Overview of Programming for RH850 Multi-core

R20UT3069EJ0100
Rev.1.00
Sep 20, 2014

Contents

Section 1 Overview of Programming for Multi-core

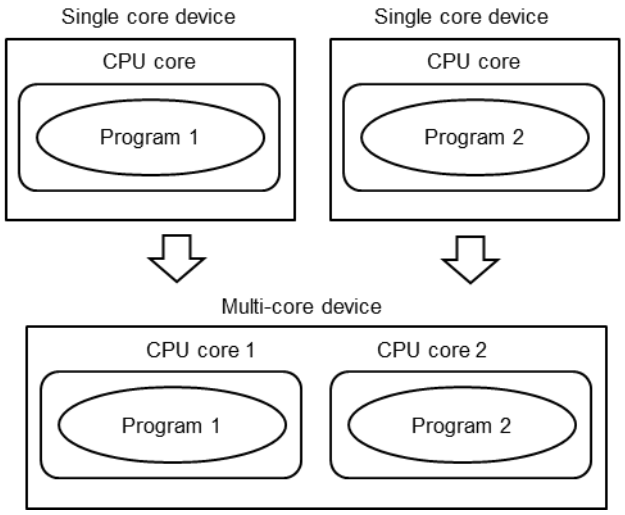
This chapter describes the overview of programming for a multi-core device.

1.1 Programming Models

There are three models that are used as programming models for a multi-core device: simple integrated model, distributed functional model, and distributed load model.

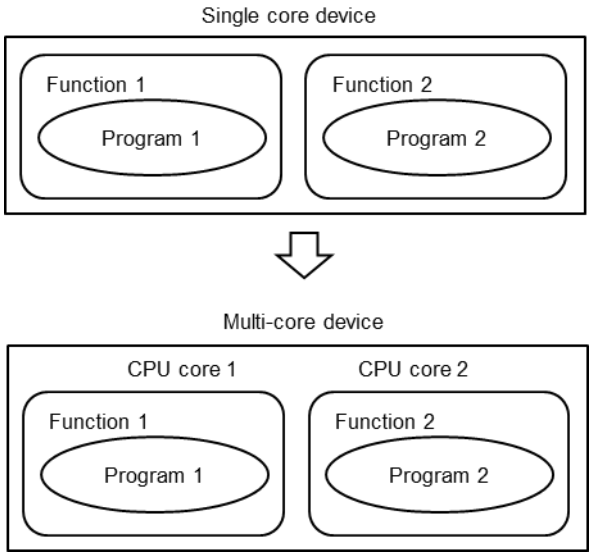
Simple integrated model

In this programming model, two programs that were being executed by separate single core devices are to be executed by separate cores in a multi-core device. Basically, the two programs are executed independently in each core without interfering with each other.



