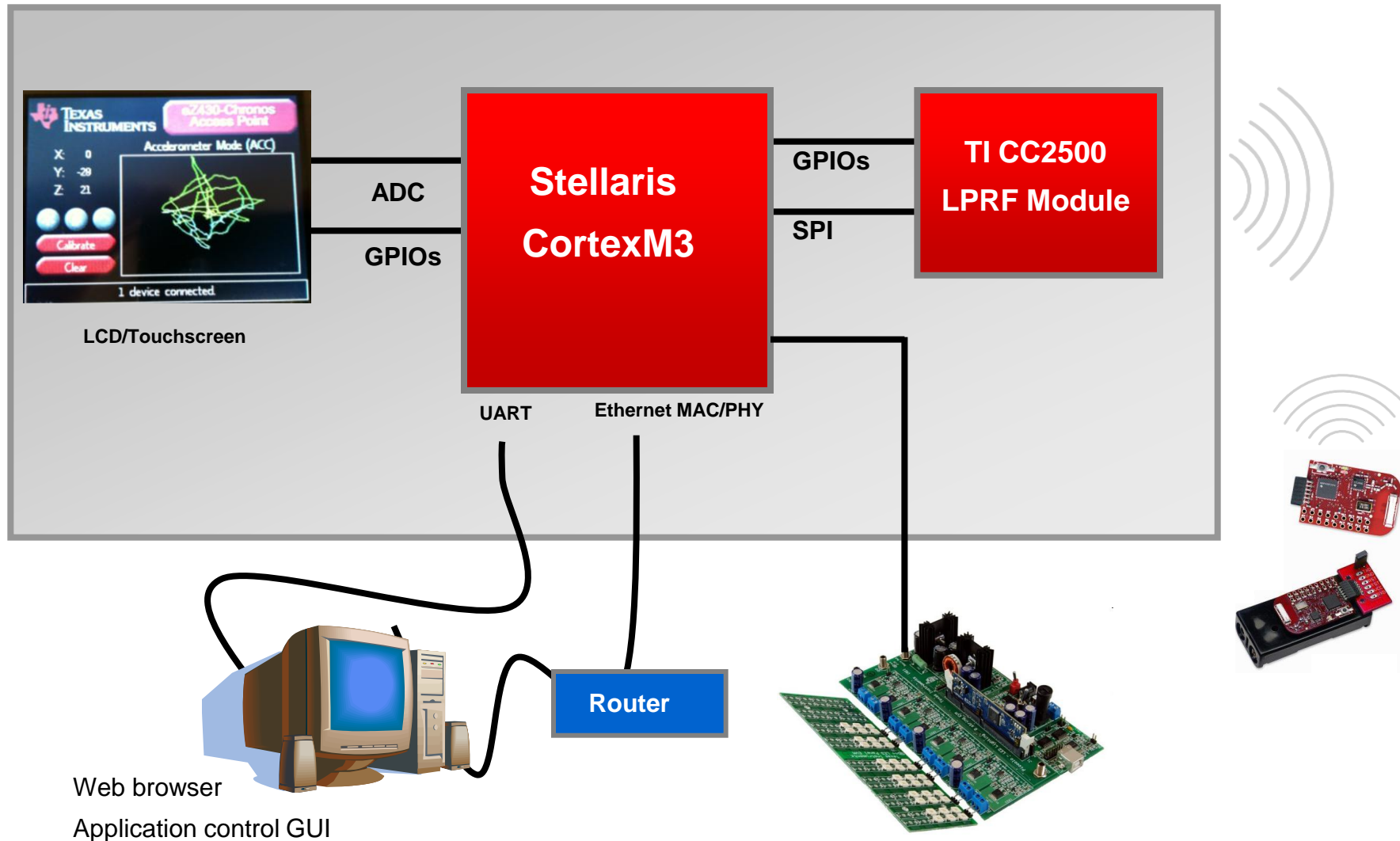
- alarm & security: occupancy sensors, light sensors, carbon monoxide sensors, glass-breakage detectors
- smoke detectors
- remote controls
- AMR: gas meters, water meters, e-meters
- home automation: garage door openers, appliances, environmental devices

Network topology with SimpliciTI wireless sensing application



Range can be extended through repeaters. The circles represent range of gateway and extended range of repeaters.

