

User Manual

DA16200 HTTP Extended APIs

UM-WI-022

Abstract

This document assists software developers with implementing applications for the DA16200 SDK. A certain degree of reader familiarity with programming environments, debugging tools and software engineering process in general is assumed.

DA16200 HTTP Extended APIs

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Terms and Definitions

HTTP	HyperText Transfer Protocol
HTML	HyperText Markup Language

References

- [1] DA16200, Datasheet, Dialog Semiconductor
- [2] DA16200, SDK Programmer Guide, Dialog Semiconductor
- [3] DA16200, Example Application Manual, Dialog Semiconductor
- [4] NetX Duo HTTP User Guide

DA16200 HTTP Extended APIs

1 Overview

The DA16200 SDK provides for two HTTP APIs.

- The original NetXDuo HTTP APIs
- The DA16200 HTTP APIs

The DA16200 SDK offers a HTTP Server/Client module. This document describes how to use HTTP APIs on the DA16200 SDK.

NOTE

The HTTP Server/Client of the DA16200 SDK is based on the NetXDuo HTTP v5.10 module from ExpressLogic.

For details on how to use the NetXDuo HTTP APIs, refer to the Hypertext Transfer Protocol (NetX Duo HTTP) User's Guide (see [\[4\]](#)).

2 HTTP(s) API

2.1 API: HTTP Client

Table 1: Extended HTTP-Client API List

<pre>UINT nx_http_client_head_start(NX_HTTP_CLIENT *client_ptr, ULONG ip_address, CHAR *resource, CHAR *username, CHAR *password, ULONG wait_option)</pre>	
Parameter	<pre>*client_ptr : Pointer to HTTP client *ip_address : HTTP Server IP address *resource : Pointer to resource (URL) *username : Pointer to username *password : Pointer to password *wait_option: Suspension option</pre>
Return	Completion status
Description	This function processes the application HEAD request. The specified resource (URL) is requested from the HTTP Server at the specified IP address.

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<pre>UINT _nx_http_client_head_packet(NX_HTTP_CLIENT *client_ptr, NX_PACKET **packet_ptr, UINT *content_length, UINT *resp_state, CHAR *content_type, UINT *content_type_len, ULONG wait_option)</pre>	
Parameter	<pre>*client_ptr : Pointer to HTTP client *packet_ptr : Destination for packet pointer *content_length : Content Length field in response *content_type : Content Type field in response *content_type_len : Length of content_type *wait_option : Suspension option</pre>
Return	Completion status
Description	This function processes the application HEAD request. The specified resource (URL) is requested from the HTTP Server at the specified IP address.

<pre>UINT nx_http_client_set_secure_connection(NX_HTTP_CLIENT *client_ptr, UINT is_secure)</pre>	
Parameter	<pre>*client_ptr : Pointer to HTTP client *is_secure : HTTPs or HTTP connection</pre>
Return	0 (NX_SUCCESS) on success
Description	This function sets HTTPs connection. Default is HTTP connection.

<pre>UINT nx_http_client_set_authmode(NX_HTTP_CLIENT *client_ptr, UINT authmode)</pre>	
Parameter	<pre>*client_ptr : Pointer to HTTP client *authmode : MBEDTLS_SSL_VERIFY_NONE(0) : peer certificate is not checked MBEDTLS_SSL_VERIFY_REQUIRED(2) : peer present a valid certificate, handshake is aborted if verificate failed.</pre>
Return	0 (NX_SUCCESS) on success
Description	This function sets the certificate verification mode in HTTPs connection. Default is None.

<pre>UINT nx_http_client_set_content_heap(NX_HTTP_CLIENT *client_ptr, UINT enabled)</pre>	
Parameter	<pre>*client_ptr : Pointer to HTTP client *enabled : Value to use HEAP to allocate TLS buffer in HTTPs connection.</pre>
Return	0 (NX_SUCCESS) on success
Description	This function sets to use heap to allocate TLS buffer in HTTPs connection. Default memory area is 'sec_pool' in DA16200 system.