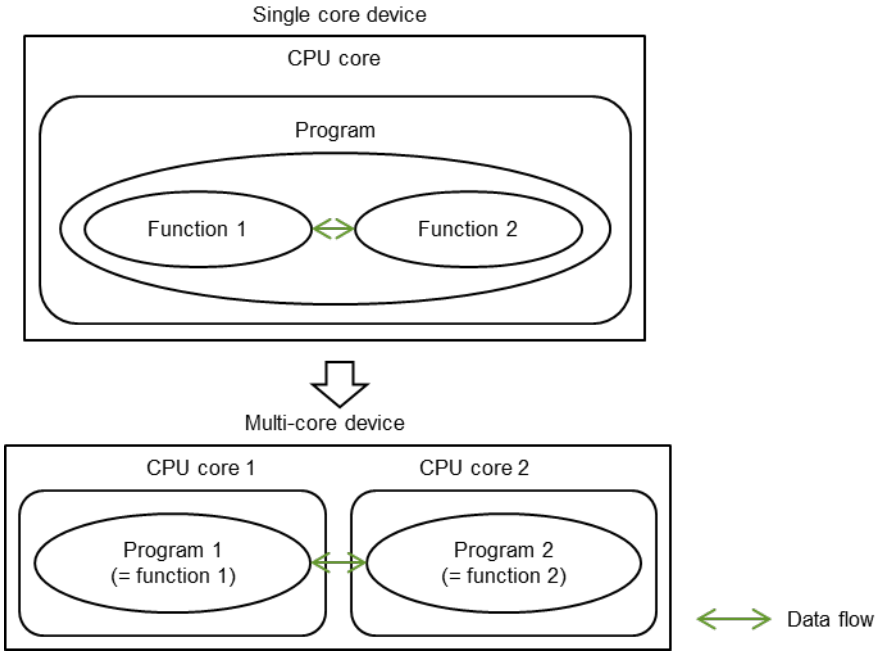
Distributed functional model

In this programming model, two independent functions which were in a single program are to be executed by separate cores in a multi-core device.



Distributed load model

In this programming model, two highly-independent and dividable functions which were in a single program are to be divided into two programs, and these two programs are to be executed by separate cores in a multi-core device. If data needs to be passed between the two programs, data is passed through inter-process communication.



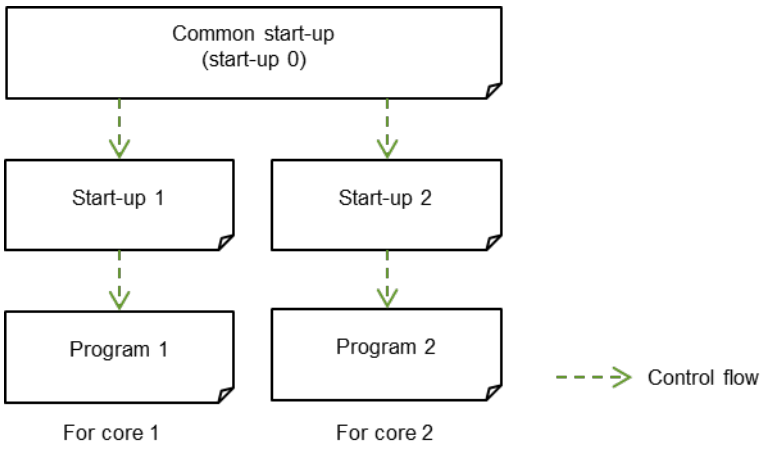
1.2 Program Configuration Examples

A programming configuration example and execution processing are described separately for each programming model.

A file configuration such as shown below is assumed when there are two cores.
Program and start-up process executed by core 1 -> Program 1 and tart-up 1
Program and start-up process executed by core 2 -> Program 2 and start-up 2
Common start-up process starting from a multi-core reset up to a branch to the start-up process for each core -> Start-up 0

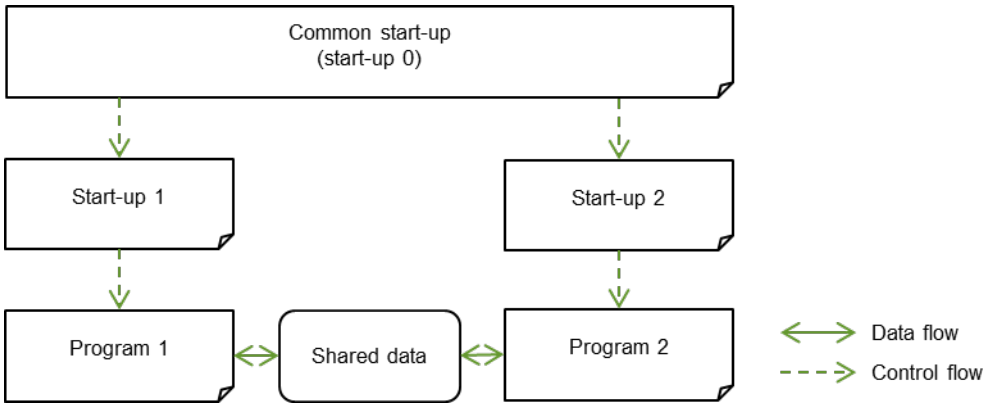
Configuration example of simple integrated model or distributed functional model

Start-up 0 initializes the resources of the entire multi-core device and then calls start-up 1 and start-up 2.
Start-up 1 and start-up 2 initialize the resources of their respective core and then respectively call program 1 and program 2.