Demo system overview



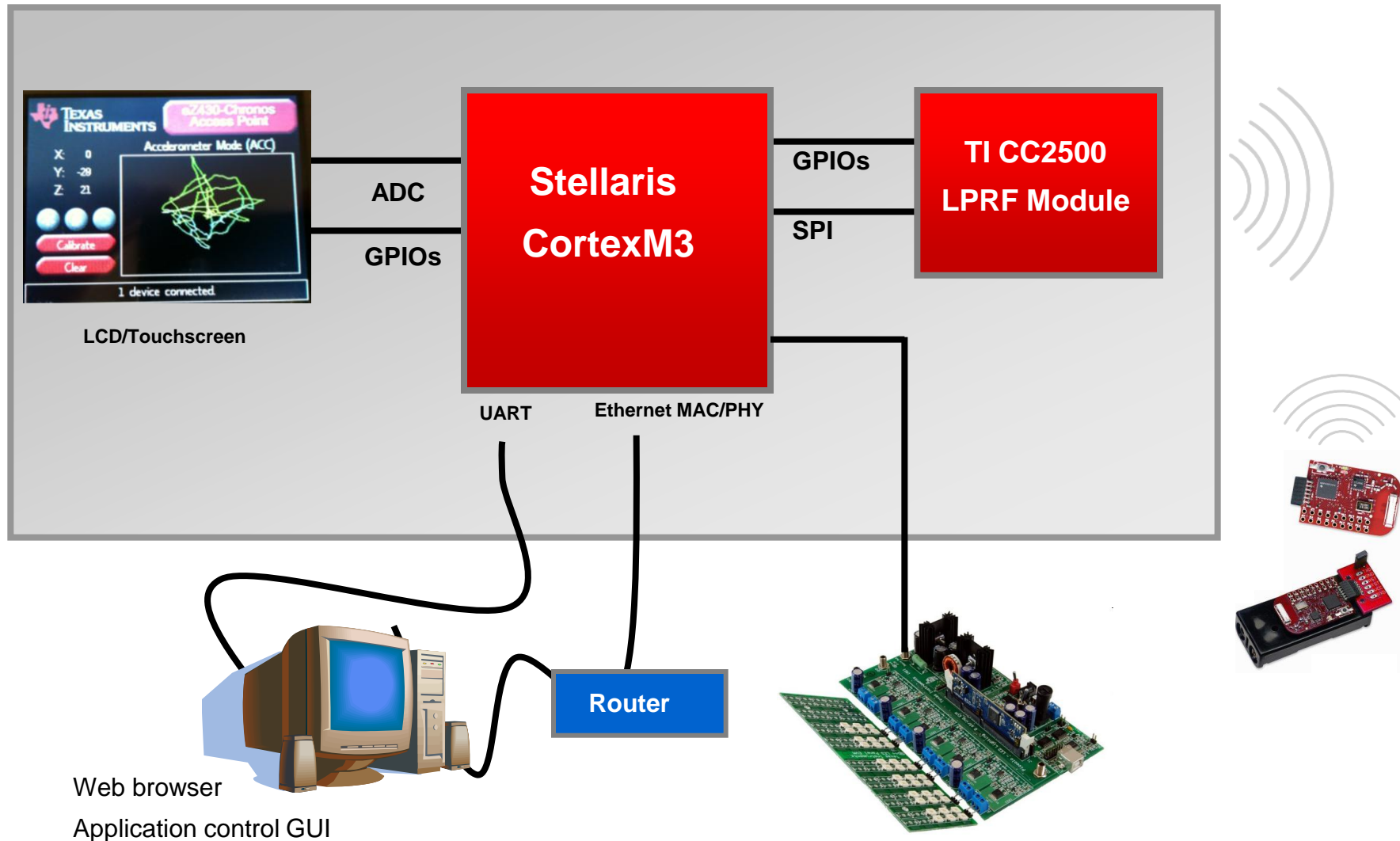
Stellaris® Development Kits

DK-LM3S9B96 Development Kit

- ✓ 80 MHz Stellaris LM3S9B96 MCU with fully-integrated Ethernet, CAN, and USB OTG/Host/Device
- ✓ Bright 3.5" QVGA LCD touch-screen display
- ✓ Navigation POT switch and select pushbuttons
- ✓ Integrated Interchip Sound (I2S) Audio Interface
- ✓ EPI cards: I/O break-out board and 8 MB SDR SDRAM module
- ✓ MicroSD card interface
- ✓ LM3S9B96 I/O available on labeled break-out pads
- ✓ ARM® 10-pin JTAG debug connector with input and output modes



