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Renesas Synergy™ Platform

S3 Ethernet Add-On Application

Introduction

This document describes how to utilize the SSP Ethernet Add-on Driver to expend the network connectivity of Synergy S3. Upon completion of this note you will be able to add this driver to your own project, configure it correctly for the target application, and write code using the NetX Network Stack. The included example project demonstrates a simple web server application as a reference and efficient starting point.

Document Scope

The following topics are covered in this document:

- Installation of Ethernet Add-on distribution
- Quick Setup for DK-S3A7 with DM9051 Demo Board
- Using NetX Application Layer Modules with Ethernet Add-on driver
- Running the Example Application

Target Device

The example application targets Renesas Synergy S3A7/S3A3 groups.

PC Recommendations

- A PC running Windows® 7(32-bit, 64-bit), Windows® 10(32-bit, 64-bit) with the following Renesas software installed:
 - e^2 studio ISDE version: 5.3.1.002 or IAR EW for Synergy v7.71.1
 - Synergy Software Package (SSP) 1.2.0 or SSC(Synergy Standalone Configurator) 5.3.1
- A PC with a USB 2.0 port and connection to the target board with Ethernet cable

Required Resources

To build and run the example application, you will need:

- DK-S3A7 Version 2.0 or later
- DM9051 Demo Board Version 2.1 or later (For the Asia region, you can purchase this item through the TaoBao online shop. Otherwise, you can contact with Davicom Semiconductor directly through the email sales@davicom.com.tw)

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1. Installation information of Ethernet Add-on Driver

1.1 Installation

The steps to install the distributions are as follows:

- 1. Check SSP v1.2.0 has been installed first
- Note: The default installation folder for the SSP is C:\Renesas\e2_studio
- Download the Ethernet Add-on pack from Renesas Synergy Gallery (<u>https://synergygallery.renesas.com/</u>) Note: The file locates in Davicom's project, which is under Partner Showcase of Synergy Gallery.
- 3. Open the SSP Packs folder following the below direction under e2_studio folder
 - $e2_studio \rightarrow internal \rightarrow projectgen \rightarrow arm \rightarrow Packs$
- 4. Manually copy and paste the Ethernet Add-on pack into the Packs folder as below picture

← → Y ↑ → This PC → Windows (C:) → Renes	as > e2_studio_v5.3.1.002 > internal > projectgen > arm >	Packs			~
		Name	Date modified	Туре	Size	
🖈 Quick access		supportfilepacks.xml	6/22/2017 5:58 PM	XML Document	5 KB	
Desktop	1	Renesas.Svnergy wifi rtl8711am.1.2.0.pack	6/22/2017 9:29 AM	PACK File	16 KB	
🖶 Downloads	1	Renesas.Synergy_ethernet_dm9051.1.2.0.pack	6/13/2017 11:51 AM	PACK File	20 KB	
Documents	1	Renesas.Synergy_wifi_bcm43362.1.2.0-b.1.5.pack	3/14/2017 1:41 PM	PACK File	1,008 KB	
Pictures	*	Renesas.Synergy_wifi_gt202.1.2.0-b.1.5.pack	3/14/2017 1:26 PM	PACK File	580 KB	
AMEBA RTL8711AM Add-on		Renesas.SynergyBlinkyThreadX.1.2.0.pack	2/7/2017 3:51 PM	PACK File	5 KB	
Jorjin		Renesas.SynergyBlinky.1.2.0.pack	2/7/2017 3:51 PM	PACK File	5 KB	
Jorijn		Renesas.Synergy_mcu_s3a7.1.2.0.pack	2/7/2017 3:50 PM	PACK File	653 KB	
S3 Ethernet add-on		Renesas.Synergy_mcu_s5d9.1.2.0.pack	2/7/2017 3:50 PM	PACK File	878 KB	
35 Etheniet aug-on	remet add-on Renesas.Synergy_mcu_s7g2.1.2.0.pack 2/7/2017 3:50 PM PACK File 931	931 KB				
and ConeDrive		Renesas.Synergy_touch_panel_i2c_ft5x06.1.2.0.pack	2/7/2017 3:50 PM	PACK File	6 KB	
This PC		Renesas.Synergy_touch_panel_i2c_sx8654.1.2.0.pack	2/7/2017 3:50 PM	PACK File	7 KB	
Desister		Renesas.Synergy_mcu_s3a3.1.2.0.pack	2/7/2017 3:50 PM	PACK File	694 KB	
Desktop		Renesas.Synergy_mcu_s124.1.2.0.pack	2/7/2017 3:50 PM	PACK File	372 KB	
Documents		Renesas.Synergy_mcu_s128.1.2.0.pack	2/7/2017 3:50 PM	PACK File	338 KB	
Downloads		Renesas.Synergy_board_custom.1.2.0.pack	2/7/2017 3:50 PM	PACK File	2 KB	
Music		Renesas.Synergy_board_s3a7_dk.1.2.0.pack	2/7/2017 3:50 PM	PACK File	24 KB	
Pictures		Renesas.Synergy_board_s5d9_pk.1.2.0.pack	2/7/2017 3:50 PM	PACK File	23 KB	
📓 Videos		Renesas.Synergy_board_s/g2_dk.1.2.0.pack	2/7/2017 3:50 PM	PACK File	30 KB	
🔛 Windows (C:)		Renesas.synergy_board_s7g2_pe_nmi1.1.2.0.pack	2/7/2017 5:50 PM	PACK File	24 KB	
DATADisk (D:)		Reneral Synergy_board_s1g2_ski12.0.pack	2/7/2017 3:50 PM	PACK File	14 KB	
🔫 root (\\172.29.9.14) (H:)		Reneral Synergy 120 nack	2/7/2017 3:50 PM	DACK File	80 230 KB	
common (\\172.29.9.4\public) (S:)			a, 1, 2011 0.001 W		00,200 100	
- utility (0) 172 20 0 4 public) (Tr)						

