Synergy Software Package (SSP) v1.1.3
Release Note

Introduction
This document describes the release notes for SSP software release version 1.1.3.

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1. Release Information

<table>
<thead>
<tr>
<th>Tool</th>
<th>Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSP Release Version</td>
<td>1.1.3</td>
<td></td>
</tr>
<tr>
<td>Release Date</td>
<td>08/05/2016</td>
<td></td>
</tr>
</tbody>
</table>

Important notices for this release:

- The intended audience for this release are the Renesas Synergy customers, prospective customers, partners, and support staff.
- Existing projects may not migrate seamlessly to the newer e2 studio 5.0.0.043 since there are substantial improvements in the way modules are added that may break compatibility. Users are strongly advised to back up their existing projects before installing e2 studio and SSP 1.1.3 versions.

2. MCU supported

S7G2, S3A7, and S124 groups.

3. Compatible and tested tools (software and hardware environment)

<table>
<thead>
<tr>
<th>Tool</th>
<th>Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>e² studio</td>
<td>5.0.0.043</td>
<td>Software development and debugging tool. Link: <a href="https://synergygallery.renesas.com/">https://synergygallery.renesas.com/</a></td>
</tr>
<tr>
<td>GNU ARM Compiler</td>
<td>eabi-4_9-2015q3-20150921-win32</td>
<td>GNU ARM® compiler GCC_4.9.3.20150529. Refer to section Known issues and limitations in v1.1.3 release.</td>
</tr>
<tr>
<td>IAR Compiler</td>
<td>7.40.5</td>
<td>Software development tool. Refer to section Known issues and limitations in v1.1.3 release.</td>
</tr>
<tr>
<td>PE-HMI1</td>
<td>2.0</td>
<td>Product Example (PE) for Human Machine Interface to evaluate the Renesas SynergyTM S7G2 240 MHz ARM® Cortex®-M4 microcontroller.</td>
</tr>
<tr>
<td>DK-S124</td>
<td>2.0</td>
<td>Development Kit for Renesas Synergy™ S124, 32 MHz ARM® Cortex®-M0+ microcontroller in a LQFP64 package.</td>
</tr>
<tr>
<td>DK-S7G2</td>
<td>3.1</td>
<td>Development Kit for Renesas Synergy™ S7G2, 240 MHz ARM® Cortex®-M4 microcontroller in a BGA224 package.</td>
</tr>
<tr>
<td>DK-S3A7</td>
<td>2.0</td>
<td>Development Kit for Renesas Synergy™ S3A7, 48 MHz ARM® Cortex®-M4 microcontroller in a LQFP144 package.</td>
</tr>
<tr>
<td>J-Link Software</td>
<td>5.x</td>
<td>Segger J-Link™ debug probe is the quasi standard for ARM® Cortex®-M based MCUs.</td>
</tr>
</tbody>
</table>

4. Express Logic, Inc. component version information

<table>
<thead>
<tr>
<th>Component</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>ThreadX®</td>
<td>5.7</td>
</tr>
<tr>
<td>NetX™</td>
<td>5.9</td>
</tr>
<tr>
<td>NetX Duo</td>
<td>5.9 SP1</td>
</tr>
<tr>
<td>NetX Application bundle</td>
<td>5.9 SP1</td>
</tr>
<tr>
<td>USBX™ Host</td>
<td>5.7 SP2</td>
</tr>
<tr>
<td>USBX™ Device</td>
<td>5.7 SP2</td>
</tr>
<tr>
<td>FileX®</td>
<td>5.2</td>
</tr>
</tbody>
</table>
5. Information for migrating existing projects

**IMPORTANT:** For migrating projects that use an SSP version older than SSP v1.1.0, refer to the “Project Migration Guide - SSP 1.0.0 to SSP 1.1.0” document before installing e² studio 5.0.0 and/or SSP 1.1.3 and follow the instructions provided in the document.

