

Renesas Synergy[™] Platform

DK-S3A7 Ethernet Application with DM9051

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Introduction

This application note describes how to utilize the Synergy[™] Software Package (SSP) Ethernet Add-on Driver to expend the network connectivity of DK-S3A7. Upon completion of this example application, 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 Demonstration Board
- Using NetX Application Layer Modules with Ethernet Add-on driver
- Running the Example Application

Target Device

DK-S3A7

PC Recommendations

- A PC running Windows[®] 7 (32-bit, 64-bit), Windows[®] 10 (32-bit, 64-bit) with the following Renesas Synergy[™] Software installed:
 - e² studio ISDE version: 5.3.1.002 or IAR Embedded Workbench[®] for Renesas 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 an Ethernet cable

Required Resources

To build and run the example application, you need:

- DK-S3A7 Version 2.0 or later
- DM9051 Demonstration 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 <u>sales@davicom.com.tw</u>)



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1. Installation information of the Ethernet Add-on Driver

1.1 Installation

The steps to install the distributions are as follows:

- 1. Check that SSP v1.2.0 has been installed
- Note: The default installation folder for the SSP is C:\Renesas\e2_studio
- 2. Download the Ethernet Add-on pack from the Renesas Synergy[™] Gallery (<u>https://synergygallery.renesas.com/</u>)

Note: The file is located in the Davicom's project, that is under the Partner Showcase of the Synergy Gallery.

- 3. Open the SSP Packs folder following the directions below. The SSP Packs folder is under the e2_studio folder e2_studio → internal → projectgen → arm → Packs
- 4. Manually copy and paste the **Ethernet Add-on pack** into the **Packs** folder as shown in the picture below.

> · 🛧 📙 > This PC > Windows	(C:) → Renes	sas $ ightarrow$ e2_studio_v5.3.1.002 $ ightarrow$ internal $ ightarrow$ projectgen $ ightarrow$ arm $ ightarrow$ l	Packs			~
		Name	Date modified	Туре	Size	
Quick access		supportfilepacks.xml	6/22/2017 5:58 PM	XML Document	5 KB	
E Desktop	A	Renesas.Synergy_wifi_rtl8711am.1.2.0.pack	6/22/2017 9:29 AM	PACK File	16 KB	
👆 Downloads	*	Renesas.Synergy_ethernet_dm9051.1.2.0.pack	6/13/2017 11:51 AM	PACK File	20 KB	
🖆 Documents	×	Renesas.Synergy_wifi_bcm43362.1.2.0-b.1.5.pack	3/14/2017 1:41 PM	PACK File	1,008 KB	
E 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	
Jorjin		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	
SS Ethemet add-on		Renesas.Synergy_mcu_s7g2.1.2.0.pack	2/7/2017 3:50 PM	PACK File	931 KB	
🝊 OneDrive		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	
		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_s7g2_dk.1.2.0.pack	2/7/2017 3:50 PM	PACK File	30 KB	
Windows (C:)		Renesas.Synergy_board_s7g2_pe_hmi1.1.2.0.pack	2/7/2017 3:50 PM	PACK File	24 KB	
ATADisk (D:)		Renesas.Synergy_board_s7g2_sk.1.2.0.pack	2/7/2017 3:50 PM	PACK File	24 KB	
		Renesas.Synergy_board_s124_dk.1.2.0.pack	2/7/2017 3:50 PM	PACK File	14 KB	
🗙 root (\\172.29.9.14) (H:)		Renesas.Synergy.1.2.0.pack	2/7/2017 3:50 PM	PACK File	80,239 KB	
common (\\172.29.9.4\public) (S:)						



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

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_jpeg_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.
✓		
✓ 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]
I 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

Tools	Version	Description
e ² studio	5.3.1	ISDE software development environment
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 demonstration board

2.1 DM-9051 demonstration board

Connect the Davicom DM9051 Demo Board to the PMODA connecter on the DK-S3A7. 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 the table below, for the DM9051 Demo Board connections to PMODA on DK-S3A7 board.



DM9051 Demo Board (J1) header pin #	PMODA header pin#	Description	
1	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	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			
6	9	Not Connected	
8	10	Not Connected	
10	11	Not Connected	
12	12	Not Connected	

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

Note: Make sure that 3.3 volt is selected for PMODA





2.2 Configuring Ethernet Add-on components

The following instructions list the common steps in creating an e²studio project with an 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 later
 - A. Choose S3A7 DK as the board



- 3. Create a project with your desired Project template.
- A. Choosing **Blinky** with ThreadX[®] gives you a project with ThreadX already added.
- 4. Go to the Threads tab.
- 5. Add a thread to the system if one is not already present.
 - A. Use the **Blinky** thread, that is already created.