5. After the previous processes are done, you should be able to see an available Add-on component in the Synergy configurator as below picture.

	-	
Components		
Component	Version	Description
sf_external_irq	1.2.0	Framework External IRQ: Provides=[Framework External IRQ], Requires=[External I.
sf_i2c	1.2.0	Framework I2C: Provides=[Framework I2C], Requires=[ThreadX, I2C]
sf_jpeq_decode	1.2.0	Framework JPEG Decode: Provides=[SF JPEG Decode], Requires=[ThreadX_JPEG
sf_message	1.2.0	Messaging Framework: Provides=[Message], Requires=[ThreadX]
sf_power_profiles	1.2.0	Framework Power Profiles: Provides=[Framework Power Profiles], Requires=[CGC.
sf_spi	1.2.0	Framework SPI: Provides=[Framework SPI], Requires=[ThreadX, SCI SPI]
sf_tes_2d_drw	1.2.0	TES D/AVE 2D Port: Provides=[D/AVE 2D Port], Requires=[ThreadX,D/AVE 2D]
sf_thread_monitor	1.2.0	Framework Thread Monitor: Provides=[Framework Thread Monitor], Requires=[T.,
sf_touch_ctsu	1.2.0	Framework Capacitive Touch: Provides=[Framework Capacitive Touch], Requires
sf_touch_ctsu_button	1.2.0	Framework Capacitive Touch Button: Provides=[Framework Capacitive Touch But.
sf_touch_ctsu_slider	1.2.0	Framework Capacitive Touch Slider: Provides=[Framework Capacitive Touch Slide
sf_touch_panel_i2c	1.2.0	Framework Touch Panel using I2C: Provides=[Framework Touch Panel], Requires
sf_uart_comms	1.2.0	Framework UART Communications: Provides=[Framework UART], Requires=[Thr
🗸 🍦 ethernet-addon 1.0.0		
✓ sf_ether_dm9051	1.2.0	dm9051 ethernet Framework: Provides=[SF DM9051 Ethernet Framework] , Requir
> 🔗 realtek wifi-addon 1.0.0		
> 🔗 wifi-addon 1.0.0-b.3		
🗸 救 HAL Drivers		
🗸 🏈 all		
🔲 r_adc	1.2.0	A/D Converter: Provides=[ADC]
🔲 r_agt	1.2.0	Asynchronous General Purpose Timer: Provides=[TIMER]
r_cac	1.2.0	Clock Accuracy Check: Provides=[CAC]
🗐 r_can	1.2.0	Controller Area Network: Provides=[CAN]
✓ r_cgc	1.2.0	Clock Generation Circuit: Provides=[CGC]
r_crc	1.2.0	Cyclic Redundancy Check: Provides=[CRC]
r_ctsu	1.2.0	Capacitive Touch Sensing Unit: Provides=[CTSU] , Requires=[Transfer]
r_dac	1.2.0	D/A Converter: Provides=[DAC]
r_dmac	1.2.0	Direct Memory Access Controller: Provides=[Transfer]
🔲 r doc	120	Data Operation Circuit: Provider-IDOC1