**Note:** Users are strongly advised to back up their existing projects before installing e² studio v5.0 and SSP 1.1.3.

6. Release package and installation information

This package contains SSP v1.1.0 minor release, SSP v1.1.1 and SSP v1.1.3 patch releases; the installer installs SSP v1.1.0 and applies the SSP v1.1.1 and v1.1.3 patches.

Before installing the SSP, ensure that the following items are installed on the PC:

- Renesas e² studio ISDE v5.0.0 (download from Renesas Gallery [https://synergygallery.renesas.com/](https://synergygallery.renesas.com/))
- GNU ARM Compiler (included in Renesas e² studio ISDE v5.0.0 installer)

To install the SSP, follow these steps:

1. Download the following items for the SSP Release from Synergy Gallery:
   - SSP_Distribution_1.1.3.zip (SSP Package Installer, including SSP Package, HTML User’s Manual for SSP v1.1.0 and the Readme_SSP.txt); MD5 checksum = 34cd43453c99293979c12fb4ba5b93cc
   - Release_Notes_SSP_ver1.1.3.pdf
   - Synergy Software Package 1.1.0 User’s Manual r01us0171eu0094_synergy_ssp.pdf.
   - Project Migration Guide - SSP 1.0.0 to SSP 1.1.0.pdf

2. Unzip the package and run the SSP_Distribution_1.1.3.exe installer.

3. Install the SSP in the root folder of a compatible e² studio installation.

**Note:** The default installation folder for the SSP is C:\Renesas\e²_studio.

The SSP documentation installs by default to ~Renesas\Synergy\SSP_Documentation. You can change the default location during the installation. The following documents will be installed:

- ssp-user-manual-html-v0.94-sspv1.1.0.zip (HTML version of the SSP User’s Manual)
- readme_SSP.txt (critical information and last-minute updates)
- Renesas Synergy™ Software Package (SSP) Developer examples r11an0024eu0100_synergy_ssp.pdf (sample applications illustrating usage of SSP modules and their APIs)

7. Instructions to use SSP Patch

To use this patch for any module, follow these steps:

1. Make sure that SSP v1.1.3 patch is installed.
2. Select the “Components” tab from the Synergy configuration of your project.
3. Select version 1.1.3 of the module you want to use the patch version.
4. Generate code by clicking the “Generate Project Content” button. This will generate the module contents with selected patch version.

**Note:** This may create a warning in the BSP tab stating, “Some selected components do not match this SSP version.” This warning can be ignored.
8. Summary of bug fixes in SSP 1.1.3

8.1 BSP (Board Support Package)

Description
R_BSP_CacheOff and R_BSP_CacheSet Functions added to turn off flash cache and to restore cache to the previous state.

Applies to: DK-S7G2 and DK-S3A7

8.2 sf_el_ux (Synergy USBX Interface)

Description
USBX Synergy Port Device Controller Driver (DCD) did not run on USBHS port. By this fix, USBX Device Classes runs in HS mode on USBHS port.

Applies to: S7G2 boards

Description
Improved data throughput for USBX Synergy Port Device Controller Driver (DCD) in the sf_el_ux module. It affects to the throughput when data transfer is done by CPU copy.

Applies to: S7G2 boards, DK-S3A7, DK-S124

Description
DMA transfer support is added to the USBX Synergy Port Host Controller Driver (HCD) in the sf_el_ux module.

Notes:
- DMAC use for S7G2, S3A7 are supported.
- DTC use is not yet supported (not yet tested) in this release.
- This feature has not been fully tested and has several known limitations. It’s recommended that this feature is not used other than for experimentation. Further enhancements and fixes will be provided for this feature in future SSP releases.

Applies to: DK-S7G2, DK-S3A7

Description
DMA transfer support is added to the USBX Synergy Port Device Controller Driver (DCD) in the sf_el_ux module.

