

FIFE POWERING INNOVATION Hands-on Workshop: Tower System Solutions, Part 4: Add Ethernet to Your Application FTF-ENT-F0082

Wang Hao Freescale AE



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Hands-on Workshop: Tower System Solutions, Part 4: Add Ethernet to Your Application

- This session will provide a hands-on experience with MQX[™] for developing Ethernet Web server projects using an integrated Ethernet stack with a 32-bit MCU and IDE. Other use cases highlighted will include Telnet and FTP.
- Two hours long
- Four hands-on labs





Target Audience

- Embedded system designers who are new to networking or need a refresher.
- Embedded system designers that want to take advantage of the complementary Freescale MQX RTOS with RTCS network protocol stack.
- Designers who want to access and control embedded systems remotely over a network.



Agenda

- 1. Introduction and session objectives
- 2. Network concepts
- 3. Freescale RTCS Configuration and initialization
- 4. Socket API
- 5. Application layer protocols
- 6. HTTP Web server lab
- 7. CGI lab
- 8. FTP lab
- 9. Telnet lab
- 10. Wi-Fi concepts and integration with RTCS
- 11. Summary, Q&A



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Introduction

- This course covers TCP/IP connectivity concepts using Freescale MQX RTOS (Real-Time Operating System)
- Most embedded products use some level of connectivity for a variety of reasons:
 - Communication with other embedded devices or computers
 - Providing a user interface
 - Downloading of diagnostic information
 - Updating of application image
- With the concept presented in this session, you will be able to add Ethernet connectivity to your products to increase their value to final customers, increase their maintainability and make development easier.



Session Objectives

After completing this session, you will be able to:

- Configure and initialize RTCS
- Use socket API to create TCP and UDP connections
- Use HTTP Web server to serve dynamic data in a Web page
- Understand CGI implementation
- Use Telnet for remote command line access
- Use FTP for file transfer
- Understand Ethernet and Wi-Fi options for networking



Kinetis K70 Familywww.freescale.com/k70High Performance, HMI, Security and Connectivity

120/150MHz ARM Cortex-M4 DSP with Floating Point Unit

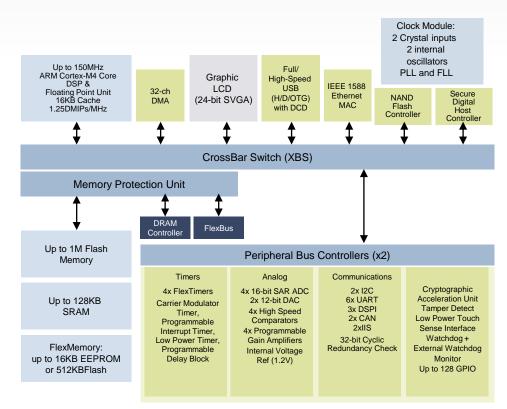
- Faster processing, reduced code size and increased system accuracy in data-acquisition-intensive applications like BLDC motor control & digital filtering
- Graphics LCD on-chip with GUI enablement support (K70 family only)
 - Supports QVGA LCD panels as a single-chip solution or up to 24-bit SVGA panels using external memory
 - Supported by Freescale's PEG library with simple WindowBuilder interface for advanced GUI development. Complimentary eGUI LCD driver also available

Security for robust, industrial applications

- Hardware tamper detection against voltage / frequency / temperature variations and physical attack
- Secure RTC with independent battery supply and Secure Key Storage for smart-metering and secure industrial systems
- Cryptographic acceleration unit provides fast, secure data transfer and storage. Supports multiple encryption algorithms with minimal system overhead

Industrial connectivity and external memory support

- IEEE 1588 hardware time stamping & clock synchronization enables accurate, deterministic control over Ethernet networks
- USB 2.0 Full-Speed Device/Host/OTG Controller with integrated transceiver. High-Speed with external ULPI interface
- NAND Flash, DDR and Secure Digital Host Controllers provide multiple options for system expansion



Enablement Bundle

- TOWER development system
- MQX RTOS USB & TCP/IP stacks, GUI & Encryption plug-ins
- Eclipse-Based CodeWarrior 10.1 IDE with Processor Expert
- PEG Graphic LCD WindowBuilder
- IAR, Keil and Full ARM Ecosystem Support



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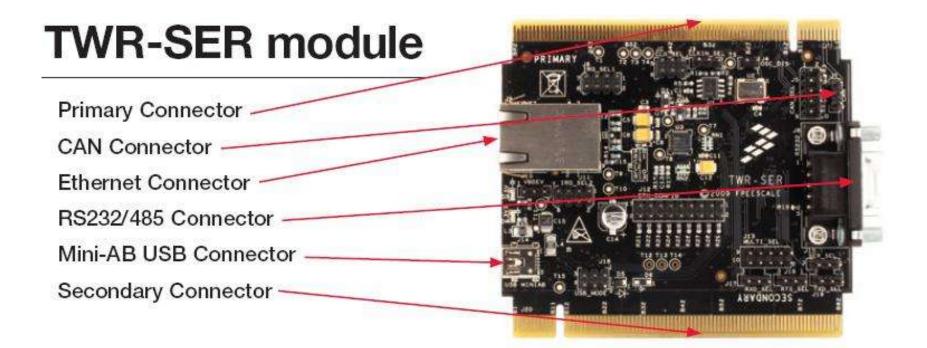
TWR-K70F120M Module



Figure 1: Front side of TWR-K70F120M module (TWRPI devices not shown).