1.2 Release information and compatible tools

Release Module Name	Version	Description
DM9051 Ethernet Add-on module	1.0.0	This Ethernet Add-on pack is based on the SSP version 1.2.0



Renesas Synergy™ Platform		S3 Ethernet Add-On Application
Tools	Version	Description
e ² studio	5.3.1	Software development environment
GNU ARM Compiler	4_9-2015q3	GNU ARM [®] compiler

GNU ARM Compiler	4_9-2015q3	GNU ARM [®] compiler GCC_4.9.3.20150529
IAR Compiler	7.71.1	IAR ARM [®] compiler toolchain

2. Quick Setup for DK-S3A7 with DM9051 DEMO Board

2.1 DM9051 DEMO Board

Connect the Davicom DM9051 Demo Board to the PMODA connecter on the DK-S3A7 platform. The DM9051 Demo Board can't be plugged into the PMODA connector directly because the interrupt pins are not available on any of the PMOD connectors on the DK-S3A7 v2.0 board. You need to connect pin 2 of DM9051 Demo Board to pin P5_6 of port pin header J9 on the DK-S3A7 board. See Table 2.1 for the DM9051 Demo Board connections to PMODA on DK-S3A7

Table 1	DM9051	Demo Board	connections to	PMODA	on DK-S3A7
			••••••••••		•

DM9051 Demo Board (J1) header pin #	PMODA header pin#	Description
1	1	Chip Select (Port 4 Pin 11)
3	2	SPI MOSI (Port 4 Pin 9 MOSI3_A)
5	3	SPI MISO (Port 4 Pin 8 MISO3_A)
7	4	SPI CLK (Port 4 Pin 10 SCK3_A)
9	5	GND
11	6	VCC
2	NC	This interrupt request pin of DM9051 should be connected to an IRQ pin of S3A7. In this App-Note, we use P5_6(IRQ15) to get interrupt request.
4	8	Not Connected
6	9	Not Connected
8	10	Not Connected
10	11	Not Connected
12	12	Not Connected

Note: Make sure that 3.3 volt is selected for PMODA

Note: The schematic of DM9051 Demo Board can be downloaded through the below link http://www.davicom.com.tw/userfile/24247/DM9051_demo_v2.1.pdf



Figure 2.1 shows the DM9051 Demo Board connected to the PMODA connector on DK-S3A7



2.2 Configuring Ethernet Add-on components

The following instructions list the common steps in creating an e²studio project with Ethernet Add-on.

- 1. Start the Synergy Project wizard in e^2 studio by clicking File > New > Synergy Project
- 2. Choose SSP version 1.2.0 or newer
 - Choose S3A7 DK as the board
- 3. Create a project with your desired Project template
 - Choose Blinky with ThreadX gives you a project with ThreadX already added
- 4. Switch to the Threads tab

-

- 5. Add a thread to system if one is not already present
 - Use Blinky thread, which is already created

Blinky Th	iread		
Settings	Property V Thread	Value	
	Symbol	blinky_thread	
	Name	Blinky Thread	
	Stack size (bytes)	1024	
	Priority	5	
	Auto start	Enabled	
	Time slicing interval (ticks)	1	

- 6. Add Add-on module through the "New Stack >" button
 - You can find the Add-on module, which is named as DM9051 Ethernet Device Driver, through the "**Framework > Addon**"