Notes:
- DMAC use for S7G2, S3A7 are supported.
- DTC use is not yet supported (not yet tested) in this release.
- DMA transfer support is not available with sf_el_ux_comms module in this release
- This feature has not been fully tested and has several known limitations. It’s recommended that this feature is not used other than for experimentation. Further enhancements and fixes will be provided for this feature in future SSP releases

Applies to: S7G2 boards, DK-S3A7, DK-S124

8.3 ux_src (USBX Source code)

Description
“Device Only” configuration is applied to “ux_src” for S1 MCU group devices. By this change, USBX (ux_src) is built to match to the memory requirements for S1 device series. You do not need to do anything to apply this configuration. UX_SYSTEM_DEVICE_ONLY configuration is automatically applied in ux_port.h by your S1 parts selection on Synergy configurator. Note that following configurations are also applied automatically as our recommendation to reduce RAM use:
- UX_THREAD_STACK_SIZE: 512 (default 1024)
- UX_SLAVE_REQUEST_DATA_MAX_LENGTH: 512 (default 4096)

However, you can override these settings by adding this symbols as compiler preprocessors in your e² studio or Embedded Workbench for Synergy project settings if you need to change.
Applies to: DK-S124

Description
Deleted a configuration named “HCD RX Exclude Interrupt Tree” from sf_el_ux module configuration. This configuration is not for Synergy parts so not required.

Applies to: All

8.4  r_rspi (Serial Peripheral Interface)

Description
Fixed the issue in the RSPI close function, this is done by closing the transfer module in the close function of RSPI driver.

Applies to: All boards

8.5  r_sci_spi (Serial Communication Interface SPI)

Description
Fixed the issue in the SCI SPI close function, this is done by closing the transfer module in the close function of SCI SPI driver.

Applies to: All boards

8.6  r_riic (IIC)

Description
Fixed issue in the IIC receive routine. IIC receive interrupt routine is updated, IIC receive flow control is modified in the driver based on the specifications in the hardware manual. This is to fix the problem in the I2C communication when transfer gets interrupted by other high priority interrupts.

Applies to: All boards

8.7  r_sce (Crypto Library)

Description
Resolves an issue where call to createKey(), encryptFinal() and addAdditionalAuthenticationData() cause a system crash.

The functions createKey(), encryptFinal() and addAdditionalAuthenticationData() now return NOT IMPLEMENTED error code.

Applies to: PE-HMI1 and DK-S3A7

8.8  r_adc (A/D Converter)

Description
The temperature and voltage sensors on the S7 device cannot be used without setting the sample state registers. The code was updated to automatically set the sample state registers when the temperature or voltage sensor is used.

Applies to: DK-S7G2, DK-S3A7 and DK-S124

8.9  r_cac (Clock Frequency Accuracy Measurement Circuit)

Description
Fixed build error in CAC module due to unidentified "g_module_name" variable, this was happening when the error log is disabled.

Applies to: DK-S7G2, DK-S3A7 and DK-S124

9. Known backward compatibility issues in v1.1.3 release with respect to v1.1.1

None

10. Known issues and limitations in v1.1.3 release
10.1 Developer Examples

Description
Errors may occur in the decoding process when the sf_audio_playback ‘play’ command is used. When these errors occur, a message about corrupt or missing data in the bitstream is printed to the console. The audio file still plays, but some data may be skipped.

Applies to: DK-S7G2

10.2 All Modules

Description
Linker scripts do not currently support mixing read/write, read only, initialized, and uninitialized code/data in the QSPI flash region of memory. The IAR linker emits a warning and allows the build to succeed. GCC returns an error, and the build does not succeed.

Applies to: All

10.3 r_agt (Asynchronous General Purpose Timer)

Description
Due to hardware limitations on the S3A7 MCU, maximum clock input to AGT is dependent on the selection of power domains between Vcc and Vbatt. When Vcc is selected, both AGTs can operate with a maximum input clock of 32 MHz. When Vbatt is selected, both AGTs can only operate with a maximum input clock of 32 KHz.

