Introduction of Renesas R-IN32M4-CL3 CC-Link IE TSN

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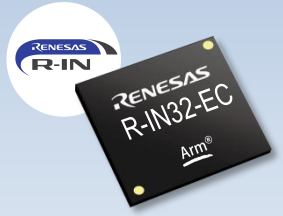
RENESAS ELECTRONICS CORPORATION
SYSTEM SOLUTION DEPARTMENT
INDUSTRIAL AUTOMATION BUSINESS DIVISION
IOT AND INFRASTRUCTURE BUSINESS

IASS-AA-21-0061-3

Lineup of Renesas's Industrial network LSI

Lineup of Industrial network LSI

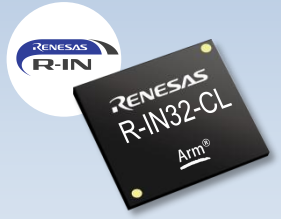
Multi Protocol



R-IN32M3-EC

Cortex®-M3 CPU
2Port with Switch PHY
EtherCAT Slave Controller

EtherCAT Technology Group
EtherNet/IP
PROFINET
Modbus
OPC UA



R-IN32M3-CL

Cortex®-M3 CPU
2Port GMAC with Switch
CC-Link IE Field Controller

CC-Link IE
EtherNet/IP
PROFINET
Modbus
OPC UA

New

R-IN32M4-CL3

Cortex®-M4 CPU
2Port with Switch Gigabit PHY
CC-Link IE Field and
CC-Link IE TSN Class B

CC-Link IE TSN
CC-Link IE
EtherNet/IP
PROFINET
Modbus
OPC UA

RZ/T1

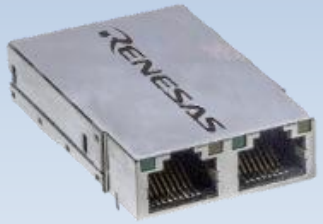
Cortex®-R4 with FPU + Cortex®-M3 CPU
2Port with Switch
EtherCAT Slave Controller

EtherCAT Technology Group
EtherNet/IP
PROFINET
Modbus
OPC UA

RZ/N1

Dual Cortex®-A7 + Cortex®-M3 CPU
5Port GMAC with Switch
True IE multi-protocol
PRP/HSR/MRPD

EtherCAT Technology Group
EtherNet/IP
PROFINET
Modbus
ETHERNET POWERLINK
SERCOS interface
OPC UA



R-IN32M3 Module

RJ-45 x2
SPI for Application CPU

EtherCAT Technology Group
EtherNet/IP
PROFINET

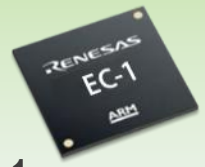
PROFINET

TPS-1

2Port with PHY
PROFINET CPU

PROFINET *IRT*

EtherCAT



EC-1

Cortex®-R4 with FPU
EtherCAT Slave Controller

EtherCAT Technology Group

CC-link IE TSN Solution

Renesas R-IN32M4-CL3

Outline of Renesas R-IN32M4-CL3

-Accelerate smart factory construction with "CC-link IE TSN" technology
-Realizing Giga-bit Ethernet and low power consumption by Built-in Ethernet PHY

High-speed Real-time response

- *Renesas R-IN Engine*
  - *Arm® Cortex®-M4 processor with FPU @100MHz*
  - *Real time OS Accelerator*
  - *Ethernet Accelerator*