Threads		Generate Pro	ject Conten	e, ⊕,
Threads 🔮 📳	Blinky Thread Stacks		<i></i>	Driver
HAL/Common	DM9051 Ethernet Device Driver on sf_ether_dm9051	Addon	>	Framework
g_elc ELC Driver on r_elc		Analog	>	Renesas
g_cgc CGC Driver on r_cgc		Audio	>	X-Ware
sy binky mead		Connectivity	>	P402 -
		File System	>	P404
		Graphics	>	P406
		Input	>	P701
		Networking	>	P702 C
< >		Services	>	P704 C
Blinky Thread Objects		USB	>	VBAT
				P215
				VSS [
				P212
				P713
				P712 C
				P710 C
				P708 C
				P414
				P412
				P411
				P409

7. Add SPI Driver on r_sci_spi under DM9051 Ethernet Device Driver Note: Make sure to remove the DTC driver for transmission and reception



8. Thread pane setup

- After the previous steps are completed, the thread pane should be as same as below picture

DM9051 Ethernet De	vice Driver on sf_ether_e	dm9051	
		1	
NetX Common on nx	g_spi0 SPI Driver on r	_sci_spi	g_external_irq0 External IRQ Driver on r_icu
Add NetX Source [Optional]	Add DTC Driver for Transmission [Recommended but optional]	Add DTC Driver for Reception [Recommended but optional]	

- Configure the property of DM9051 Ethernet Device Driver

Note: As the DM9051 Demo Board connections, the Port 4 Pin 11 is set for SPI CS of DM9051, and the Port 5 Pin 6 is set for Interrupt Request of DM9051.

Problems	🗟 Tasks 🗧 Console 🔲 *Properties 🛛 🔋 Memory Usage 🆓 Smart Brow	ser		
g_sf_el_nx0	DM9051 Device Driver on sf_ether_dm9051			
Settings	Property	Value		
Information	✓ Common			
	SPI CS Pin for DM9051	IOPORT_PORT_04_PIN_11		
	External IRQ Pin for DM9051	IOPORT_PORT_05_PIN_6		
	MAC Address High Bits	0x0000060		
	MAC Address Low Bits	0x6E905102		
	 Module g_sf_el_nx0 DM9051 Device Driver on sf_ether_dm9051 			
	Name of NetX Driver Entry	g_sf_el_nx0		
	Name of Device Driver	g_sf_ether_dm90510		

- Configure the property of SPI Driver on r_sci_spi

Note: For DM9051, The maximum clock frequency of SPI is 50 MHz. Here, we use 10MHz for implementation.

Settings	Property	Value		
Information	✓ Common			
	Parameter Checking	Default (BSP)		
	 Module g_spi0 SPI Driver on r_sci_spi 			
	Name	g_spi0		
	Channel	0		
	Operating Mode	🔒 Master		
	Clock Phase	🔒 Data sampling on odd edge, data variation on even edge		
	Clock Polarity	🔒 Low when idle		
	Mode Fault Error	🔒 Disable		
	Bit Order	🔒 MSB First		
	Bitrate	100000		
	Bit Rate Modulation Enable	Enable		
	Callback	🔒 g_spi_ether_callback		
	Receive Interrupt Priority	Priority 2		
	Transmit Interrupt Priority	Priority 2		
	Transmit End Interrupt Priority	Priority 2		
	Error Interrupt Priority	Priority 2		

Configure the property of External IRQ Driver on r_icu

Note: As the DM9051 Demo Board connections, the external IRQ pin is Port 5 Pin 6, which supports IRQ channel 15.



u unisosi	irg External IRO Driver on r icu	
5		M-h-r
Settings	Ргорепу	value
Information	✓ Common	
	Parameter Checking	Default (BSP)
	 Module g_dm9051_irq External IRQ Driver on r_icu 	
	Name	g_dm9051_irq
	Channel	15
	Trigger	🔒 Falling
	Digital Filtering	🔒 Enabled
	Digital Filtering Sample Clock (Only valid when Digital Filtering is Enabled)	PCLK / 1
	Interrupt enabled after initialization	🔒 True
	Callback	🔒 g_dm9051_interrupt_request
	Interrupt Priority	Priority 3 (CM4: valid_CM0+: lowest - not valid if using ThreadX)

- 9. SPI Pin configurations
 - For DK-S3A7 on PMODA, use SCI3
 - From the Pins tab, go to the **Pin Selection** section
 - Go to Peripherals > Connectivity:SCI > SCI3
 - Set SCI3 up in **Custom** operation mode. Set up P409, P408, and P410 for SCI SPI use.