Due to hardware limitations on the S3A7 MCU, when transitioning operating mode from Normal to Standby, Vbatt can go out of regulation temporarily. In some cases, the interrupt required for transitioning operating mode from Standby to Normal (wakeup) is not negated. The result of this condition is that the interrupt that should cause an operating mode transition from Standby to Normal (wakeup) is not detected and the MCU remains in Standby mode. Several workarounds are being tested.

Applies to: S3A7

10.4 r_cac (Clock Frequency Accuracy Measurement Circuit)

Description
It is required to use CAC module by enabling the error log from the properties of the BSP tab; the CAC module does not build without enabling the error log. Also, by enabling the error logs you will see some warnings.

Applies to: All

10.5 r_dac (Digital to Analog Converter)

Description
The S3A7 MCU has a register to select one of four voltage references for the DAC. At this time, only Vcc is supported.

Applies to: S3A7

10.6 r_fmi (Factory Microcontroller Information)

Description
Factory MCU Information consists of three record types: Product Information, Software Provisioning, and IP Information.

Product Information is the only record programmed into the Synergy MCUs, and is the only record fetched by the FMI driver.

Applies to: All

10.7 r_lpm (Low Power Mode)

Description
When a project uses ThreadX, the application should only switch to LPM_LOW_POWER_MODE_STANDBY or LPM_LOW_POWER_MODE_DEEP immediately before calling the API function lowPowerModeEnter/R_LPM_LowPowerModeEnter. If LPM_LOW_POWER_MODE_STANDBY or LPM_LOW_POWER_MODE_DEEP are used with ThreadX, the user must make sure to revert the low power mode to
LPM_LOW_POWER_MODE_SLEEP immediately after the MCU wakes from LPM_LOW_POWER_MODE_STANDBY.

Applies to: All

10.8  r_rspi (Serial Peripheral Interface)

Description
In r_sci_sspi_spei_isr_common(), p_context element of the callback argument structure is not set. Because of this, the applications cannot use p_context element to handle error cases.

Applies to: All

10.9  r_sci_spi (Serial Communication Interface SPI)

Description
In r_sci_sspi_spei_isr_common(), p_context element of the callback argument structure is not set. Because of this, the applications cannot use p_context element to handle error cases.

Applies to: All

10.10 sf_audio_playback (Audio Playback)

Description
Calling sf_audio_playback start after calling sf_audio_playback stop during playback fails.

Workaround: Call pause and wait for the current buffer to finish playing before calling stop.

Applies to: All

10.11 sf_el_nx_comms (Synergy NetX Communication Interface)

Description
The sf_el_nx_comms module calls nx_system_initialize(), which is a common function. This can clear initializations made for other USB code at the application level.

Workaround: Wait for sf_el_nx_comms initialization to complete prior to initializing any other USB code and not call nx_system_initialize() in the application code.

Applies to: S7G2

Description
After calling close, then calling open again for sf_el_nx_comms, the Telnet server connection times out. No workaround is available.

Applies to: S7G2

10.12 sf_el_ux (Synergy USBX Interface)

Description
USBX CDC read spins forever when receiving an actual length buffer that is a multiple of 64 bytes (wMaxPacketSize of the endpoint) but less than the maximum read length parameter.

Workaround: If you expect packets that are multiples of 64 bytes, give the exact expected length or read 64 bytes at a time.

Applies to: S7G2
10.13  sf_el_ux_comms (Synergy USBX Communication Interface)

Description
The read API timeout only returns with a timeout error if the device is not plugged in. Read does not time out if the device is enumerated and no data arrives in the specified time.

Workaround: If a timeout is needed for reading data after the connection is established, we recommend buffering the data in a separate thread. This can be done in a separate thread that pends on USB data by waiting forever, then posts received data to a queue. Then the application thread can pend in the queue with a timeout.

Applies to: All

Description
The close API is not functional and should not be used. The USBX communications framework can only be configured once. There is no workaround at this time. The configuration parameters passed into open and the descriptors defined in sf_el_ux_comms_port.h are permanent and cannot be updated at runtime after open is called.