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<pre>UINT nx_http_client_set_content_buflen(NX_HTTP_CLIENT *client_ptr, size_t in, size_t out)</pre>	
Parameter	<pre>*client_ptr : Pointer to HTTP client *in : Length of incoming TLS buffer in HTTPs connection *out : Length of outgoing TLS buffer in HTTPs connection</pre>
Return	0 (NX_SUCCESS) on success
Description	This function sets lengths of TLS buffer in HTTPs connection. Default TLS buffer's length is 4096(bytes).

<pre>UINT nx_http_client_set_ca_cert(NX_HTTP_CLIENT *client_ptr, char *ca_cert, size_t len)</pre>	
Parameter	<pre>*client_ptr : Pointer to HTTP client *ca_cert : Pointer to CA certificate *len : Length of CA certificate</pre>
Return	0 (NX_SUCCESS) on success
Description	This function sets CA certificate of HTTPs connection.

<pre>UINT nx_http_client_set_cert(NX_HTTP_CLIENT *client_ptr, char *cert, size_t len)</pre>	
Parameter	<pre>*client_ptr : Pointer to HTTP client *cert : Pointer to certificate *len : Length of certificate</pre>
Return	0 (NX_SUCCESS) on success
Description	This function sets certificate of HTTPs connection.

<pre>UINT nx_http_client_set_private_key(NX_HTTP_CLIENT *client_ptr, char *private_key, size_t len)</pre>	
Parameter	<pre>*client_ptr : Pointer to HTTP client *cert : Pointer to certificate *len : Length of certificate</pre>
Return	0 (NX_SUCCESS) on success
Description	This function sets certificate of HTTPs connection.

<pre>UINT nx_http_client_set_host_domain(NX_HTTP_CLIENT *client_ptr, const CHAR *domain, UINT domain_len)</pre>	
Parameter	<pre>*client_ptr : Pointer to HTTP client *domain : Pointer to host domain name *domain_len : Length of host domain name</pre>
Return	0 (NX_SUCCESS) on success
Description	This function sets specific host domain of Host field in HTTP request. If not set it up, IP address will be included in HTTP request.

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<pre>UINT nx_http_client_set_range(NX_HTTP_CLIENT *client_ptr, ULONG start, ULONG end)</pre>	
Parameter	<pre>*client_ptr : Pointer to HTTP client *start : Start range *end : End range</pre>
Return	0 (NX_SUCCESS) on success
Description	This function sets specific range of Range field in HTTP request. If not set it up, there is no Range field in HTTP request.

<pre>UINT nx_http_client_set_keep_alive(NX_HTTP_CLIENT *client_ptr, UINT enable)</pre>	
Parameter	<pre>*client_ptr : Pointer to HTTP client *enable : Value to set Keep-Alive of Connection field</pre>
Return	0 (NX_SUCCESS) on success
Description	This function sets specific range of Range field in HTTP request. If not set it up, there is no Range field in HTTP request.

<pre>UINT nx_http_client_get_response_header(NX_HTTP_CLIENT *client_ptr, NX_PACKET **header_packet_ptr, UINT *content_length, UINT *resp_state, CHAR *content_type, UINT *content_type_len)</pre>	
Parameter	<pre>*client_ptr : Pointer to HTTP client *header_packet_ptr : Destination for packet pointer *content_length : Content Length in response *resp_state : Response State in response *content_type : Content type in response *content_type_len : Length of content type in response</pre>
Return	Completion status
Description	This function returns HTTP header in a response packet. It can be called when application wants to get header part in a response.

<pre>UINT nx_http_client_add_header_field_1(NX_HTTP_CLIENT *client_ptr, const CHAR *field, UINT field_len)</pre>	
Parameter	<pre>*client_ptr : Pointer to HTTP client *field : String of field value to add to header field_len : String length of field value</pre>
Return	Completion status
Description	This function allows the user to add a field to the header.