Pin Selection	Pin Configuration			
type filter text 🖉 🗎 🕀				â
 Peripherals Monitoring:CAC Analog:ADC Analog:OPAMP 	Module name: Usage:		SCI3 When using Simple I2C mode, ensu open drain. When switching between I2C and o	re port pins output type is n-ch ther modes, first disable.
 Analog:CMP Analog:DAC12 Connectivity:CAN Connectivity:IIC 	Pin Group Selection: Operation Mode:		Mixed ~ Custom ~	
✓ ✓ Connectivity:SCI	Input/Output			
SCI0	TXD_MOSI:	~	P409 ~	
SCI2	RXD_MISO:	~	P408 ~	
SCI4	SCK:	~	P410 ~	
SCI9	CTS_RTS_SS:		None ~	
> Connectivity:SSI	SDA:		None ~	
Connectivity:USBF	SCL:		None ~	

- 10. SPI Chip-Select pin configurations
 - From the Pins tab, go to the **Pin Selection** section
 - Go to **Ports > P4 > P411**

Pin Configuration	
Module name:	P411
Symbolic Name:	
Comment:	
Port Capabilities:	AGT1: AGTOA CTSU0: TS07 GPT9: GTIOCA IRQ0: IRQ04 OPS0: GTOVUP SCI0: SDA SCI0: TXD_MOSI SCI3: CTS_RTS_SS SDHI0: DAT0 SPI0: MOSI
P411 Configuration	
Mode:	Output mode (Initial High) \sim
Pull up:	None ~
IRQ:	None ~
Drive Capacity:	Low ~
Output type:	CMOS ~



- 11. Set up the IRQ pin P5_6 for DK-S3A7, which is IRQ15:
 - From the Pins tab, go to the **Pin Selection** section
 - Go to **Ports > P5 > P506**

Pin Configuration		
Madda anna	DEOG	
Wodule name.	P300	
Symbolic Name:		
Comment:		
Port Capabilities:	ADC0: AN22 IRQ0: IRQ15	
P506 Configuration		
Mode:	Input mode	\sim
Pull up:	None	~
IRQ:	IRQ15	~
Drive Capacity:	Low	\sim
Output type:	CMOS	\sim
Chip input/output		
P506:	✓ GPIO	\sim

Note: For the IAR EW, the Ethernet Add-on component can be configured by Synergy Standalone Configurator (SSC), and the configuration steps are as same as above.

3. Writing an Application with the Ethernet Add-on driver

As the Figure 3.1, the DM9051 device driver is fully integrated with NetX Network stack inside the SSP, so users can not only easily extend the Ethernet connectivity on Synergy S3, but also leverage the NetX Network stack to develop the Network application. In this section, we will deeply introduce how to utilize DM9051 Add-on driver by using the NetX API calls or the NetX Application Layer Modules.



Figure 3.1 Infrastructure of NetX application implementation with DM9051 Add-on Driver



3.1 Using NetX API Calls

Each IP instance in NetX has a primary interface network driver specified by the application in the nx_ip_create service. On the other hand, each IP instance has a helper thread, which is responsible for handing all deferred packet processing and all periodic processing. Therefore, the first processing in an IP creation is to call the nx_ip_create service, and this service will start the network driver initialization and start an endless loop to process packet and periodic requests after the initialization is completed. For being able to utilize this service, we look up its description in NetX User's Manual as below picture, and it's easy to find out that there is a required input parameter, which is user-supplied network driver. That's where we are going to add a DM9051 driver entry function, which is defined in DM9051 Add-on driver.