Demo system overview

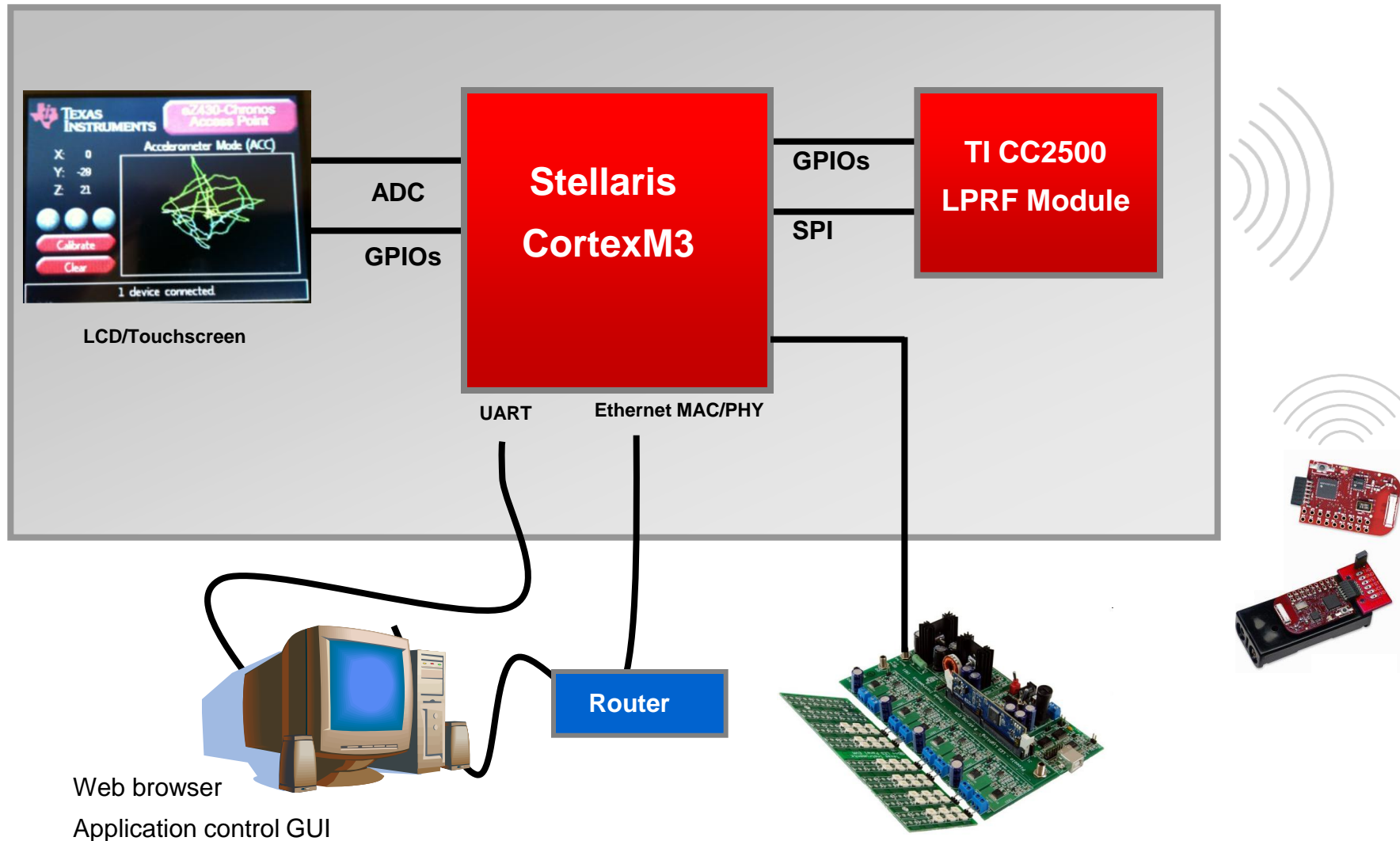


Stellaris Wireless Development kit

- Stellaris DK-LM3S9B96-EM2 Expansion Board
- CC2500EM wireless evaluation module
- eZ430-RF2500 kit
 - ✓ USB Emulator
 - ✓ (2x) F2274 / CC2500 Target
 - ✓ Battery Expansion board