Applies to: All

Description
The sf_el_ux_comms module calls ux_system_initialize(), which is a common function. This can clear initializations made for other USB code at the application level. Workaround is to wait for sf_el_ux_comms initialization to complete prior to initializing any other USB code and not call ux_system_initialize() in the application code.

Applies to: All

Description
The sf_el_ux_comms module only supports FS mode but does not support HS mode. The function performs the hard-coded USBX initialization sequence internally, which includes function call ux_dcd_synergy_initialize(R_USB_FS). This issue will be fixed in the future SSP release.

Applies to: All

Description
The sf_el_ux_comms module does not support DMA transfer. The function performs the hard-coded USBX initialization sequence internally, which includes function call ux_dcd_synergy_initialize(R_USBFS_BASE) and not able to call ux_dcd_synergy_initialize_transfer_support(), which is required for DMA support. This issue will be fixed in the future SSP release.

Applies to: All

10.14  sf_power_profiles (Power Mode Profile)

Description
The power profiles API function sleep does not revert the low power mode of the MCU back to the default state expected by ThreadX. If, after returning from the sleep function, ThreadX enters the idle thread either because a thread is not ready to run, or by tx_thread_sleep(), the MCU may never wake up. The user must revert the low power mode immediately after the return from the power profiles sleep function using the following code:

R_LPM_LowPowerConfigure(LPM_LOW_POWER_MODE_SLEEP,
    LPM_OUTPUT_PORT_ENABLE_RETAIN,
    LPM_POWER_SUPPLY_DEEPCUT0,
    LPM_IO_PORT_NO_CHANGE);

Applies to: All

Description
Power profiles do not enable wake up by numbered IRQs (IRQ0-IRQ15...), so extra work is required. To wake the MCU using a numbered IRQ, the application needs to use the r_lpm API functions wupenGet and wupenSet to enable wake from standby mode by a numbered IRQ. The code is as follows, using IRQ14 as an example:

    uint32_t wupen_preSleep = 0;
    /**< Get the current WUPEN value */
Applies to: All

10.15 tx (ThreadX)

Description
Code will hard fault if the CM0+ ThreadX source is built with GCC with no optimization (-O0). To use ThreadX source with no optimization, apply -O2 optimization to the file ssp/src/framework/el/tx/src/synergy/tx_thread_schedule.c.

Applies to: S124

10.16 ux (USBX Host and Device)

Description
UX_THREAD_STACK_SIZE is set to 1024, but should be set to 2048. Workaround is to define UX_THREAD_STACK_SIZE to 2048 at the project level.

Applies to: All

10.17 sf_el_ux (Synergy USBX Interface)

Description
DMA/DTC transfer support for USBX Synergy Port Host Controller Driver (HCD) in the sf_el_ux has performance issue and functional limitation.

USB HS data throughput with DMA transfer is 10~20% lower than CPU transfer case according to the measurements.

USB FS data throughput with DMA transfer is equivalent to CPU transfer case according to the measurements.

DTC use is not yet supported (not yet tested) for S7G2 and S3A7 in this release.

Applies to: S7G2 Boards and DK-S3A7

Description
DMA/DTC transfer support is added for the USBX Synergy Port Device Controller Driver (DCD) in the sf_el_ux has performance issue and functional limitation.

Notes:
- USB HS data throughput with DMA transfer is equivalent to CPU transfer case according to the measurements.
- USB FS data throughput with DMA transfer speed is 10~20% lower than CPU transfer case according to the measurements.
- DTC use is not yet supported for S7G2, S3A7 and S124 in this release.

Applies to: S7G2 Boards, DK-S124 and DK-S3A7

Description
This is not information for known issue but information to clarify the configurations applied to USBX pre-built libraries in SSP1.1.0. SSP1.1.0 applied the configurations for USBX pre-built libraries below, which are different from the default value. The other configurations not listed in the table below are same. By this applied configurations, few pre-built libraries can behave different from the source mode.