TWR-SER Module





Freescale MQX RTOS Solution

Full-featured, scalable and proven RTOS bundled *free* with 32-bit MCUs/MPUs

Full-featured and powerful

- Tightly integrated RTOS, middleware (USB, TCP/IP stacks) and BSPs (I/O Drivers)
- Designed for speed and size efficiency (12 KB of ROM & 2.5K RAM on ColdFire V2 core)

Market proven

- MQX has been available on Freescale processors for > 15 years
- MQX has been used in millions of products, including medical and heavy industrial areas

Simple and scalable

- Intuitive API and modular architecture; fine-tune to fit application requirements
- Production source code provided Similar to other software OS







MQX software speeds time to market with support from Freescale



Software integration headache



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Products Supported

Complimentary Freescale MQX Software Solution comes with:

- ColdFire+
 - MCF51JF, MCF51QM
- ColdFire
 - MCF51CN, MCF51AG, MCF51EM, MCF51AC, MCF51JM, MCF51MM, MCF51JE
 - MCF520X, MCF5225X, MCF5223X, MCF5222X, MCF5227X
 - MCF5301x, MCF532x
 - MCF5445X, MCF5441x
- Power Architecture
 - MPC5125
 - MPC8308
 - PX20
- Kinetis Architecture
 - K10, K20, K30,K40, K50, K60, K70
- Select 32-bit Freescale processors (i.MX / ColdFire® / Power Architecture®) do NOT include complimentary Freescale MQX, but MQX can be licensed at low cost through Embedded Access



Kinetis	ColdFire V2-V4		
TWRK40X256	M5208EVBE		
TWRK53N512	M52223EVB		
TWRK60N512	M52233DEMO		
K40X256	M52235EVB		
(KwikStik)	M52259EVB		
TWRK70F120M	M52259DEMO		
ColdFire V1	TWRMCF52259		
TWRMCF51AG	M52277EVB		
TWRMCF51CN	M53015EVB		
TWRMCF51JE	M5329EVB		
TWRMCF51JF	TWRMCF54418		
TWRMCF51MM	M54455EVB		
TWRMCF51QM	PowerPC		
M51ACDEMO	TWRMPC5125		
M51EMDEMO	MPC8308RDB		
M51JMEVB	TWR-PXS20		

Red = New in MQX 3.8

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Freescale MQX RTOS

Simple and Scalable: Straight-forward API and modular architecture can be fine-tuned to fit application requirements



Designed to be customized by:

- Feature
- Size
- Speed

Lightweight services

- Smaller & faster vs. regular MQX services
- Allows control of RAM/ROM utilization

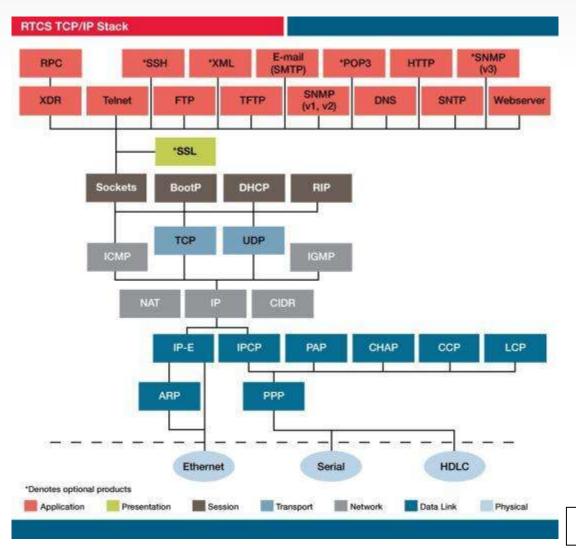
Scalable code density ideal for MCU & MPU

- ROM size ranges from CFV2: 12K to 150K
- RAM size starting at 2.5K
- 2 task application with 1 LW semaphore and minimum interrupt stack

New, custom components can be added



FSL MQX Real-Time Communication Suite (RTCS)



Simple and Scalable

- Small, configurable size conserves memory space for application
- Allows developers to add Web servers, e-mail, network management, security and routing to their designs

Full-Featured and Powerful

- Developed to be tightly integrated with MQX RTOS
- Includes FTP, Telnet, DHCP, DNS servers / clients and SNMP client
- Ethernet Serial to gateway applications
- ★ Optional pre-integrated products



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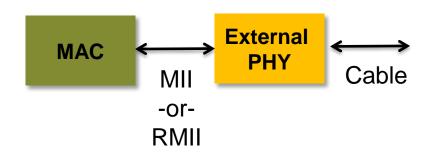


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Ethernet Hardware

Kinetis 10/100-Mbps Ethernet MAC

- IPv4 and IPv6 support
- Supports IEEE 1588
- AMD magic packet detection for waking up MAC from sleep mode
- Medium Independent Interface (MII) operating at 25 MHz, or Reduced MII (RMII) operating at 50 MHz to interface to external Phy.