Advanced Network Controllers

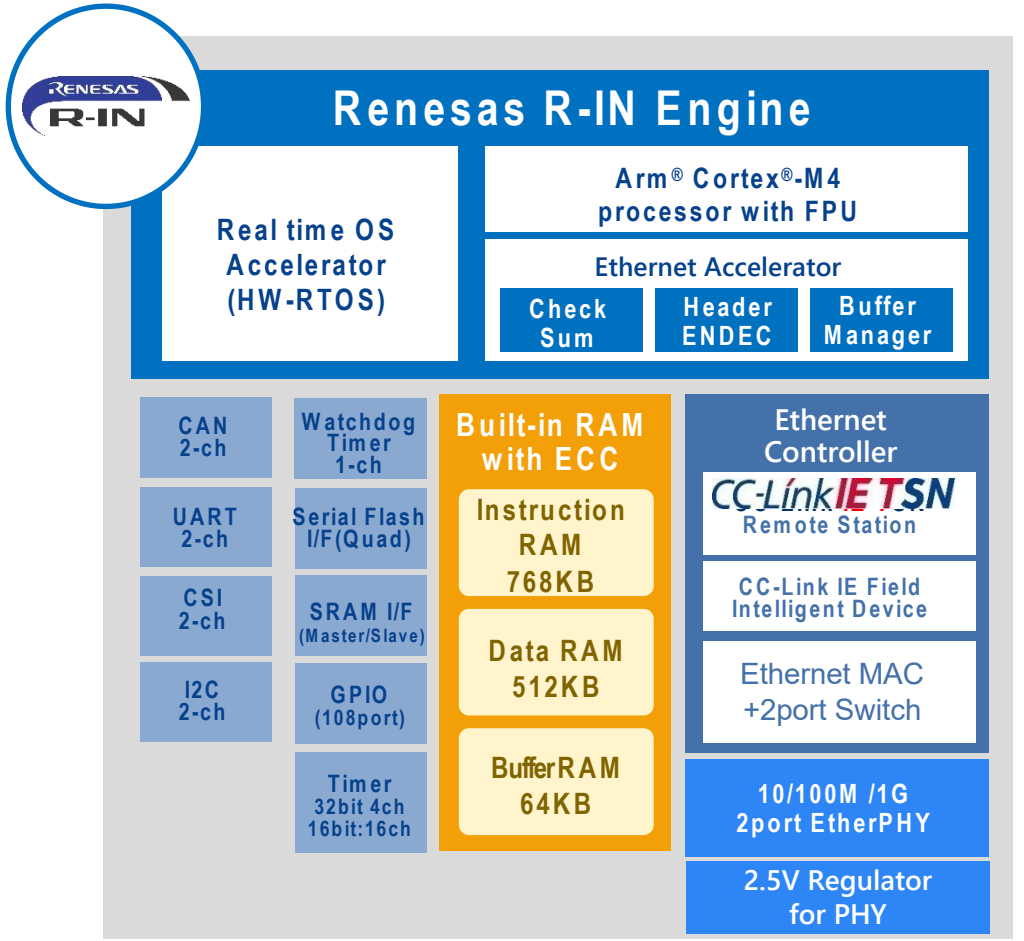
New

- *CC-Link IE TSN* Controller*
- *CC-Link IE Field Controller*
- *10/100M/1G Built-in Low power Ether PHY*
- *2port Ethernet Switch*
  IEEE1588, DLR, Cut-through Hub
- *Built-in 1.3Mbyte RAM with ECC*

Peripherals

- *Quad SPI I/F for Serial Flash*
- *SRAM and External CPU I/F*
- *CAN 2ch, IIC 2ch*