nx_ip_create

Create an IP instance

```
Prototype
```

Below is a snippet of sample code which demonstrates how to create an IP instance and enable the application protocols by using the NetX APIs with DM9051 Add-on Driver.

```
/* Network Thread entry function */
void network_thread_entry(void)
{
    /* TODO: add your own code here */
   UINT status;
   ULONG actual status;
   nx_system_initialize();
   status = nx packet pool create(&g packet pool0, "NX Packet Pool", 2048,
                                   &g packet pool0 pool memory[0], (16 * 2048));
   APP ERR TRAP(status)
    status = nx ip create(&g ip, "NX IP Instance",
                          (IP ADDRESS(192,168,1,90)), (IP ADDRESS(255,255,255,0)),
                          &g packet_pool0, g_sf_el_nx0,
                          &g_ip0_stack_memory[0], 2048, 3);
   APP ERR TRAP(status)
   status = nx arp enable(&g ip, mem arp, sizeof(mem arp));
   APP ERR TRAP(status)
   status = nx tcp enable(&g ip);
   APP ERR TRAP(status)
   status = nx icmp enable(&g ip);
   APP ERR TRAP(status)
    status = nx_ip_interface_status_check (&g_ip, 0, NX_IP_INITIALIZE_DONE,
                                           &actual status, NX WAIT FOREVER);
   APP ERR TRAP(status)
```

Note: The "g_sf_el_nx0" is a name of DM9051 driver entry function. Once you select the module of **DM9051 Device Driver on sf_ether_dm9051** in the Synergy Configurator, the name of DM9051 driver entry can be configured in the below properties window.



g_sf_el_nx0 DM9051 [Device Driver on sf_ether_c	Jm9051	
NetX Common on nx	g_spi0 SPI Driver on r_sci_spi		g_external_irq0 External IRQ Driver on r_icu
Add NetX Source [Optional]	Add DTC Driver for Transmission [Recommended but optional]	Add DTC Driver for Reception [Recommended but optional]	

Figure 3.2 The module view of DM9051 Device Driver on sd_ether_dm9051



Figure 3.3 The configurable properties for DM9051 Device Driver on sd_ether_dm9051



3.2 Using NetX Application Layer Modules

In the SSP v 1.2.0, NetX and NetX Application Layer modules are integrated into the SSP. To use these modules with DM9051 Device Driver, add the DM9051 Device Driver module as NetX Network Driver under NetX IP instance module. The following pictures show the common steps in using NetX Application Layer modules with Ethernet Add-on module.



Configure DM9051 Device Driver as same as the steps we did in section 2.2

g_ipu NetX IP Instar	lce				
NetX Common on nx	g_packet_pool0 NetX Packet Pool Instance	g_sf_el_nx0 DMS	0051 Device Driver on sf_eth	er_dm9051	
Add NetX Source [Optional]	NetX Common on nx	Add NetX Common	g_spi0 SPI Driver on r	r_sci_spi	g_external_irq0 External IRQ Driver on r_icu
	Add NetX Source [Optional]		Add DTC Driver for Transmission [Recommended	Add DTC Driver for Reception [Recommended	

After a NetX IP instance is created, we can use it to establish NetX Application Layer modules, such as HTTP, DHCP, etc.

g_http_server0 NetX	HTTP Server						
g_ip0 NetX IP Instan	ce		Γ			Add FileX	NetX HTTP Common
NetX Common on nx	g_packet_pool0 NetX Packet Pool Instance	g_sf_el_nx0 DM9	0051 Device Driver on sf_eth	er_dm9051			NetX MD5
Add NetX Source [Optional]	NetX Common on nx	Add NetX Common	dd NetX ommon g_spi0 SPI Driver on r_sci_spi gexternal_irq0 External IRQ Driver on r_icu				
	Add NetX Source [Optional]		Add DTC Driver for Transmission [Recommended but optional]	Add DTC Driver for Reception [Recommended but optional]			



4. Application Example of Ethernet Add-On

4.1 Importing, Configuring, and Building the Project

Before you can run this example application, you must change the default IP address for the application in the ISDE configurator to IP addresses that are appropriate for your network and PC. The following steps describe how to import, configure, change the default IP address in the application to an IP address appropriate for your network, and then build the project:

- 1. Follow the procedure in the Synergy Project Import Guide (r11an0023eu0116_synergy_ssp.pdf) to import the project into the e2 studio ISDE. Do not build the project
- 2. Open the configuration.xml for the project, select the **Threads** tab, and choose **Network Thread**. Click on g_ip0, NetX IP instance, on the **Properties** window, and change the IPv4 address to the one, which is in the same domain of the PC and is not being used. In this application, the default setting of IP address for the board is chosen as 192.168.1.90



Figure 4.1 The properties view of NetX IP instance module

3. After selecting an IP Address for the board is completed, you should also configure a static IP address for your Ethernet Port of your PC. The processes are shown as below.