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MII vs. RMII

• MII

- -4-bit data
- MAC provides 25 MHz receive/transmit clocks to the external PHY

• RMII

- -2-bit data
- Clocked twice the speed
- Both MAC and PHY clocked by same 50 MHz source
- Note on Kinetis, RMII_REF_CLK is internally tied to EXTAL (system clock reference)

MII	RMII	
MII_RXD[3:0]	RMII_RXD[1:0]	
MII_CRS		
MII_RXDV	RMII_CRS_DV	
MII_RXCLK		
MII_RXER	RMII_RXER	
MII_TXD[3:0]	RMII_TXD[1:0]	
MII_COL		
MII_TXCLK		
MII_TXEN	RMII_TXEN	
MII_TXER		
	RMII_REF_CLK	
MII_MDC	RMII_MDC	
MII_MDIO	RMII_MDIO	



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Definitions

RTCS = Real-Time TCP/IP Communications Suite

API = Application Programming Interface

TCP = Transmission Control Protocol

UDP = User Datagram Protocol



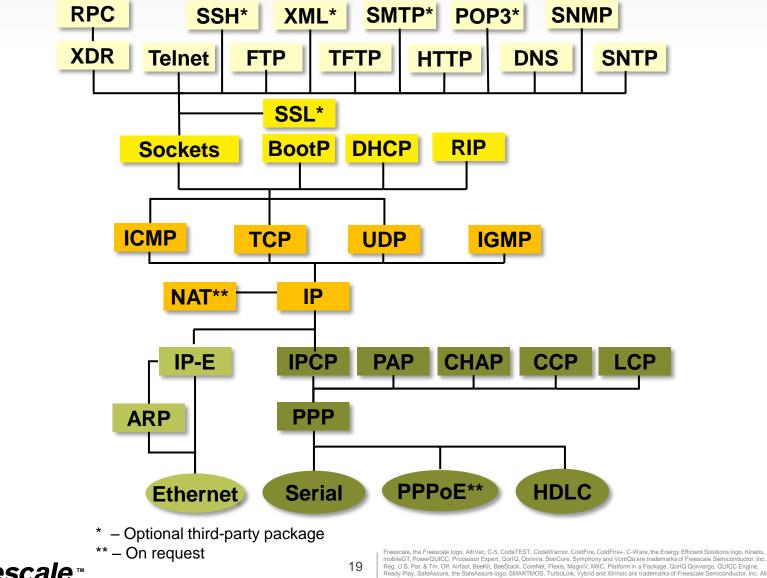
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Introduction to RTCS

- TCP/IP stack designed for embedded processors
- Uses standard socket interface
- Extensive list of application layer protocols
- Scalable at compile time and/or run-time:
 - Only used protocols are included
 - Data requirements are tunable
 - Protocol behavior is controllable
- Integrated with CodeWarrior to provide TCP/IP-aware debugging
- Standard release across all processors
- Integrated with a number of third-party optional packages



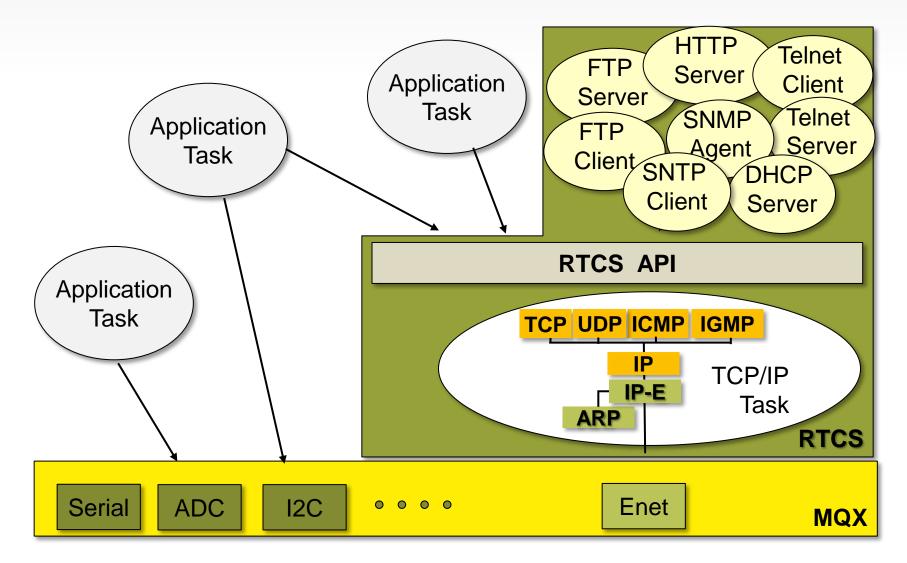
RTCS Protocols





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RTCS Architecture





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Compile Time Configuration

- Close to 100 compile time configuration settings
- Defaults set in RTCSCFG.H, overridden by user_config.h
- Each protocol can be individually enabled/disabled
- Protocol statistics can be individually enabled/disabled
- Level of error checking performed is configurable



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Run-Time Configuration

- RTCS uses some global variables that control RTCS task priority and some memory usage options
- All variables have default values
- If you want to change the values, the application must do so before it creates RTCS; that is, before it calls RTCS_create().



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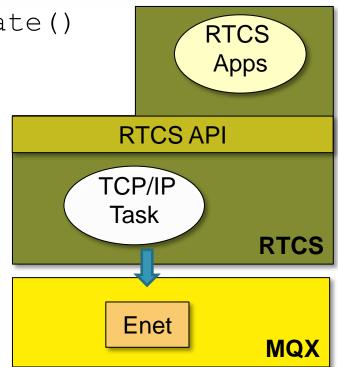
Run-Time Configuration

To change:	From this default value:	Change this creation variable:
Priority of RTCS tasks (because you must assign priorities to all the tasks that you write, RTCS lets you change the priority of RTCS tasks so that it fits with your design).	6	_RTCSTASK_priority (see caution below)
If the priority of RTCS tasks is too low, RTCS might mi specifications for a protocol.	ss received pack	ets or violate the timing
Additional stack size that is needed for DHCP and IPCP callback functions (for PPP).	0	_RTCSTASK_stacksize
Maximum number of packet control blocks (PCBs) that RTCS uses.	32	_RTCSPCB_max
Pool that RTCS should allocate memory from. If 0, system pool will be used. If a different pool needs to be used the memory pool id must be provided. Example: _RTCS_mem_pool = _mem_create_pool(ADR, SIZE)	0	_RTCS_mem_pool