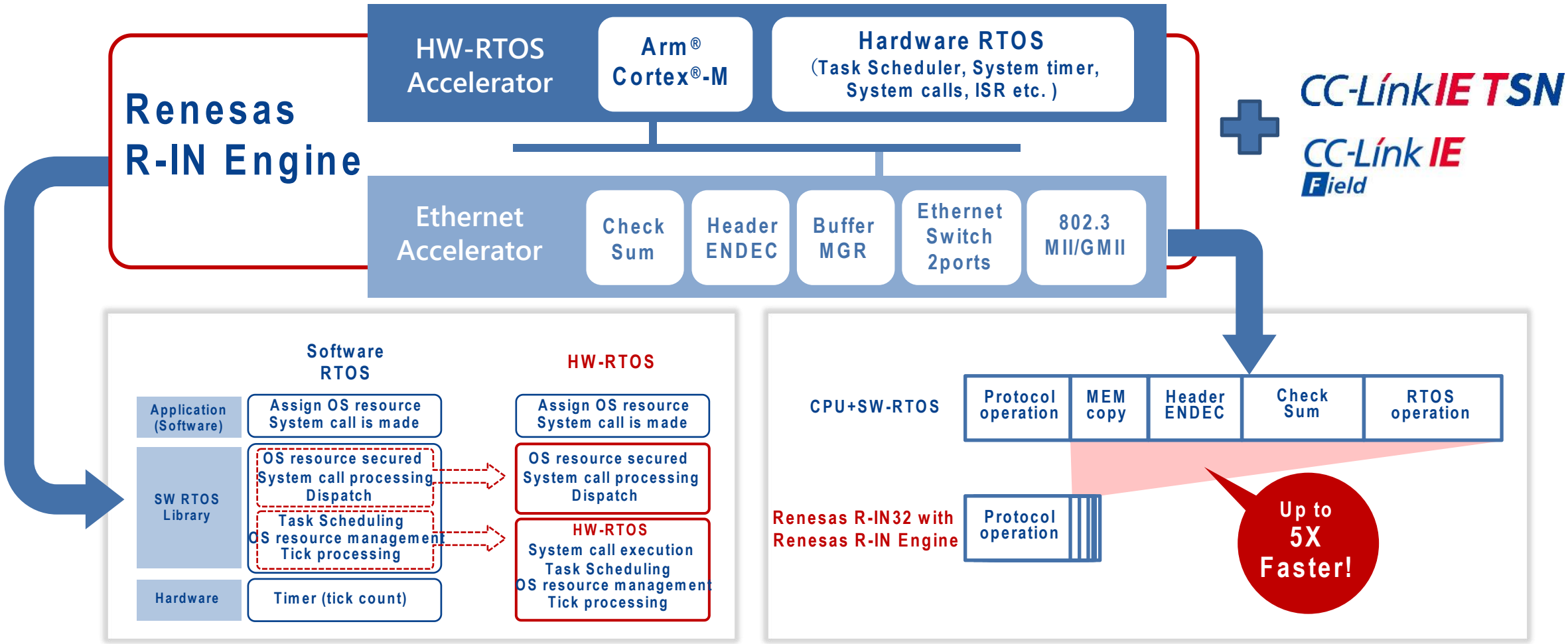
- CC-link IE TSN
- https://www.cc-link.org/en/material/documents/cclinkie-tsn_whitepater_en.pdf



Package 484pin BGA (23mmSQ., 1.0mmPitch)

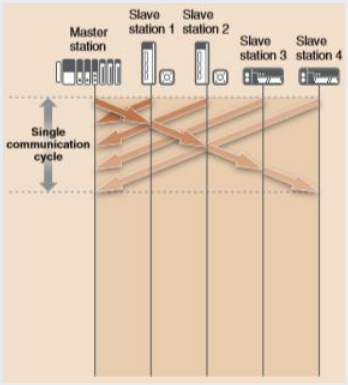
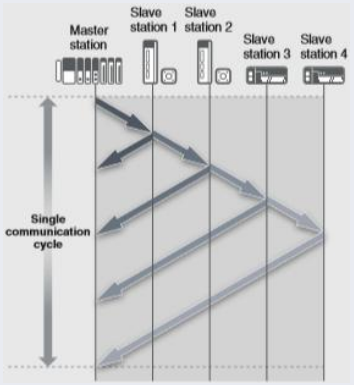
“Renesas R-IN Engine”

Renesas’s key technology for industrial network



Protocol Specification of CC-link IE TSN

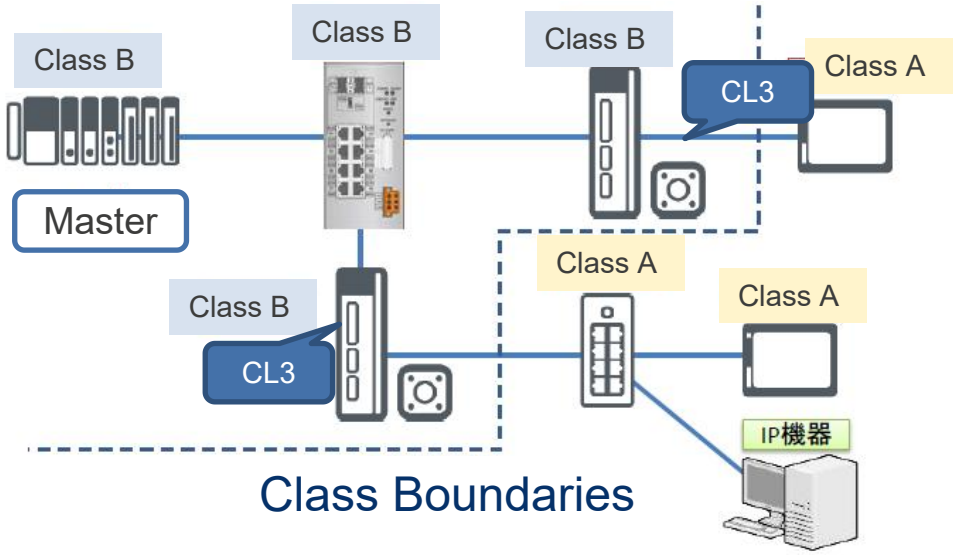
The master does not wait for response from all slave device. More than double the performance