<pre>UINT nx_http_client_add_header_field_2(NX_HTTP_CLIENT *client_ptr, const CHAR *field, UINT field_len)</pre>	
Parameter	<pre>*client_ptr : Pointer to HTTP client *field : String of field value to add to header field_len : String length of field value</pre>
Return	Completion status
Description	This function allows the user to add a field to the header.

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VOID <code>_nx_http_client_set_dump_log(int debug_mode)</code>	
Parameter	<code>debug_mode: 1(enable), 0(disable)</code>
Return	No return value.
Description	Use it only for debugging. Setting the true value prints the dump log of request and response.

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2.2 API: HTTP Server

Table 2: Extended HTTP-Server API list

UINT nx_http_server_callback_data_send(NX_HTTP_SERVER *server_ptr, UINT logical_connection, VOID *data_ptr, ULONG data length)	
Parameter	*server_ptr : Pointer to HTTP Server control block *logical_connection : The internal logical connection for the HTTP Server. This can be used by the application as an index into buffers and/or data structures specific for each Client connection. Its value ranges from 0 through NX_HTTP_SERVER_MAX_CLIENT - 1. *data_ptr : Pointer to the data to send. *data_length : Number of bytes to send.
Return	*NX_SUCCESS (0x00): Successfully sent HTTP Server data *NX_HTTP_ERROR(0xE0): HTTP Server internal error
Description	This service sends the data in the supplied packet from the application's callback routine. This is typically used to send dynamic data associated with GET/POST requests. Note that if this function is used, the callback routine is responsible for sending the entire response in the proper format. In addition, the callback routine must return the status of NX_HTTP_CALLBACK_COMPLETED.

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<pre> UINT nx_http_server_callback_generate_response_header(NX_HTTP_SERVER *server_ptr, UINT logical_connection, NX_PACKET **packet_pptr, CHAR *status_code, UINT content_length, CHAR *content_type, CHAR* additional_header) </pre>	
Parameter	<pre> *server_ptr : Pointer to HTTP Server control block *logical_connection : The internal logical connection for the HTTP Server. This can be used by the application as an index into buffers and/or data structures specific for each Client connection. Its value ranges from 0 through NX_HTTP_SERVER_MAX_CLIENT - 1. *packet_pptr : Pointer a packet pointer allocated for message *status_code : Indicate status of resource. *content_length : Size of content in bytes *content_type : Type of HTTP e.g. "text/plain" *additional_header : Pointer to additional header text </pre>
Return	<pre> *NX_SUCCESS(0x00) : Successfully created HTML header *status : Completion status of internal NetX calls (e.g. nx_packet_allocate) </pre>
Description	<p>This service calls the internal function <code>_nx_http_server_generate_response_header</code> when the HTTP server responds to Client get, put and delete requests. It is intended for use in HTTP server callback functions when the HTTP server application is designing its response to the Client.</p>

<pre> UINT nx_http_server_callback_packet_send(NX_HTTP_SERVER *server_ptr, UINT logical_connection, NX_PACKET *packet_ptr) </pre>	
Parameter	<pre> *server_ptr : Pointer to HTTP Server control block *logical_connection : The internal logical connection for the HTTP Server. This can be used by the application as an index into buffers and/or data structures specific for each Client connection. Its value ranges from 0 through NX_HTTP_SERVER_MAX_CLIENT - 1. *packet_ptr : Pointer to the packet to send. </pre>
Return	<pre> *NX_SUCCESS(0x00) : Successfully sent HTTP Server packet *status : Completion status of internal NetX calls *NX_PTR_ERROR(0x07) : Invalid pointer input </pre>
Description	<p>This service sends a complete HTTP server response from an HTTP callback. HTTP server will send the packet with the <code>NX_HTTP_SERVER_TIMEOUT_SEND</code>. The HTTP header and data must be appended to the packet. If the return status indicates an error, the HTTP application must release the packet.</p> <p>The callback should return <code>NX_HTTP_CALLBACK_COMPLETED</code>.</p> <p>See <code>nx_http_server_callback_generate_response_header</code> for a more detailed example.</p>