RTCS Initialization Sequence

- Create RTCS by calling RTCS_create()
- Initialize interface(s)
 - Assign MAC addresses
- Bind RTCS to interface
 Assign IP address, subnet mask
- Initialize RTCS applications





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RTCS Initialization – Sample Code

int_32 error; IPCFG_IP_ADDRESS_DATA ip_data; enet address enet address;

error = RTCS create();

ip_data.ip = ENET_IPADDR; ip_data.mask = ENET_IPMASK; ip_data.gateway = ENET_IPGATEWAY;

ENET_get_mac_address (DEMOCFG_DEFAULT_DEVICE, ENET_IPADDR, enet_address);
error = ipcfg_init_device (DEMOCFG_DEFAULT_DEVICE, enet_address);

error = **ipcfg bind staticip** (DEMOCFG DEFAULT DEVICE, & ip data);



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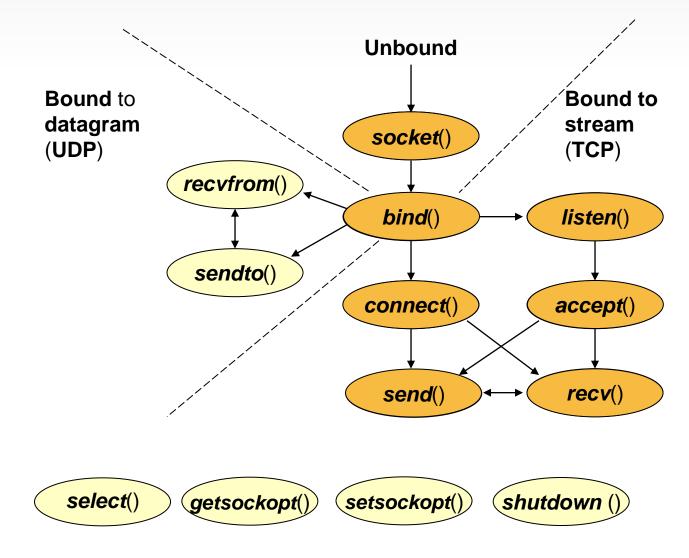
Socket API

- Data transfer is done with sockets
- A socket is one endpoint of a two-way communication link
- Socket defines:
 - Protocol (TCP or UDP)
 - Local IP address and port #
 - Remote IP address and port # (optional)
- RTCS supports TCP and UDP sockets



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Creating and Using Sockets





Socket Options

Socket options can be set to override default socket behavior using setsockopt():

value = 256;

setsockopt(listensock,SOL TCP, OPT TBSIZE, &value, sizeof(value));
• Socket options that can be set include:

- Window sizes
- Various timeouts
- Blocking vs. non-blocking mode
- Tx and Rx buffers size
- Some options must be set before socket is bound
- For memory constrained applications, it might be necessary to override a few defaults



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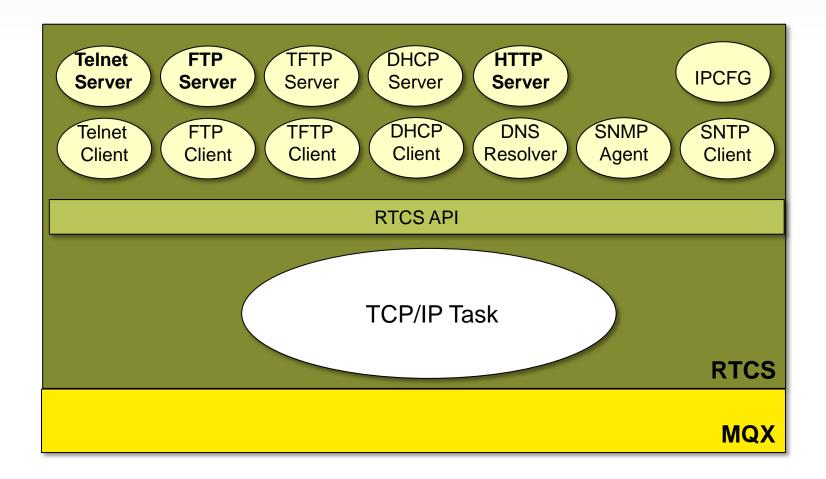
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RTCS Application Layer Protocols





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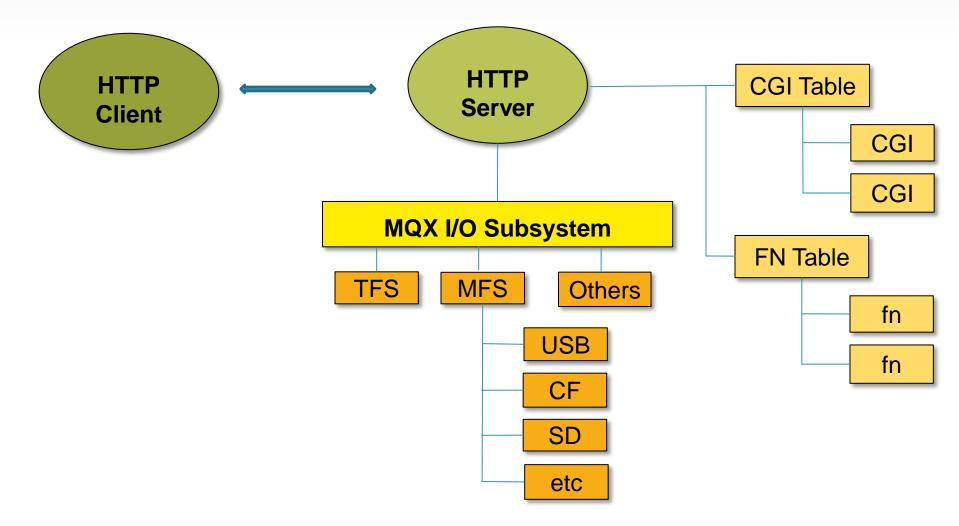
RTCS HTTP Server