Item	CC-Link IE TSN	CC-Link IE Field
Communication speed	1 Gbps/100 Mbps	1Gbps
Maximum cyclic size per station	4G octets	36K octets
Transient transmission	2048 octets	2048 octets
Communication method /Synchronization function	IEEE802.1AS and IEEE1588v2 IEEE802.1Qbv (The time sharing) 	Token Passing Timing synchronization 
No. of nodes connected	64,770 devices	121 devices
Topology	Line, star, line/star mixed, ring, ring/star mixed, mesh	Line, star, line/star mixed, ring,

Comparison between Class A and B of CC-link IE TSN

Only CL3 can be supported Class B except CP620 from Mitsubishi

Function	CC-Link IE TSN Class B	CC-Link IE TSN Class A
Time Sharing method IEEE802.1Qbv	○	-
Time synchronization IEEE 1588v2	○	○
Time synchronization IEEE 802.1AS	○	–
Accuracy of Time synchronization	1µs or less	–
Unicast	○	○
Broad cast/Multicast	○	–
Target Application	Servo, I/O, Actuator, Vision sensor,	Temp controller, RFID
Supporting Device	-**R-IN32M4-CL3** -CP620 (Mitsubishi)	-R-IN32M4-CL3 -RX72M -MCU

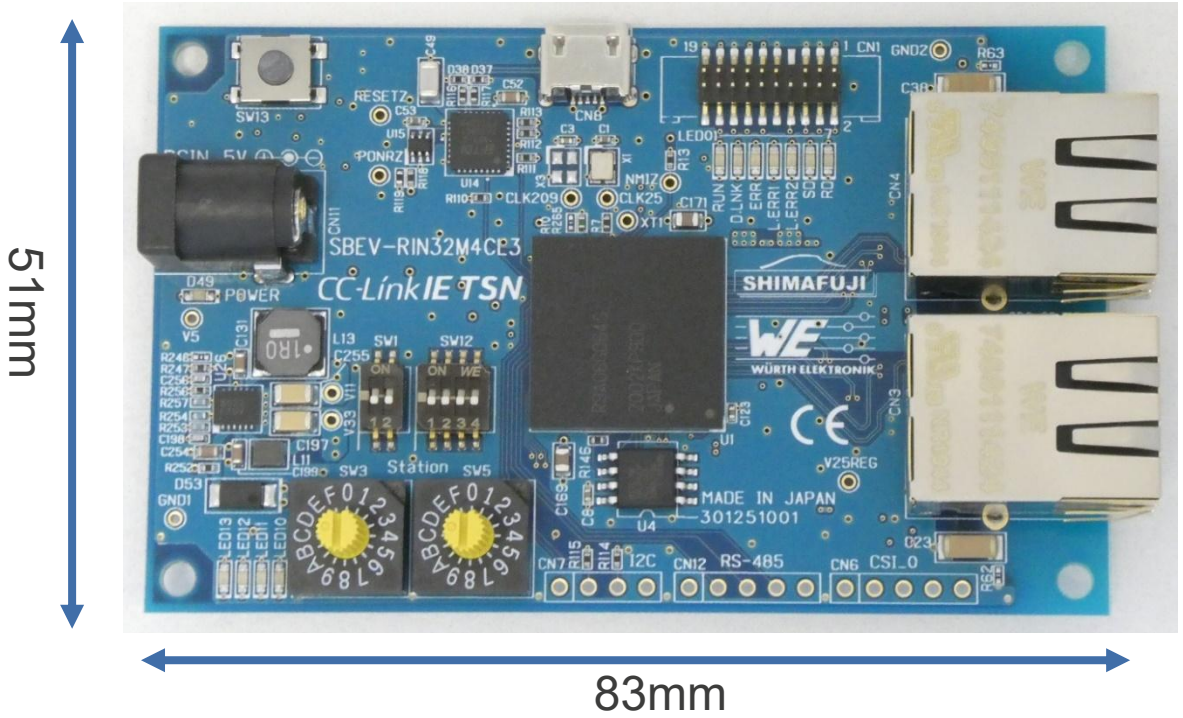


Renesas R-IN32M4-CL3 CC-Link IE TSN solution

software and manuals can be downloaded from the website.

By using our solution, customer can start evaluation of CC-link IE TSN communication in one-hour setup.

R-IN32M4-CL3 board



[R-IN32M4-CL3 (SBEV-RIN32M4CL3) | (shimafuji.co.jp)]

Software

Protocol stack