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<pre>UINT nx_http_server_callback_response_send(NX_HTTP_SERVER *server_ptr, UINT logical_connection, CHAR *header, CHAR *information, CHAR *additional_info)</pre>	
Parameter	<pre>*server_ptr : Pointer to HTTP Server control block. *logical_connection : The internal logical connection for the HTTP Server. This can be used by the application as an index into buffers and/or data structures specific for each Client connection. Its value ranges from 0 through NX_HTTP_SERVER_MAX_CLIENT - 1. *header : Pointer to the response header string. *information : Pointer to the information string. *additional_info : Pointer to the additional information string.</pre>
Return	<pre>*NX_SUCCESS(0x00) : Successfully sent HTTP Server packet *status : Completion status of internal NetX calls *NX_PTR_ERROR(0x07) : Invalid pointer input</pre>
Description	<p>This service sends the supplied response information from the application's callback routine. This is typically used to send custom responses associated with GET/POST requests. Note that if this function is used, the callback routine must return the status of NX_HTTP_CALLBACK_COMPLETED.</p>

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<pre>UINT nx_http_server_content_get(NX_HTTP_SERVER *server_ptr, UINT logical_connection, NX_PACKET *packet_ptr, ULONG byte_offset, CHAR *destination_ptr, UINT destination_size, UINT *actual_size)</pre>	
Parameter	<pre>*server_ptr : Pointer to HTTP Server control block. *packet_ptr : Pointer to the HTTP Client request packet. Note that this packet must not be released by the request notify callback. *logical_connection : The internal logical connection for the HTTP Server. This can be used by the application as an index into buffers and/or data structures specific for each Client connection. Its value ranges from 0 through NX_HTTP_SERVER_MAX_CLIENT - 1. *byte_offset : Number of bytes to offset into the content area. *destination_ptr : Pointer to the destination area for the content. *destination_size : Maximum number of bytes available in the destination area. *actual_size : Pointer to the destination variable that will be set to the actual size of the content copied.</pre>
Return	<pre>*NX_SUCCESS(0x00) : Successful HTTP Server content get *NX_HTTP_ERROR(0xE0) : HTTP Server internal error *NX_HTTP_DATA_END(0xE7) : End of request content *NX_HTTP_TIMEOUT(0xE1) : HTTP Server timeout in getting next packet of content *NX_PTR_ERROR(0x07) : Invalid pointer input *NX_CALLER_ERROR(0x11) : Invalid caller of this service</pre>
Description	<pre>should be called from the application's request notify callback specified during HTTP Server creation (nx_http_server_create).</pre>

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<pre> UINT nx_http_server_content_get_extended(NX_HTTP_SERVER *server_ptr, UINT logical_connection, NX_PACKET *packet_ptr, ULONG byte_offset, CHAR *destination_ptr, UINT destination_size, UINT *actual_size) </pre>	
Parameter	<pre> *server_ptr : Pointer to HTTP Server control block. *logical_connection : The internal logical connection for the HTTP Server. This can be used by the application as an index into buffers and/or data structures specific for each Client connection. Its value ranges from 0 through NX_HTTP_SERVER_MAX_CLIENT - 1. *packet_ptr : Pointer to the HTTP Client request packet. Note that this packet must not be released by the request notify callback. *byte_offset : Number of bytes to offset into the content area. *destination_ptr : Pointer to the destination area for the content. *destination_size : Maximum number of bytes available in\ the destination area. *actual_size : Pointer to the destination variable that will be set to the actual size of the content copied. </pre>
Return	<pre> *NX_SUCCESS(0x00) : Successful HTTP content get *NX_HTTP_ERROR(0xE0) : HTTP Server internal error *NX_HTTP_DATA_END(0xE7): End of request content *NX_HTTP_TIMEOUT(0xE1) : HTTP Server timeout in getting next packet *NX_PTR_ERROR(0x07) : Invalid pointer input *NX_CALLER_ERROR(0x11) : Invalid caller of this service </pre>
Description	<p>This service is almost identical to <code>nx_http_server_content_get</code>; it attempts to retrieve the specified amount of content from the POST or PUT HTTP Client request. However it handles requests with Content Length of zero value ('empty request') as a valid request. It should be called from the application's request notify callback specified during HTTP Server creation (<code>nx_http_server_create</code>).</p>