- HTTP 1.1 with persistent connections
- PUT and GET methods
- Support for multiple virtual WEB folders with custom WEB folder path mapping to file system paths
- · Static file system content: pages, images, multimedia
- Dynamic page content, suitable for AJAX applications
 - CGI-like, dynamic content pages
 - ASP-like, in-page placeholders
- Basic authentication
- Integrated with MQX I/O subsystem, MFS and TFS
- Runs as:
 - Single task servicing multiple sessions
 - One task per session
 - Polled mode



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HTTP Server Initialization

- Install Filesystem
- Initialize HTTP server, specify root directory and home page
- Register CGI table and function callback table, if required
- Start server



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HTTP Server Initialization – Example Code

HTTPD_STRUCT *server; extern const HTTPD_CGI_LINK_STRUCT cgi_lnk_tbl[]; extern const TFS DIR ENTRY tfs data[];

error = _io_tfs_install("tfs:", tfs_data);
if (error) printf("\nTFS install returned: %08x\n", error);

server = httpd server init((HTTPD ROOT DIR STRUCT*)root dir, "\\mqx.html");

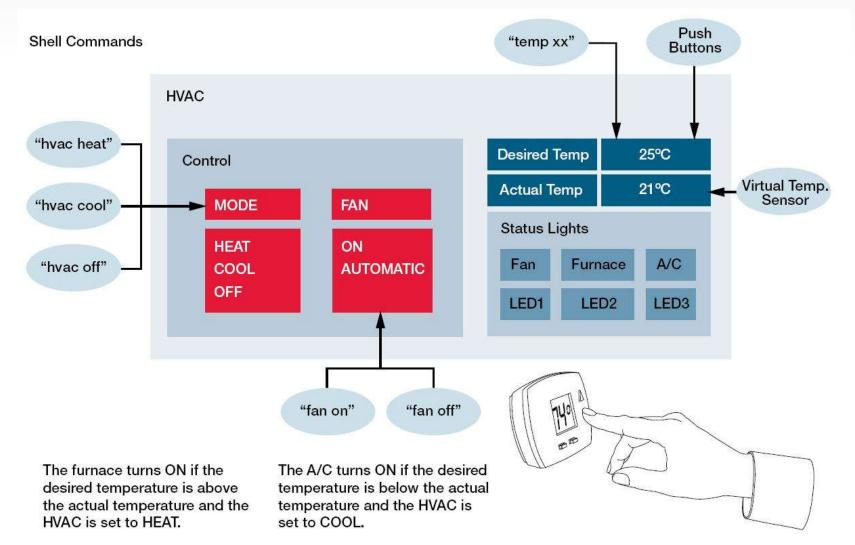
HTTPD SET PARAM CGI TBL(server, (HTTPD CGI LINK STRUCT*)cgi lnk tbl);

httpd server run(server);



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HVAC Demo Application





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HTTP Server Lab

- Now we'll look at how to modify Web page contents
- Directions for this lab are available in lab guide section 1 & 2



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CGI – Common Gateway Interface

- The Common Gateway Interface (CGI) is a standard (RFC 3875: CGI Version 1.1) that defines how Web server software can delegate the generation of Web pages to a stand-alone application or an executable file.
- Such applications, known as CGI scripts, can be written in any programming language, although scripting languages are often used.



How HVAC Demo Uses CGI

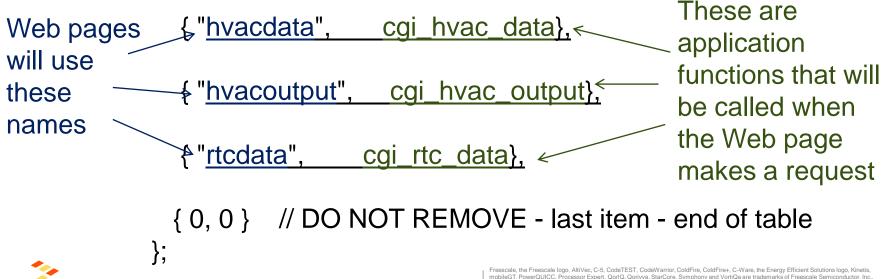
- HVAC demo we are using today has settings and status pages that both use CGI
- HVAC status page is used to display the current settings. If you look at the status page now, you'll see that some settings are not displayed correctly.
- HVAC settings page can be used to change the configuration.
 At the moment, the page is not working correctly.