- CC-link IE TSN sample software
- CC-Link IE Field sample software
- TCP/IP stack

Peripheral Driver
- RS-485
- UART
- CSI and so

Project file for Master
- Project file for "GX_Works3"

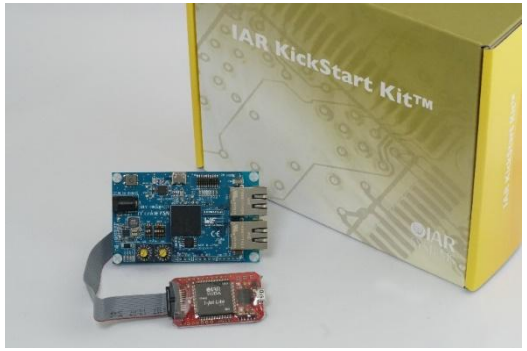
Manual's
- Datasheet
- User's manual CC-Link IE TSN edition
- User's manual CC-Link IE CC-link IE edition
- Start up manual

[R-IN32M4-CL3 - ICs for Industrial Ethernet Communication | Renesas]

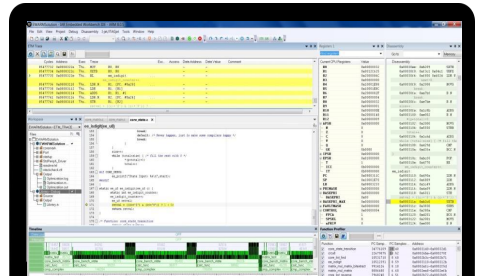
IAR KickStart Kit for Renesas R-IN32M4-CL3
- Accelerate application development of CC-Link IE TSN-

IAR Systems web site
Solutions for Renesas R-IN32M4 | IAR Systems

Contents
1. R-IN32M4-CL3 evaluation board
   （SBEV-RIN32M4CL3 by shimafuji）
2. Development toolchain IAR Embedded Workbench
   *evaluation version
3. I-jet Lite(JTAG-ICE)



Sample software
1. CC-Link IE TSN sample software
   https://www.renesas.com/jp/en/software/D6004341.html
2. CC-Link IE Field and peripheral driver
   https://www.renesas.com/jp/en/software/D6004340.html
3. Multi protocol sample software (Modbus TCP/, PROFINET, Ethernet/IP)
   https://www.renesas.com/jp/en/software/D6004433.html



CANopen sample SW for CC-LINK IE TSN

CLPA says in web page of **CC-Link IE TSN**

“ By using CSP+, CC-Link IE TSN has added support for CANopen device profiles”
https://www.cc-link.org/en/cclink/cclinkie/cclinkie_tsn.html