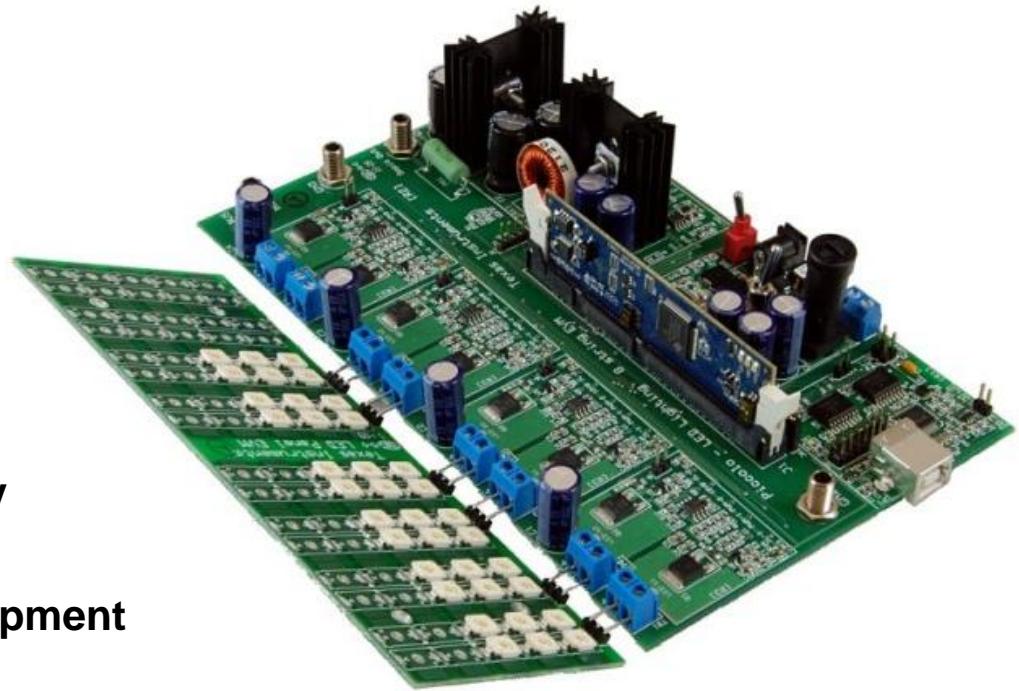


Demo system overview

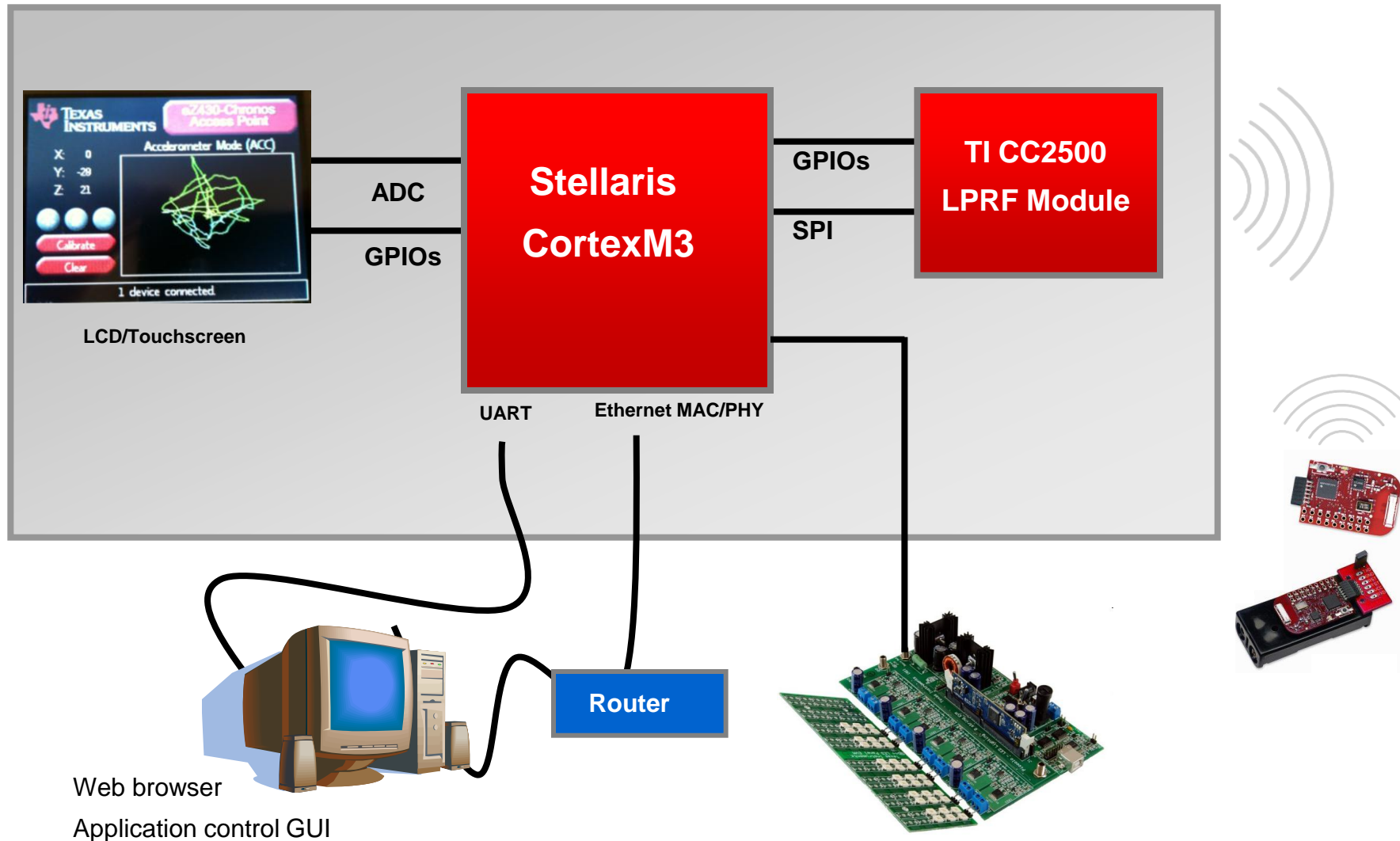


DC/DC LED Developer's Kit

- 12-48V DC input to SEPIC DC/DC stage 50V DC output
- 4 LED driver stages, each capable of driving two strings at 30 watts
- LED driver stages can be externally powered
- Piccolo based controlCARD development platform
- Open source hardware, including gerber files, schematics, and BOMs
- Closed loop DC/DC and LED driving software, complete with source code and documentation



Demo system overview



Stellaris[®] Zigbee

Design reference

Stellaris ZigBee® Networking Kit

Key features

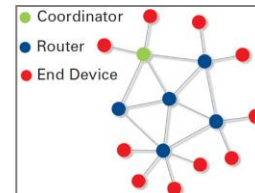
- Z-Stack™ 2.4 software and example coordinator application software to address the growing portfolio of IEEE 802.15.4 products and platforms
- Multiple heterogeneous network nodes with one CC2520 evaluation module, two battery operated sensor modules and two CC2530 evaluation modules pre-programmed with a temperature sensor application
- Example ZigBee application, StellarisWare software and documentation
- Stellaris DK-LM3S9B96-EM2 Expansion Board

NEW:
Z-STACK
Free
Download

Performance advantages



- Smart appliance communications to smart metering
- Backup communication system for plant engineering



Stellaris[®] RFID Design reference

Stellaris 13.56MHz RFID Wireless Kit

Key features

- TI TRF7960TB HF RFID Reader Module target board
- Stellaris DK-LM3S9B96-EM2 Expansion Board
- 2 ISO/IEC 14443A (MIFARE®-1K) contactless smart cards and additional TRF7960-supported tags/inlays
- Example ISO/IEC 14443A (MIFARE) application, firmware documentation
- Support for additional protocols coming soon

Performance advantages



- **Pre-pay capability for smart meters**
- **Access control for smart building systems**