CGI – Link Table

- First step: Create a CGI link table
- The array cgi_lnk_tbl[] defines callbacks for the request received by HTTP server
- From the demo in WEB/cgi_index.c file:

const HTTPD_CGI_LINK_STRUCT cgi_lnk_tbl[] = {



CGI – Web Page Requests to Read Data from App

- Step 1: Declare an array to hold data
 var hvac_value = new Array(7);
- Step 2: Use makeRequest to reference CGI table and call application function that will actually return values to Web page

- makeRequest("hvacdata.cgi", alertContents);

- Step 3: Parse data
 - var parsed = data.split("\n");
 - hvac_value[0] = parsed[0];
- Step 4: Display the value on Web page:
 - mode.innerHTML = "<h1>Mode: " + hvac_value[0] + "</h1>";



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CGI – Application Output Functions

- All data is sent between application and Web page as strings:
 - httpd_sendstr(session->sock, str);
- All Web examples include a couple of handy macros for sending strings or numbers:
 - CGI_SEND_NUM(val)
 - CGI_SEND_STR(val)
- If you want to control formatting, then you can always call httpd_sendstr function directly instead of using macros



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CGI – Web Page Requests to Write

 Step 1: Create a form in your html file that references desired cgi name from link table:

- <form name="HVAC" action="http:hvacoutput.cgi" method="POST">

 Step 2: Setup the HTML form in desired format – there are lots of options and ways to do this.

- Desired Temperature:
 <input type="text" name="temp">



CGI – Application Input Functions

Application also can read in variables from Web page

- Step 1: Read in Web page data
 - httpd_read(session, buffer, (int)((len > sizeof(buffer)) ?
 sizeof(buffer) : len))
 - This call loads entire Web page including input data from user into a single buffer
- Step 2: Parse data
 - httpd_get_varval(session, buffer, "hvac", hvac, sizeof(hvac))
 - This function will parse Web page that was loaded into buffer during httpd_read() call, looking for a form entry with name "hvac." The value is then copied into a local string also named hvac.



CGI Status and Settings Lab

- In this lab, we'll fix the code so that the HVAC status and HVAC settings pages work correctly
- Directions for this lab are available in the lab guide section 3



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RTCS FTP Server

- File Transfer Protocol (FTP) is used to transfer files from a remote computer according to RFC 959
- Server consists of a protocol interpreter and a data transfer process.



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How HVAC Demo Uses FTP

- HVAC demo also has FTP server capability included
- A file system is mounted on USB thumb drive, and files from the drive can be accessed via FTP over the network



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FTP Server Initialization

Call FTPd_init() function:

FTPd_init("FTP_server", 7, 3000);

Required parameters for FTPd_init function:

- name [in] Name of FTPserver task
- priority [in] Priority of FTPserver task (we recommend that you make the priority lower than the priority of the RTCS task; that is, make it a higher number)
- stacksize [in] Stack size for FTPserver task



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FTP Server Details

- Function FTPd_init() starts FTP server and creates FTPSRV_task.
- FTP server allows any number of users to connect from a remote workstation using an FTP client
- FTP server optionally supports usernames and passwords
- Commands supported by FTP server are configurable
- Application must initialize
 - FTPd_commands[] with supported commands
 - FTPd_rootdir[] with default FTP root directory path



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FTP Lab

- In this lab, we'll connect to the tower board using an FTP connection and transfer a file
- Directions for this lab are available in lab guide, section 4



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RTCS Telnet Server

- Telnet protocol specification, RFC 854
- Typically used as virtual terminal connection (command line interface)
- Telnet server listens on a stream socket
- Connection requests automatically create a new shell task and route the shell task's I/O to appropriate socket
- The telnet shell function array can match the serial port shell or it can be an alternate list. This is useful to limit the commands that are available remotely.



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How HVAC Demo Uses Telnet

- HVAC demo does have telnet server capability included
- For this demo, telnet shell command list is a subset of commands that can be used from serial port shell
- Ipconfig commands and network statistic commands have been removed from telnet command list as it doesn't make sense to reconfigure Ethernet port using Ethernet port
- Most of commands for manipulation and modification of MFS directory on USB drive are not available over telnet
- Telnet connection provides control functionality to control application similar to what you saw with Web server; main difference is control is done using a command line instead of pretty Web interface



Initialize Telnet Server

Call TELNETSRV_init() function:

TELNETSRV_init("Telnet_server", 7, 2000, (RTCS_TASK_PTR) &Telnetd_shell_template);

Required parameters for TELNETSRV_Init function:

- name [in] Name of Telnet server task
- priority [in] Priority of Telnet server task (we recommend that you make the priority lower than the priority of the RTCS task; that is, make it a higher number)
- stacksize [in] Stack size for Telnet server task
- shell [in] Shell task that Telnet server starts when a client initiates a connection



Telnet Server Initialization – Create Shell Task

When client requests a connection to telnet server, a new shell task will be spawned. Code must specify a shell task and function to use.

Declaration for Telnet shell task:

```
const RTCS_TASK Telnetd_shell_template = {"Telnet_shell", 8,
2000, Telnetd_shell_fn, NULL};
```

Actual Telnet shell function:

```
static void Telnetd_shell_fn (pointer dummy)
```

```
{
   Shell( Telnet_commands, NULL);
```



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Specifying Telnet Shell Command Set

A structure is used to specify text commands used for shell and functions that should be called when each command is recognized:

const SHELL_COMMAND_STRUCT Telnet_commands[] = {

{ "exit", Shell_exit },

```
{ "fan", Shell_fan },
```

{ "help", Shell_help },

{ "hvac", Shell_hvac },

```
{ "info", Shell_info },
```

#if DEMOCFG_ENABLE_USB_FILESYSTEM

```
{ "log", Shell_log },
```

#endif

```
#if DEMOCFG_ENABLE_RTCS
```

```
#if RTCSCFG_ENABLE_ICMP
```

```
{ "ping", Shell_ping },
```

```
#endif
```