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<pre> UINT nx_http_server_create(NX_HTTP_SERVER *http_server_ptr, CHAR *http_server_name, NX_IP *ip_ptr, VOID *stack_ptr, ULONG stack_size, NX_PACKET_POOL *pool_ptr, NX_HTTP_SERVER_PARAMETERS *parameters, UINT (*authentication_check)(NX_HTTP_SERVER *server_ptr, UINT logical_connection, UINT request_type, CHAR *resource, CHAR **name, CHAR **password, CHAR **realm), UINT (*request_notify)(NX_HTTP_SERVER *server_ptr, UINT logical_conneciton, UINT request_type, CHAR *resource, NX_PACKET *packet_ptr)) </pre>	
Parameter	<pre> *http_server_ptr : Pointer to HTTP Server control block. *http_server_name : Pointer to HTTP Server's name. *ip_ptr : Pointer to previously created IP instance. *stack_ptr : Pointer to HTTP Server thread stack area. *stack_size : Pointer to HTTP Server thread stack size. *authentication_check : Function pointer to application's authentication checking routine. : If specified, this routine is called for each HTTP Client request. If this parameter is NULL, no authentication will be performed. *request_notify : Function pointer to application's request notify routine. If specified, this routine is called prior to the HTTP server processing of the request. This allows the resource name to be redirected or fields within a resource to be updated prior to completing the HTTP Client request. </pre>
Return	<pre> *NX_SUCCESS(0x00) : Successful HTTP Server create. *NX_HTTP_ERROR(0xE0) : HTTP Server create error. *NX_PTR_ERROR(0x07) : Invalid HTTP Server, IP, media, stack or packet pool pointer. *NX_HTTP_POOL_ERROR(0xE9) : Packet payload of pool is not large enough to contain complete HTTP request. </pre>
Description	<p>This service creates an HTTP Server instance, which runs in the context of its own ThreadX thread. The optional authentication_check and request_notify application callback routines give the application software control over the basic operations of the HTTP Server.</p>

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<pre>UINT nx_http_server_get_entity_content(NX_HTTP_SERVER *server_ptr, UINT logical_connection, NX_PACKET **packet_pptr, ULONG *available_offset, ULONG *available_length)</pre>	
Parameter	<pre>*server_ptr : Pointer to HTTP Server *logical_connection : The internal logical connection for the HTTP Server. This can be used by the application as an index into buffers and/or data structures specific for each Client connection. Its value ranges from 0 through NX_HTTP_SERVER_MAX_CLIENT - 1. *packet_pptr : Pointer to location of packet pointer *available_offset : Pointer to offset of entity data from the packet prepend pointer *available_length : Pointer to length of entity data</pre>
Return	<pre>NX_SUCCESS(0x00) : Successfully retrieved size and location of entity content NX_HTTP_BOUNDARY_ALREADY_FOUND(0xF4) : Content for the HTTP server internal multipart markers is already found *NX_HTTP_ERROR(0xE0) : HTTP Server internal error *NX_HTTP_TIMEOUT(0xE1) : Time expired waiting for next packet/rest of Client message *NX_PTR_ERROR(0x07) : Invalid pointer input</pre>
Description	<p>This service determines the location of the start of data within the current multipart entity in the received Client messages, and the length of data not including the boundary string. Internally HTTP server updates its own offsets so that this function can be called again on the same Client datagram for messages with multiple entities. The packet pointer is updated to the next packet where the Client message is a multi-packet datagram.</p> <p>Note that NX_HTTP_MULTIPART_ENABLE must be enabled to use this service.</p> <p>See nx_http_server_get_entity_header for more details.</p>