Goo File Edi	♥ 😰 ▶ Control Panel ▶ Network a t View Tools Advanced Help	nd Internet 🕨 Network Co	nnectio	ons 🕨
Organiz	e 👻 Disable this network device	Diagnose this connecti	on	Rename this connection
	Cisco AnyConnect Secure Mobility Client Connection Disabled	Local Area Cor Unidentified no Intel(R) Ethern	nection tv	n Local Disable
	Wireless Network Connection 3 Disabled Microsoft Virtual WiFi Miniport A	Wireless Netwo Disabled Microsoft Virtu	urk al	Status Diagnose
				Bridge Connections Create Shortcut
			(i) (i)	Delete Rename
			۲	Properties

Figure 4.2

Configure the Ethernet port of your PC to static IP address in order to test the Board



Networking Sharing Connect using:	You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings. Obtain an IP address automatically
This connection uses the following items:	Use the following IP address:
Client for Microsoft Networks	IP address: 192 . 168 . 1 . 3
Poterministic Network Enhancer QoS Packet Scheduler	Subnet mask: 255 . 255 . 0
File and Printer Sharing for Microsoft Networks Cisco IP Communicator driver for CDP	Default gateway:
Internet Protocol Version 6 (TCP/IPv6) Internet Protocol Version 4 (TCP/IPv4) The second version 4 (TCP/IPv	Obtain DNS server address automatically
<	Use the following DNS server addresses:
Install Uninstall Properties	Preferred DNS server:
Description Transmission Control Protocol/Internet Protocol. The default	Alternate DNS server:
wide area network protocol that provides communication across diverse interconnected networks.	Validate settings upon exit Advanced
Close Cancel	OK Cancel

Figure 4.3 Static IP address for the Ethernet port of the PC

4. Follow the procedure in the Synergy Project Import Guide (r11an0023eu0116_synergy_ssp.pdf) to build and debug the project. When prompted to select the debug configuration, select Ethernet_Addon_Application_V120_DK_S3A7 Debug (under Renesas GDB Hardware Debugging)

4.2 Running the Application Example

The application example implements a simple web server application on a Renesas Synergy development board (DK-S3A7) using the DM9051 Add-on module, SSP and the NetX network stack. For being able to run the application on the Synergy board (DK-S3A7), you need to configure two DIPSWs by following steps.

Step 1: Enable the PMOD connector of the Synergy board (DK-S3A7) by setting the DIPSW S5 PMOD switch to ON.



Figure 4.4 The setting of DIPSW S5 for the DK-S3A7

Step 2: Enable the USB Host connector of the Synergy board (DK-S3A7) by setting the DIPSW S6 USBF switch to OFF



Figure 4.5 The setting of DIPSW S6 for the DK-S3A7



The NetX HTTP Server is designed for use with the FileX embedded file system, and we use the USB Drive to store the HTTP files in this application. Therefore, you need to insert the USB Drive into the USB connector (USB Mass storage) as shown in Figure 4.6 before you start to run the application.



Figure 4.6 USB Drive connection for DK-S3A7

To run the example web server application:

In a Command Prompt window on your PC, enter the [¬] ping _→ command with the IP address that you specified for the board (192.168.1.90). In the following example, the ping result for the board address is shown in Figure 4.7. If the connectivity and configurations are proper, you will see the ping working.

```
C: \Users \cpchan > ping 192.168.1.90

Pinging 192.168.1.90 with 32 bytes of data:

Reply from 192.168.1.90: bytes=32 time=3ms TTL=128

Reply from 192.168.1.90: bytes=32 time=2ms TTL=128

Reply from 192.168.1.90: bytes=32 time=1ms TTL=128

Reply from 192.168.1.90: bytes=32 time=2ms TTL=128

Ping statistics for 192.168.1.90:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 3ms, Average = 2ms

C: \Users \cpchan \_
```





2. In the URL text filed of web browser, enter the IP address, which you used with the ping command in the previous step. You should see the view in Figure 4.8.





3. In the web page, you can control the status of LED1 on DK-S3A7 board by clicking the web buttons, which are ON, OFF and BLINK.