#endif

```
{ "scale", Shell_scale },
{ "temp", Shell_temp },
{ "?", Shell_command_list },
{ NULL, NULL }
};
```



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Telnet Shell Commands for Web-HVAC Demo

Shell Command	Description		
exit	Exits shell application		
fan	Changes/displays fan mode (on or off/auto)		
help	Provides list of commands or instructions for any other shell commands		
hvac	Changes/displays HVAC mode (off, cool, heat or auto)		
info	Displays current mode, desired temp, actual temp and fan mode settings		
log	Saves a log file of shell/temp to MFS directory		
ping			
scale	Changes/displays temperature scale (C or F)		
temp	Changes/displays desired temp and displays current temp		
?	Lists all available shell commands		



Telnet Lab

- In this lab, we'll connect to tower board using a Telnet connection and use the shell to control demo
- Directions for this lab are available in lab guide, section 5.



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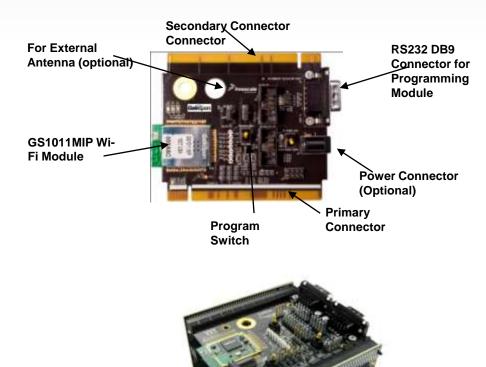
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TWR + Wi-Fi Example: TWR-WIFI-G1011MI

- Quickly add Wi-Fi and IP connectivity to Freescale MCU based products
 - ColdFire and Kinetis Support
- Wi-Fi and IP network parameter provisioning through Web Server or Wi-Fi Protected Set-up (WPS)
- Flexibility for ultra low power capability or extended range capability





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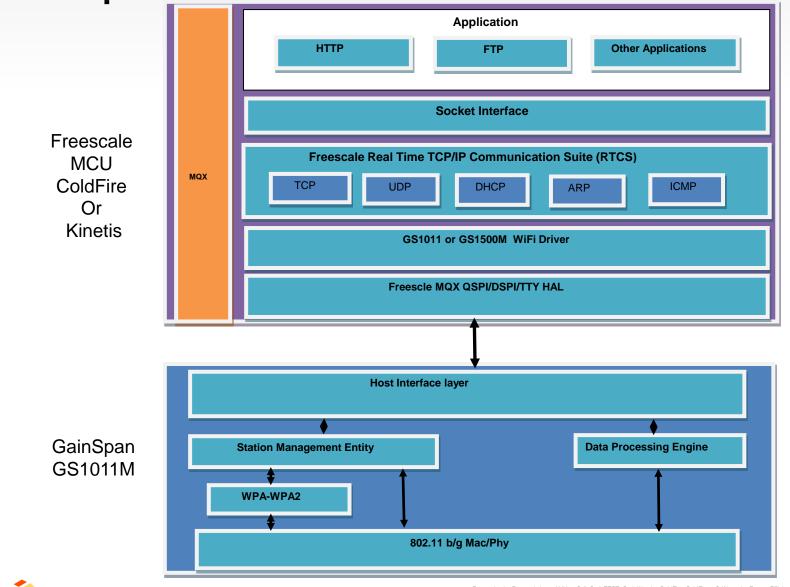
Wi-Fi Vendor Comparison

	TWR-WIFI-G1011MI 802.11b Wi-Fi module featuring GainSpan	TWR-WIFI-AR4100 802.11n Wi-Fi module featuring Qualcomm Atheros	TWR-WIFI-RS2101 802.11n Wi-Fi module featuring Redpine Signals
On-board Wi-Fi silicon	GainSpan GS1011	Qualcomm/Atheros AR4100	Redpine Signals RS9110-LI
On-board Wi-Fi module	GS1011MIP	AR4100 System in Chip design in 8mm x 9mm LGA package	RS9110-N-11-21
802.11 protocols supported	802.11b	802.11b/g/n single stream	802.11b/g/n
Data rates supported	 802.11b at 1, 2, 5.5, and 11 Mbps 	 802.11b at 1, 2, 5.5 and 11 Mbps 802.11g at 6, 9, 12, 18, 24, 36, 48,and 54 Mbps 802.11n at 6.5, 13.0, 19.5, 26.0, 39.0, 52.0, 58.5, 65.0, 72.2 Mbps 	 802.11b at 1, 2, 5.5 and 11 Mbps 802.11a/g at 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n at 6.5, 13, 19.5, 26, 39, 52, 58.5, 65 Mbps
RF Certifications	FCC, IC, ETSI, (Telec/ Japan with GS1011 MIC)	FCC, CE	FCC, CE, IC, Telec
Wi-Fi Alliance Certification	~	~	✓ Reference Design: 802.11n D2.0, WPA2
Security Protocols supported	WEP, WPA, WPA2-PSK, WPA2- Enterprise	WEP, WPA/WPA2 (AES and TKIP), WAPI, WPS, &WPS2	WPA, WPA2-PSK
Current consumption in lowest powered state	< 7 µA	5 µA	0.9 mA (deep sleep)
Wake-up time from lowest powered state	< 20 ms	2.2mS	1 ms
Range	1km in line of sight		150m open-air
Other / Enablement	Simple web provisioning, over the air firmware update, suitable for long life battery operated applications	STBC (Rx), LDPC (Tx), Auto Calibration & Near Zero rBOM	