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<pre>UINT nx_http_server_get_entity_header(NX_HTTP_SERVER *server_ptr, UINT logical_connection, NX_PACKET **packet_pptr, UCHAR *entity_header_buffer, ULONG buffer_size)</pre>	
Parameter	<pre>*server_ptr : Pointer to HTTP Server *logical_connection : The internal logical connection for the HTTP Server. This can be used by the application as an index into buffers and/or data structures specific for each Client connection. Its value ranges from 0 through NX_HTTP_SERVER_MAX_CLIENT - 1. *packet_pptr : Pointer to location of packet pointer *entity_header_buffer: Pointer to location to store entity header *buffer_size : Size of input buffer</pre>
Return	<pre>*NX_SUCCESS(0x00) : Successfully retrieved entity header *NX_HTTP_NOT_FOUND(0xE6): Entity header field not found *NX_HTTP_TIMEOUT(0xE1) : Time expired to receive next packet for multipacket client message *NX_PTR_ERROR(0x07) : Invalid pointer input *NX_CALLER_ERROR(0x11) : Invalid caller of this service</pre>
Description	<p>This service retrieves the entity header into the specified buffer. Internally HTTP Server updates its own pointers to locate the next multipart entity in a Client datagram with multiple entity headers. The packet pointer is updated to the next packet where the Client message is a multi-packet datagram.</p> <p>Note that NX_HTTP_MULTIPART_ENABLE must be enabled to use this service.</p>

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UINT nx_http_server_packet_content_find(NX_HTTP_SERVER *server_ptr, UINT logical_connection, NX_PACKET **packet_ptr, ULONG *content_length)	
Parameter	*server_ptr : Pointer to HTTP server instance *logical_connection : The internal logical connection for the HTTP Server. This can be used by the application as an index into buffers and/or data structures specific for each Client connection. Its value ranges from 0 through NX_HTTP_SERVER_MAX_CLIENT - 1. *packet_ptr : Pointer to packet pointer for returning the packet with updated prepend pointer *content_length : Pointer to extracted content_length
Return	*NX_SUCCESS(0x00) : HTTP content length found and packet successfully updated *NX_HTTP_TIMEOUT(0xE1) : Time expired waiting on next packet *NX_PTR_ERROR(0x07) : Invalid pointer input *NX_CALLER_ERROR(0x11) : Invalid caller of this service
Description	This service extracts the content length from the HTTP header. It also updates the supplied packet as follows: the packet prepend pointer (start of location of packet buffer to write to) is set to the HTTP content (data) just passed the HTTP header. If the beginning of content is not found in the current packet, the function waits for the next packet to be received using the NX_HTTP_SERVER_TIMEOUT_RECEIVE wait option. Note this should not be called before calling nx_http_server_get_entity_header because it modifies the prepend pointer past the entity header.

UINT nx_http_server_packet_get(NX_HTTP_SERVER *server_ptr, UINT logical_connection, NX_PACKET **packet_ptr)	
Parameter	*server_ptr : Pointer to HTTP server instance *logical_connection : The internal logical connection for the HTTP Server. This can be used by the application as an index into buffers and/or data structures specific for each Client connection. Its value ranges from 0 through NX_HTTP_SERVER_MAX_CLIENT - 1. *packet_ptr : Pointer to received packet
Return	*NX_SUCCESS(0x00) : Successfully received next HTTP packet *NX_HTTP_TIMEOUT(0xE1) : Time expired waiting on next packet *NX_PTR_ERROR(0x07) : Invalid pointer input
Description	This service returns the next packet received on the HTTP server socket. The wait option to receive a packet is NX_HTTP_SERVER_TIMEOUT_RECEIVE.

Revision History

Revision	Date	Description
1.0	24-Apr-2020	Initial Release

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Status Definitions

Status	Definition
DRAFT	The content of this document is under review and subject to formal approval, which may result in modifications or additions.
APPROVED or unmarked	The content of this document has been approved for publication.

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