Configuration example of distributed load model

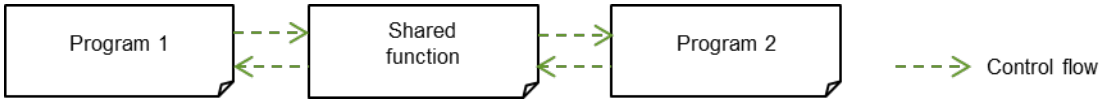
In addition to a file of the distributed functional model, a shared data file defining the data to be shared is prepared. The shared data can also be defined in program 1 or program 2.
Start-up 0 initializes the resources of the entire multi-core device and then calls start-up 1 and start-up 2.
Start-up 1 and start-up 2 initialize the resources of their respective core and then respectively call program 1 and program 2.



The shared data can be accessed from program 1 or program 2.
If the shared data is only read-only data, no particular process is required to read data from program 1 or program 2. On the other hand, if the shared data can also be used for writing, synchronized control or exclusive control needs to be performed when data is read from or written to program 1 or program 2. This is to prevent the shared data from being simultaneously accessed from both programs. Care is required because the execution result may be unintended if the data to be read or written is accessed from both programs at the same time.

Sharing of functions in each programming model:

Functions can be shared in either of the above two programming models.
Prepare the shared function file defining the shared functions that are called from program 1 and program 2. The shared function file can also be included in program 1 or program 2. This enables the code size of the entire multi-core device to be reduced.



If the shared function is a re-entrant function, no particular process is required to call the function from program 1 or program 2. On the other hand, if the shared function is not a re-entrant function, synchronized control or exclusive control needs to be performed when the function is called from program 1 or program 2. This is to prevent the shared function from being simultaneously called from both programs. Care is required because the execution result may be unintended if a non-reentrant function is called from both programs at the same time. When a global variable is referenced from a shared function, the absolute address needs to be used for reference.

Section 2 Correspondence Relationship with Tutorial

"Tutorial for RH850 Multi-core Environment (Build)" gives specific examples of terms in this document. The correspondence relationship between terms in this document and "Tutorial for RH850 Multi-core Environment (Build)" is shown in "Table 1 Correspondence Relationship with Tutorial for RH850 Multi-core Environment".

Table 1 Correspondence Relationship with Tutorial for RH850 Multi-core Environment

Overview of Programming for RH850 Multi-core	**Tutorial for RH850 Multi-core Environment (Build)**
Common start-up	2.2.1 Start-up routine for boot loader
Start-up 1 or start-up 2	3.2.1 Start-up routine for application
Program 1 or program 2	Section 3 Application Project
Shared data	3.4 Sharing the Variables
Shared function	3.5 Sharing the Functions

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
3. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from such alteration, modification, copy or otherwise misappropriation of Renesas Electronics product.
5. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The recommended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.
   "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots etc.
   "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; and safety equipment etc.
   Renesas Electronics products are neither intended nor authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems, surgical implantations etc.), or may cause serious property damages (nuclear reactor control systems, military equipment etc.). You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application for which it is not intended. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for which the product is not intended by Renesas Electronics.
6. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
7. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or systems manufactured by you.
8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
9. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You should not use Renesas Electronics products or technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. When exporting the Renesas Electronics products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations.
10. It is the responsibility of the buyer or distributor of Renesas Electronics products, who distributes, disposes of, or otherwise places the product with a third party, to notify such third party in advance of the contents and conditions set forth in this document, Renesas Electronics assumes no responsibility for any losses incurred by you or third parties as a result of unauthorized use of Renesas Electronics products.
11. This document may not be reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

RENESAS

SALES OFFICES Renesas Electronics Corporation http://www.renesas.com

Refer to "http://www.renesas.com/" for the latest and detailed information.

Renesas Electronics America Inc.
2801 Scott Boulevard Santa Clara, CA 95050-2549, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
Room 1709, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100191, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, P. R. China 200333
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022/9044

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics Korea Co., Ltd.
12F., 234 Teheran-ro, Gangnam-Ku, Seoul, 135-920, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

Colophon 4.0