

SkkyNet ETK

Verified Software Add-on Renesas Synergy™

The SkkyNet Embedded Toolkit (ETK) for Renesas Synergy



Technical Overview

The SkkyNet ETK provides a direct link from Renesas Synergy to the SkkyHub™ service, a seamless, end-to-end solution for IoT and M2M applications that lets you access your device and its data from anywhere in the world.

The ETK also connects your device to the Cogent DataHub®, industrial middleware for making in-plant connections to OPC servers and clients, Modbus slaves, ODBC databases, web pages, Excel spreadsheets, custom .NET programs, and more.

No open firewall ports, no VPN – expose data, not your network

Monitor, control, visualize and consolidate information

Fully customizable

Security

The ETK makes only outbound connections to SkkyHub and the DataHub, which means zero attack surface. Secure by design; no VPN, no IT policy changes, no security hardware.

Speed

Achieve IoT or in-plant networking speeds of only a couple milliseconds over network latency. Data transmission rates of up to 1,000 data changes per second.

Small footprint

No hardware dependencies except Ethernet; uses ThreadX OS and NetX (with DHCP and DNS optional). Low memory requirements and relatively few SSP API calls.

Industry 4.0 / IIC Ready

Any device running the ETK can connect to any Industry 4.0 or IIC enabled system, using the Cogent DataHub's OPC UA capabilities (Available Q1, 2016).

SKKYNET

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Seamlessly add the following capabilities to your Synergy application:

- Persistent connectivity for transfer latencies only microseconds above network ping time
- Event-driven communication - only data changes are transmitted
- Bi-directional communication, allowing both monitoring and control
- Publish/subscribe data model
- Server-side data discovery - no server configuration necessary
- Efficient structured text data format for low bandwidth usage
- Multiple ingoing and outgoing data sockets on a single thread
- Integrated timers with round-robin sharing with socket data
- Automatic resynchronization when connection is lost and recovered
- Automatic connection retries
- Thread-safe API for developer threads to emit and consume data
- Built-in WebSocket support for traversing proxies
- Support for IPV6
- Optional built-in scripting for powerful local processing
- Optional support for SSL (when available)
- Optional support for Modbus master to multiple slaves
- Optional Modbus/TCP master, with type conversion, deadband and linear transforms

Relationship to SSP

The Skkynet ETK has no hardware dependencies, aside from requiring an Ethernet adapter. It depends only on the ThreadX operating system and the NetX networking layer. Optionally, it can make use of DHCP and DNS client capability within NetX.

User Applications	
Skkynet ETK	
NetX (DHCP, DNS, BSD)	Framework
ThreadX	
HAL	
BSP	
Synergy MCU	

Skkynet ETK

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Memory Requirements

The Skkynet ETK has both fixed and variable memory requirements. The variable memory is allocated from a memory heap that is created when the application starts. Variable memory includes:

- user thread stack
- data point definitions
- Modbus I/O address to point mapping
- book-keeping structures within the ETK

By default the ETK allocates 64K of heap space. Less than half of that space is actually used for the sample application that is provided with the ETK.

The fixed-size allocations include the NetX packet pool, thread stacks for DHCP and DNS clients, socket buffers for the NetX BSD implementation, network driver stack and ETK main thread stack. Most of these are fairly small, with the exception of the NetX packet pool which defaults to 80K. The demonstration application executable requires approximately 150K of flash, which includes all ThreadX, NetX and Skkynet ETK code.

Object	Memory required
NetX packet pool	80 KB
NetX thread stacks (driver, DNS, DHCP, BSD)	1 KB x 4
NetX BSD socket table	4 KB
ETK memory heap	32 KB (64 KB recommended)
ETK primary thread stack	4 KB
ETK clock counter thread stack	512 B
Total	~125 – 157 KB



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Performance

Performance measures are based on the S7 microcontroller. Modbus polling rate is the rate at which a single Modbus slave device can be polled. A polling rate of 10 ms is the fastest rate available with system clock tick of 10 ms. Transmit and receive rates measure the number of data points per second that can be send and received over a local network when communicating with Cogent DataHub.

Network speed for cloud configurations may have some impact on this speed. Network bandwidth

measures the number of bytes to transmit or receive a single data value change. This number will vary with the length of the data point name, and in the case of string data, the length of the string.

Modbus polling rate	10 ms
Transmit data rate	~1000 data changes /second
Receive data rate	~500 data changes / second
Network bandwidth	~100 bytes per data change (typical)

Specific SSP API calls

The Skkynet ETK makes use of a relatively small subset of the ThreadX and NetX API. These calls consist of:

ThreadX	NetX	NetX BSD
tx_byte_allocate	nx_dhcp_create	bsd_initialize
tx_byte_pool_create	nx_dhcp_start	connect
tx_byte_release	nx_dns_create	freeaddrinfo
tx_mutex_create	nx_dns_server_add	getaddrinfo
tx_mutex_delete	nx_dns_server_add	gethostbyname
tx_mutex_get	nx_icmp_enable	getservbyname
tx_mutex_put	nx_ip_create	ioctl
tx_semaphore_create	nx_ip_fragment_enable	read
tx_semaphore_delete	nx_ip_gateway_address_set	recv
tx_semaphore_get	nx_ip_status_check	select
tx_semaphore_get	nx_packet_pool_create	send
tx_semaphore_put	nx_tcp_enable	setsockopt
tx_thread_create	nx_udp_enable	shutdown
tx_thread_sleep		soc_close
		socket
		write



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