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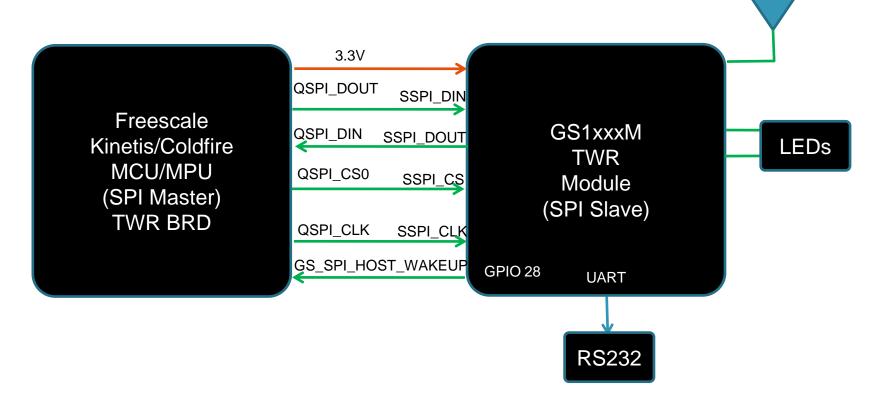
GainSpan MQX IP2WiFi Driver Architecture





TWR-WIFI-GS1xxxM Block Diagram

- GainSpan Wi-Fi Tower Module (TWR-WIFI-GS1011M)
 - Low-cost, ultra low power evaluation board
 - Featuring the GainSpan GS1011M module Family



Debug or Programming Port

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Antenna



TWR-Wi-Fi - Software

- Full Wi-Fi stack (IP2WiFi)
 - No additional Wi-Fi functions required on MCU side
 - Supports Infrastructure, Adhoc mode or Limited AP Mode
- Ease of use and provisioning using
 - Wi-Fi Protected Setup (WPS)
 - Embedded Web Server (HTTP) for Provisioning
- Supports both Personal and 802.1x Enterprise Security
 WEP, WPA, WPA2-PSK
 - EAP-TLS, EAP-TTLS, EAP-FAST, PEAP



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GainSpan GS1011M Wi-Fi Driver API

- The GS1011 module is added as the ENET device 1, whereas the Ethernet controller (FEC) is ENET device 0.
- Interface structure between the GS WiFi driver and MQX network stack is GS_IF of type ENET_MAC_IF_STRUCT (~bsp\twrk60n512\init_enet.c)
 - Structure contains the WiFi driver APIs that NW stack can access
- RTCS provides the Wireless media parameters control and configuration interfaces through the iwconfig set/get API or ENET_mediactI API.
- The GS1011M driver's set/get functions (control/config) are invoked by the Gs_mediactl in response to the iwconfig/ENET_mediactl invocations from the application.
 - Parameters such as Network join (essid), security, passphrase etc. can be configured

```
#if BSPCFG_ENABLE_GS
const ENET_IF_STRUCT ENET_1 = {
  &Gs IF,
  &phy_gs_IF,
  1.
  1.
  0,
GS_PARAM_WIFI_STRUCT gs_wifi_param = {
 PARAM CONFIG ESSID.
 PARAM_CONFIG_PASSPHRASE,
 PARAM CONFIG PASSPHRASE LEN,
 PARAM_CONFIG_ESSID_LEN,
 PARAM CONFIG SECURITY.
 PARAM_CONFIG_REG_DOMAIN,
 PARAM_CONFIG_CHANNEL,
 PARAM CONFIG PS MODE.
 PARAM CONFIG IW MODE,
 BSP_GS_SPI_DEVICE,
 BSP_GS_GPIO_DEVICE,
 BSP GS GPIO INT PIN
```

#endif

#if DEMOCFG_USE_WIFI

memset(&ssidbuf,0,sizeof(ssidbuf)); ssid.essid = (char*)ssidbuf; ssid.flags =0; ssid.length =0; error = ENET_mediactl (ehandle,ENET_GET_MEDIACTL_ESSID,&ssid);

if(!ssid.flags)

//printf("\n Use default SSID \n");

ssid.flags = 1; ssid.essid = DEMOCFG_SSID; ssid.length = strlen(DEMOCFG_SSID);

error = ENET_mediactl (ehandle,ENET_SET_MEDIACTL_ESSID,&ssid);

param.flags =0; param.value =0; error = ENET_mediactl(ehandle,ENET_GET_MEDIACTL_SEC_TYPE,¶m);

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Agenda

- 1. Introduction and session objectives
- 2. Network concepts
- 3. Freescale RTCS Configuration and initialization
- 4. Socket API
- 5. Application layer protocols
- 6. HTTP Web server lab
- 7. CGI lab
- 8. Telnet lab
- 9. FTP lab
- 10. Wi-Fi concepts and integration with RTCS
- 11. Summary, Q&A



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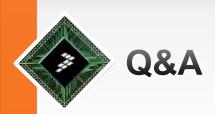


Review

Session Objectives:

- Configure and initialize RTCS
- Use socket API to create TCP and UDP connections
- Use HTTP Web server to serve dynamic data in a Web page
- Understand CGI implementation
- Use Telnet for remote command line access
- Use FTP for file transfer
- Understand Ethernet and Wi-Fi options for networking





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Session materials will be posted @ www.freescale.com/FTF



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