4. Click **Terminate** button to close the debugger.

5. S3 Ethernet Add-on Application Implementation Details

In this section, the implementation details of S3 Ethernet application are described. The Ethernet application is created on top of the NetX Webserver application, which is available for DK/SK-S7G2, PK-S5D9 and PEHMI. One of the reasons for choosing the NetX Webserver application is to showcase the modular approach for adding a new application on top of the existing application. The DM9051 Add-on Module satisfies NetX driver function requirement and uniform interface of NetX IP Instance Module to be able to move NetX application from other device to Synergy S3 without changing the application. In Figure 5.1, the Webserver application consists of the Network thread, Web thread, and the USB thread. A few modifications are done on the web page layout. The Thread1 to Thread7 are removed to simplify the project, and the relative thread counters, which are thread_1_counter, thread_2_counter..., are removed to simplify the



display parameters of web page. On the other hand, the LED control thread is added to implement IO control through HTTP web interface.



Figure 5.1 Architecture of NetX Webserver application on DK-S3A7

The details of the NetX Webserver application for DK-S3A7 and its thread are given in the following sections.

5.1 HTTP Server Thread

This thread module along with Synergy Configurator created code, brings in the HTTP server creation, with the TCP/IP core stack. In addition, it also brings the USBX Host Mass Storage Stack and DM9051 driver add-on. Essentially, this thread is responsible for HTTP server, Ethernet Connectivity, and executing the user code.

The configurator generated code is part of the <code>common_data.c/h</code> and <code>http_server_thread.c/h</code> under the <code>src/synergy_gen</code> folder. The code, under these files, are common code specific to the thread's module stack components selected. In this case, the common code related to NetX is available under <code>g_comm_init()</code> function. Also, in the common code, the NetX driver entry function, packet pool creation for the DM9051 driver module is also available as part of the configurator created code.

In the user application code(src/http_server_thread_entry.c), it waits for USB device to be inserted, updates the previously created FileX media instance for NetX HTTP Server Media Pointer, starts the HTTP Server and resumes the LED Control Thread.

In the SSP v1.2.0, this will be configurator created, along with FileX media pointer for the HTTP server).

 $Currently \texttt{nx_http_server_create} is user written code, but in the SSP v1.2.0, this is configurator created. In this application, this is still user written code and is part of <code>http_server_thread.c.</code>$

Note: Before USB device is detected/inserted, HTTP server gets created by Synergy configurator with &g_fx_media0, which is a pointer to FileX Media Control Block for a USB flash device. Therefore, this media pointer should be updated before HTTP Server gets started.

On the other hand, the HTTP server creation API also requires the authentication_check and get_notify functions where user page creation and handling of the page specific Get/Set are handled. These are in src/ demo_nx_http_httpserver_query.c. In addition to the page hosting, it also gives the option to Get/Set the user data from/on to the page. Additionally, the thread also sets the event flag to indicate the LED control thread that the user desired operation (ON/OFF/BLINK) for the LEDs on the board.

Once the USB removed event is gotten from USB Thread, this thread will stop the NetX HTTP server and turn off the LED Control Thread.

5.2 LED Control Thread

The thread mainly controls the LEDs based on the event received from the user through the HTTP server page.



5.3 USB Thread

The entry function of this thread doesn't contain any necessary process for USB Mass Storage operation. However, the $ux_host_change_callback$, which is used for checking USB Device insertion and setting the event to inform HTTP Server Thread, is located on the same source file.

The sample directory structure of the NetX Webserver application code, the DM9051 Addon module, and its related driver, and code are as shown in Figure 5.2 and 5.3. The DM9051 Addon module is an add-on, and its relative files are listed under synergy/ssp/src/framework/sf_ether_dm9051,

synergy/ssp/src/framework/sf_ether_dm9051_nsal_nx, and synergy/ssp/inc/framework/api folder.







Figure 5.3 DM9051 add-on code and its driver directory structure



Website and Support

Support: <u>https://synergygallery.renesas.com/support</u>

Technical Contact Details:

- America: <u>https://renesas.zendesk.com/anonymous_requests/new</u>
- Europe: <u>https://www.renesas.com/en-eu/support/contact.html</u>
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Revision History

		Description	
Rev.	Date	Page	Summary
1.0	May 18, 2017		Initial version
1.1	June 20, 2017		Modified version with additional contents

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