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

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

Threads			Generate Proje	ect Content	€, €
Threads	Đ 🔒	Blinky Thread Stacks		P D	Driver
HAL/Common g_fmi FMI Driver	on r fmi	DM9051 Ethernet Device Driver on sf_ether_dm90	051 Addon		ramework
g_elc ELC Driver	on r_elc		Analog	> F	Renesas
g_cgc CGC Drive	er on r_cgc		Audio	> >	K-Ware
Blinky Thread			Connectivity	>	P402 P403
			File System	>	P404
			Graphics	>	P405 P406
			Input	>	P700 P701
			Networking	>	P702 P703
<	>		Services	>	P704 P705
Diale Thread Ohio			USB	>	VBAT
Blinky Thread Object	ts 🔮 🗐				VCL P215
					P214 VSS
					P213 P212
					VCC P713
					P712 P711
					P710
					P709 P706
					P415 P414
					P413 P412
					P411 P410
					P409
Summary BSP Clocks	Pins Threads Me	ssaging ICU Components			<

7. Add the 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:

A. After the previous steps are completed, the **Blinky Thread Stacks** pane should be the same as below.



B. Configure the Properties of the DM9051 Ethernet Device Driver.

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

g_st_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	

- C. 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 10 MHz for the current implementation.

	I Driver on r_sci_spi		
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	



- D. Configure the property of External IRQ Driver on r_icu.
- Note: For the DM9051 Demo Board connections, the external IRQ pin is Port 5 Pin 6, that supports the IRQ channel 15.

g_dm9051_irq External IRQ Driver on r_icu			
Information	✓ Common		
monution	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:
 - A. For DK-S3A7 on PMODA, use SCI3.
 - B. From the **Pins** tab, go to the **Pin Selection** section.
 - C. Go to Peripherals > Connectivity:SCI > SCI3
 - D. Set SCI3 up in Custom operation mode. Set up P409, P408, and P410 for SCI SPI use.

type filter text 🖉 🗎 🗐		a de la companya de la
✓ ✓ Peripherals ∧	Module name:	SCI3
> Monitoring:CAC > ✓ Analog:ADC > Analog:OPAMP	Usage:	When using Simple I2C mode, ensure port pins output type is n-ch open drain. When switching between I2C and other modes, first disable.
> Analog:CMP > Analog:DAC12	Pin Group Selection:	Mixed ~
> ✓ Connectivity:CAN > ✓ Connectivity:IIC	Operation Mode:	Custom ~
 ✓ Connectivity:SCI ✓ ✓ Connectivity:SCI 	Input/Output	
SCI0 SCI1	TXD_MOSI:	✓ P409 ✓
SCI2	RXD_MISO:	✓ P408 ✓
✓ SCI3 SCI4	SCK:	✓ P410 ✓
SCI9	CTS_RTS_SS:	None ~
Connectivity:SPI Connectivity:SSI	SDA:	None ~
> ✓ Connectivity:USBI > ✓ Input:CTSU	SCL:	None ~



10. SPI Chip-Select in configurations:

- A. From the **Pins Configuration** tab, go to the **Pin Selection** section.
- B. Go to **Ports > P4 > P411**

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

11. Set up the IRQ pin P5_6 for DK-S3A7, which is IRQ15:

- A. From the **Pins tab**, go to the **Pin Selection** section
- B. Go to **Ports > P5 > P506**

Pin Configuration		
, in the second s		
Module name:	P506	
Symbolic Name:		
Comment:		
Port Capabilities:	ADC0: AN22 IRQ0: IRQ15	
P506 Configuration		
Mode:	Input mode	\sim
Pull up:	None	\sim
IRQ:	IRQ15	\sim
Drive Capacity:	Low	\sim
Output type:	CMOS	\sim
Chip input/output		
P506:	✓ GPIO	

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



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

As shown in the figure below, the DM9051 device driver is fully integrated with the NetX Network stack inside the SSP, so users can 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 introduce in detail how to utilize DM9051 Add-on driver by using the NetX API calls or the NetX Application Layer Modules.



Figure 2 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. Each IP instance has a helper thread, which is responsible for handling all deferred packet processing and all periodic processing. 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. To utilize this service, we look up its description in *NetX User's Manual* as shown below and it's easy see that there is a required input parameter, which is a 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.





Below is a snippet of sample code that 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 the DM9051 driver entry function. Once you select the module of **DM9051 Device Driver on sf_ether_dm9051** in the Synergy Configurator, the name of the DM9051 driver entry can be configured in the below properties window.

Network Thread Stacks g_sf_el_nx0 DM9051 D	g_sf_el_nx0 DM9051 Device Driver on sf_ether_dm9051					
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 The module view of DM9051 Device Driver on sd_ether_dm9051



g_sf_el_nx0	DM9051 Device Driver on sf_ether_dm9051		
Settings	Property V Common	Value	
Information	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	

Figure 4 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 the DM9051 Device Driver, add the DM9051 Device Driver module as a NetX Network Driver under NetX IP instance module. The following pictures show the common steps in using NetX Application Layer modules with the Ethernet Add-on module.



Configure the DM9051 Device Driver like the steps we did in section 2.2.