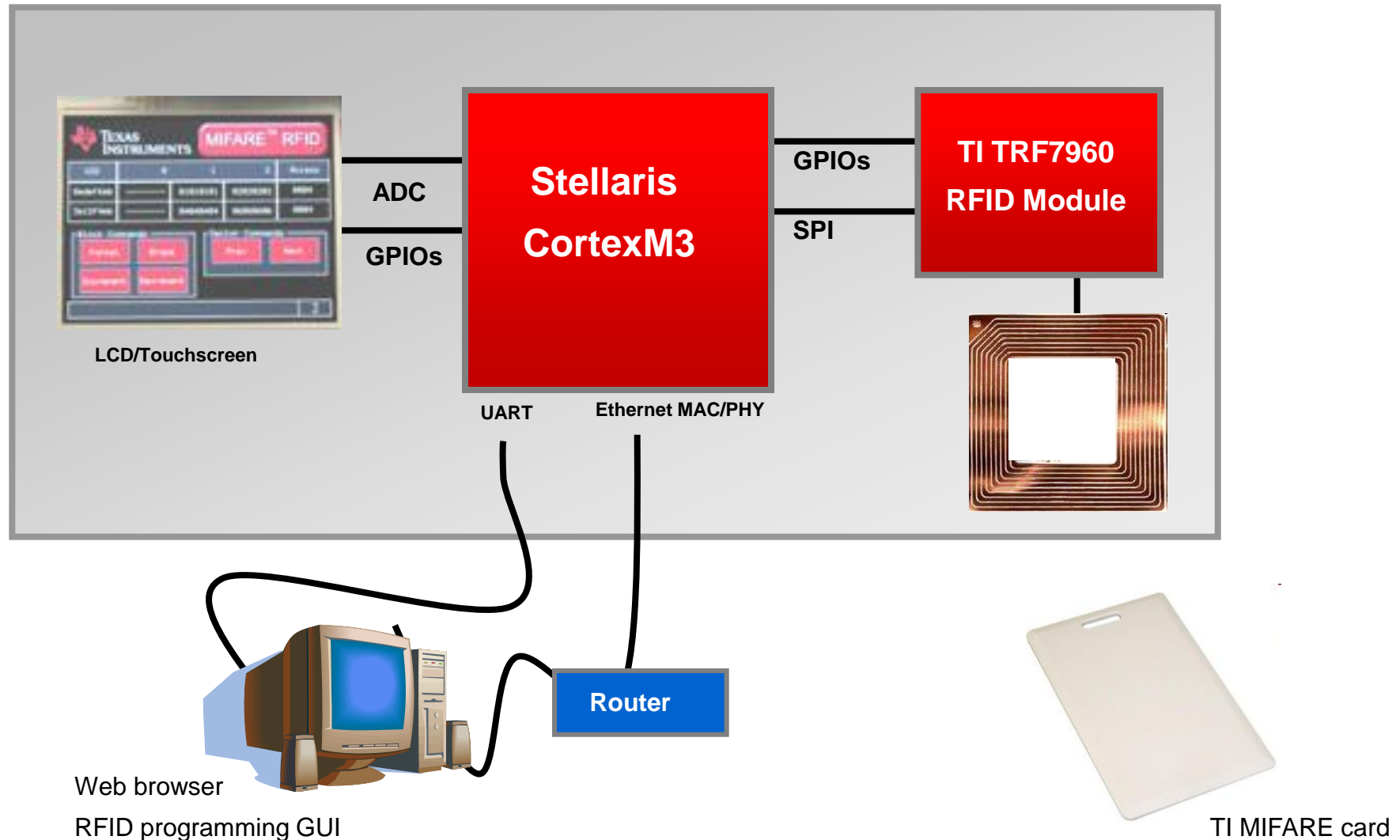


\$99 USD

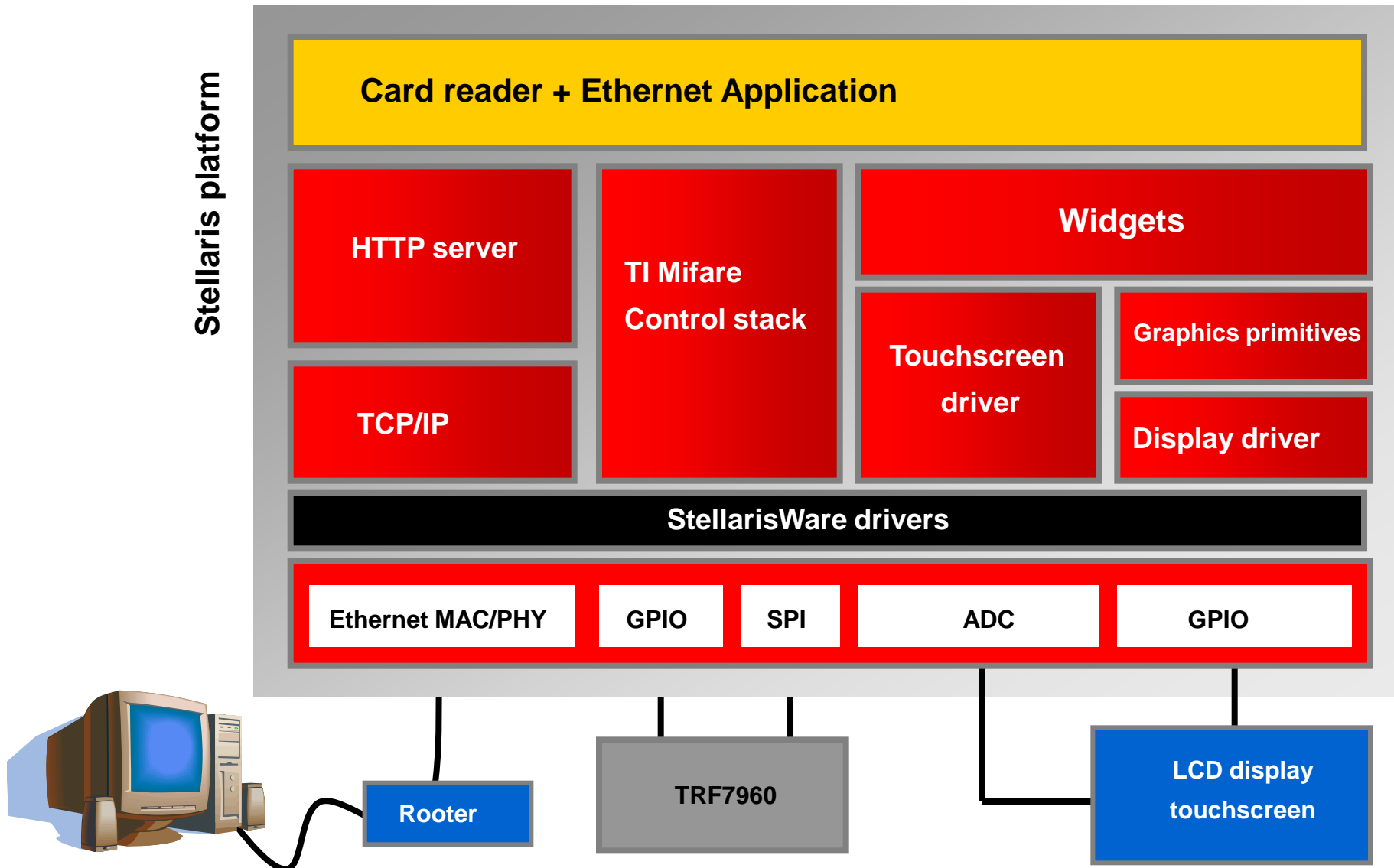
What is RFID/MIFARE?

- Radio-frequency identification (RFID) is a technology that uses communication via **electromagnetic waves** to exchange data between a **terminal** and an **object** for identification and tracking
- **MIFARE** is the most widely installed **contactless smart card**, or **proximity card**, technology in the world
- The **MIFARE classic** employs a proprietary protocol instead of ISO/IEC 14443A-4, with a proprietary **security protocol for authentication and ciphering**
- The **MIFARE classic 1K** offers 1024 bytes of data storage, split into **16 sectors**; each sector is protected by two different keys, called *A* and *B*. They can be programmed for operations like **reading, writing, increasing value blocks**, etc.)

Demo system overview



Demo software architecture



Demo use

- The application continuously attempt to connect to **MIFARE classic cards** using a **hard coded key** and displays the data for **up to 2 cards**
- The application allows the user to **format, erase, increment, or decrement any block** of the card which is writable
- The user interface uses LCD and touchscreen capabilities to access easily some basic features of MIFARE 1K classic contactless smart card
- Smard card data are interpreted and displayed through Ethernet