For S7 and S3 parts (Cortex-M4):

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>UX_THREAD_STACK_SIZE</td>
<td>2,048 (default: 1,024 in ux_port.h)</td>
</tr>
<tr>
<td>UX_SLAVE_REQUEST_DATA_MAX_LENGTH</td>
<td>1,024 (default: 4,096 in ux_port.h)</td>
</tr>
<tr>
<td>UX_HOST_CLASS_STORAGE_MEMORY_BUFFER_SIZE</td>
<td>8,096 (default: 4,096 in ux_host_class_storage.h)</td>
</tr>
</tbody>
</table>
### UX_MAX_ISO_TD

1 (default: 128 in ux_port.h)

### UX_HOST_CLASS_HID_DCOMPRESSION_BUFFER

128 (default: 4,096 in ux_host_class_hid.h)

### UX_HOST_CLASS_HID_USAGES

512 (default: 1,024 in ux_host_class_hid.h)

For S124 parts (Cortex-M0+):

### UX_SYSTEM_DEVICE_ONLY

Defined

### UX_THREAD_STACK_SIZE

512 (default: 1,024 in ux_port.h)

### UX_SLAVE_REQUEST_DATA_MAX_LENGTH

512 (default: 4,096 in ux_port.h)

(Others)

Same as S7 or S3 parts

The table below explains about possible differences of the behavior between a USBX pre-build libraries and the source modules by configurations:

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UX_SLAVE_REQUEST_DATA_MAX_LENGTH</strong> (= 2,048)</td>
<td>This configuration affects the behavior of ux_device_class_cdc_acm. When ux_slave_class_storage_media_block_length in the UX_SLAVE_CLASS_STORAGE_LUN structure needs to be greater than 1KB, users have to use ux_device_class_cdc_acm_src module.</td>
</tr>
<tr>
<td><strong>UX_HOST_CLASS_STORAGE_MEMORY_BUFFER_SIZE</strong> (= 1,024)</td>
<td>This configuration affects the performance (throughput) of ux_host_class_storage pre-built library. The block memory area used for FileX is limited to this configuration. To get better data transfer performance, users have to use ux_host_class_storage_src module.</td>
</tr>
<tr>
<td><strong>UX_MAX_ISO_TD</strong> (= 1)</td>
<td>This configuration affects the behavior of ux_host_class_audio pre-built library.</td>
</tr>
<tr>
<td><strong>UX_HOST_CLASS_HID_DCOMPRESSION_BUFFER</strong> (= 128)</td>
<td>This configuration affects the behavior of ux_host_class_hid. When the size of HID report is larger than 128, users have to use ux_host_class_hid module.</td>
</tr>
</tbody>
</table>
| **UX_HOST_CLASS_HID_USAGES** (= 512) | This configuration affects the behavior of ux_host_class_hid. When the number of usage items in a HID report is larger than this number, users
| have to use ux_host_class_hid module. |

**Applies to:** S7G2 Boards, DK-S124 and DK-S3A7
11. USBX availability on Synergy Devices

<table>
<thead>
<tr>
<th></th>
<th>USBX Mass Storage Class</th>
<th>USBX HID Class</th>
<th>USBX CDC/ACM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Host</td>
<td>Device</td>
<td>Host</td>
</tr>
<tr>
<td>High Speed</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Full Speed</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

✓ = Available (tested)

× = Not Available (not tested/not functional or both)

N/A = Not Supported by MCU

12. Additional Technical Notices


Additional technical information, including informative papers and articles on SSP and Synergy can be found at Synergy Knowledge Base, [https://knowledgebase.renesas.com/Renesas_Synergy_Platform](https://knowledgebase.renesas.com/Renesas_Synergy_Platform).
Website and Support

Support: https://synergygallery.renesas.com/support

Technical Contact Details:
  America: https://renesas.zendesk.com/anonymous_requests/new
  Europe: http://www.renesas.eu/support/index.jsp
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