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

g_ip0 NetX IP Instand	e		1			Add FileX	NetX HTTP Common
NetX Common on nx	g_packet_pool0 NetX Packet Pool Instance	g_sf_el_nx0 DM90	51 Device Driver on sf_eth	l er_dm9051		1	NetX MD5
Add NetX Source [Optional]	NetX Common on nx	Add NetX Common	g_spi0 SPI Driver on r_sci_spi External Irq0 External IRQ Drive on r_icu		External IRQ Driver		
	Add NetX Source [Optional]		Add DTC Driver for Transmission [Recommended but optional]	Add DTC Driver for Reception [Recommended but optional]			

4. Application Example of an 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 the 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* 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 **Module g_ip0**, **NetX IP instance**, on the **Properties** window, and change the IPv4 address to the one that 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.

q ip0 NetX	IP Instance	
Settings	Property	Value
Information	 Module g_ip0 NetX IP Instance 	
	Name	g_ip0
	IPv4 Address (use commas for separation)	192,168,1,90
	Subnet Mask (use commas for separation)	255,255,255,0
	IP Helper Thread Stack Size (bytes)	2048
	IP Helper Thread Priority	3
	ARP	🔒 Enable
	ARP Cache Size in Bytes	512
	Reverse ARP	Disable
	TCP	🔒 Enable
	UDP	Enable
	ICMP	Enable
	IGMP	Enable
	IP fragmentation	Enable

Figure 5 The properties view of NetX IP instance module



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



Figure 6 Configure the Ethernet port of your PC to the static IP address to test the board

Vetworking Sharing Connect using:	this capability. Otherwise, you need for the appropriate IP settings.	
Configure	 Obtain an IP address automati Ouse the following IP address: 	
Client for Microsoft Networks	IP address:	192.168.1.3
Deterministic Network Enhancer QoS Packet Scheduler	Subnet mask:	255 . 255 . 255 . 0
Ele and Printer Sharing for Microsoft Networks A Cisco IP Communicator driver for CDP	Default gateway:	
	Obtain DNS server address aut	tomatically
< •	Use the following DNS server a	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 7 Static IP address for the Ethernet port of the PC

A. Follow the procedure in the Synergy Project Import Guide 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 DK-S3A7 board using the DM9051 Add-on module, SSP and the NetX network stack. For being able to run the application on the DK-S3A7, you need to configure two DIPSWs by the following steps.

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



Figure 8 The setting of DIPSW S5 for the DK-S3A7

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



Figure 9 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. You need to insert the USB Drive into the USB connector (USB Mass storage) as shown in the figure below, before you start to run the application.



Figure 10 USB Drive connection for the DK-S3A7

To run the example web server application:

1. 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 the following figure. If the connectivity and configurations are proper, you will see the ping working.

```
C: Wsers \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 field of your web browser, enter the IP address that you used with the ping command in the previous step. You should see the view in the figure below.



Figure 12 HTTP Web page

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





5. DK-S3A7 Ethernet Add-on Application Implementation Details

In this section, the implementation details of DK-S3A7 Ethernet application are described. The Ethernet application is created on top of the NetX Webserver application, that is available for the DK-S7G2, SK-S7G2, PK-S5D9, and PE-HMI boards . 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 the NetX application from other devices to the DK-S3A7 without changing the application. As shown in the figure below, the Webserver application consists of the Network thread, Web thread, and the USB thread. A few modifications have been done on the web page



layout. Thread1 to Thread7 are removed to simplify the project. The relative thread counters, that are **thread_1_counter**, **thread_2_counter**..., have also been removed to simplify the display parameters of web page. The LED control thread is added to implement IO control through HTTP web interface.



Figure 13 Architecture of the NetX Webserver application on the DK-S3A7 board

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

5.1 HTTP Server Thread

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

The configurator generated code is part of the common_data.c/h and http_server_thread.c/h under the src/synergy_gen folder. The code, under these files, are a common code specific to the thread's selected module stack components. In this case, the common code related to NetX is available under the g_comm_init() function. 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 the USB device to be inserted, updates the previously created FileX media instance for NetX HTTP Server Media Pointer, that 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 nx_http_server_create is a user written code, but will be generated by the configurator in SSP v1.2.0. In this application, it is still a user written code and is part of http_server_thread.c.

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

The HTTP server creation API also requires the authentication_check and get_notify functions where the 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. 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

This 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. The ux_host_change_callback, that is used for checking the USB Device insertion and setting the event to inform the HTTP Server Thread, is located on the same source file.

The sample directory structure of the NetX Webserver application code, the DM9051 Add-on module, and its related driver, and code are shown in Figures 14 and 15. The DM9051 Add-on 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 14 NetX Webserver application and the Synergy Configurator created code



✓ 😕 synergy	
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>	h sf_ether_dm9051_api.h
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> h ssp	_features.h
> h ssp	_version.h
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	sf_el_ux
	sf_ether_dm9051
	h ether_phy.h
	h sf_ether_dm9051_private_api.h
	sf_ether_dm9051.c
	sf_ether_dm9051_nsal_nx
>	₢ sf_ether_dm9051_nsal_nx.c

Figure 15 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://www.renesas.com/en-us/support/contact.html</u>
- Europe: <u>https://www.renesas.com/en-eu/support/contact.html</u>
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Revision History

		Descript	ion
Rev.	Date	Page	Summary
1.00	Oct 25, 2017	-	Initial version

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