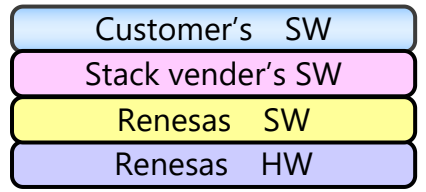
Add sample software for CANopen

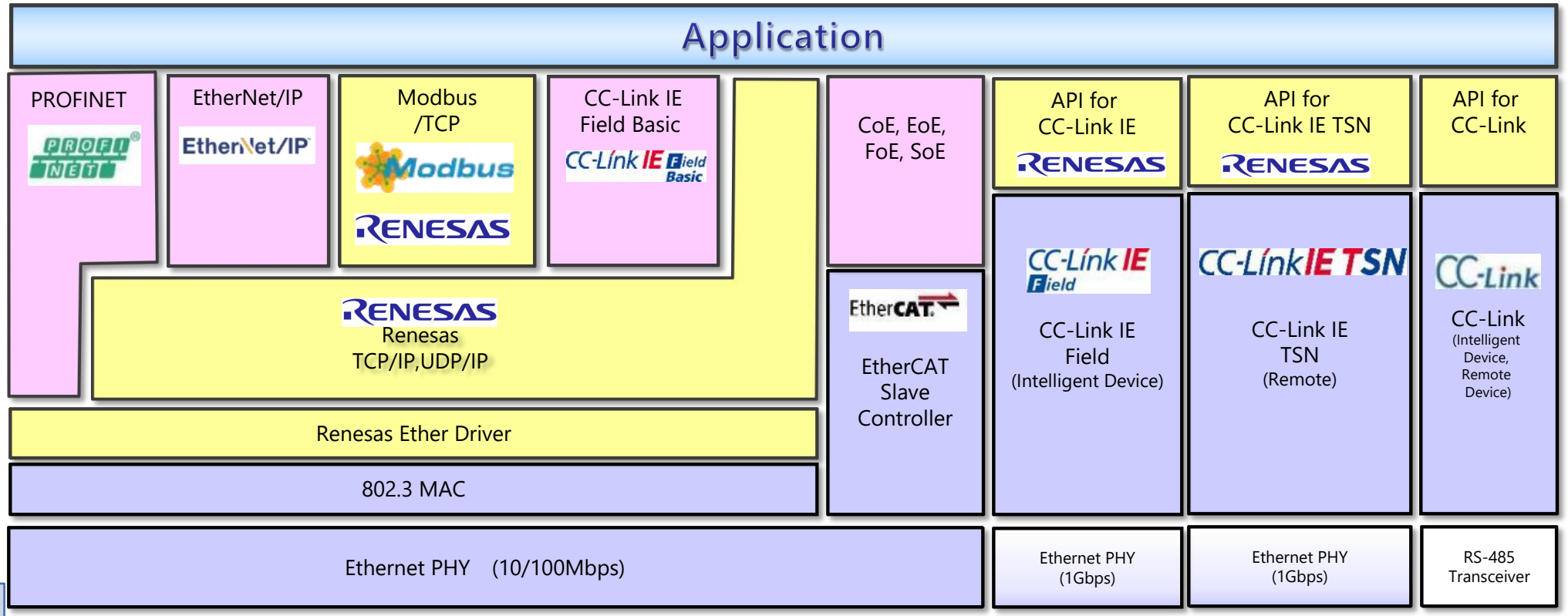
CC-Link IE TSN sample software (V1.02)
https://www.renesas.com/jp/en/software/D6004341.html

contents：
- Sample software
- CC-Link IE TSN manual
- Startup manual（connect procedure with motion unit RD78G by Mitsubishi）
- GX Works3 (project file for master station)

<folder structure>
RIN32M4-CL3-CCTSN-samplesoft
+- CSPP
| +- 0x1234_RemoteSample_CAN_1_en.CSPP.zip ★CSPP for CANopen
| +- 0x1234_RemoteSample_1_en.CSPP.zip
|
+- GX_Works3
| +- CCIETSN_CANOpen_Check.gx3 ★Project for CANopen
| +- CCIETSN_Cyclic_SLMP_Check.gx3

PROTOCOL CORRESPONDENCE TABLE





LSI									
R-IN32M3-EC/CL	○	○	○	○	○	○(ECのみ)	○（CLのみ）	×	○
R-IN32M4-CL2	○	○	○	○	○	×	○	×	○
R-IN32M4-CL3	○	○	○	○	○	×	○	○	×