[White Paper]

T-Engine Forum
Ubiquitous ID Center
Document
DRAFT

910-S204-1.A0.04/UID-CO00007-01.A0.04
2008-10-17

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ucode Resolution Gateway

Number: 910-S204-1.A0.04/UID-CO00007-01.A0.04
Title: ucode Resolution Gateway
Status: [X] Working Draft, [ ] Final Draft for Voting, [ ] Standard
Date: 2008/10/17

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ucode Resolution Gateway

Introduction

Scope

This document specifies the functions of a ucode resolution gateway and an interface protocol between the client and gateway.

Position of this Document

The protocol used for ucode resolution in this document is a simplified ucode resolution protocol [2]. This document can be extended in the future to correspond to the "ucode Resolution Protocol (Standard Edition)" [3] based on "Ubiquitous ID Architecture" [1].

Reference Documents

[1] T-Engine Forum, Ubiquitous ID Center, "Ubiquitous ID Architecture," 910-S002/UID-00002, 2006.
[2] T-Engine Forum, Ubiquitous ID Center, "Simplified ucode Resolution Protocol," 910-S202/UID-00005, 2006.
[3] T-Engine Forum, Ubiquitous ID Center, "ucode Resolution Protocol (Standard Edition)," 910-S221/UID-00008, 2006.
[4] T-Engine Forum, Ubiquitous ID Center, "ucode Encode Specification with QR Code Tag Signature," 930-S304/UID-00025, 2006.
[5] RFC 2068, "Hypertext Transfer Protocol -- HTTP/1.1," 1997.
[6] RFC3513,「Internet Protocol Version 6 (IPv6) Addressing Architecture」, 2003.
[7] RFC3986,「Uniform Resource Identifier (URI): Generic Syntax」, 2005.
[8] RFC952,「DOD INTERNET HOST TABLE SPECIFICATION」, 1985.

Definition of Terms

- ucode

An identifier (ID) for the purpose of identifying "objects" and "places" in the real world

1. Purpose

1.1. Definition

The ubiquitous ID architecture permits information on "objects" and "places" in the real world to be retrieved by various kinds of terminals such as cellular phones. The ucode resolution gateway is a proxy server for accessing ucode resolution servers and information servers in place of terminals, and the ucode resolution gateway protocol is an access protocol for this ucode resolution gateway.

1.2. Purpose

To retrieve information on "objects" and "places" in the real world, it is necessary to retrieve ucode resolution information from a ucode resolution server and access an information server. However, since ucode resolution databases are hierarchically structured, resolution may not be done efficiently obtained in the terminals where a CPU power or network bandwidth is restricted. Therefore, instead of terminals, the ucode resolution gateway is defined which executes ucode resolution and contents acquisition. By using the ucode resolution gateway, terminals can retrieve contents from ucodes efficiently.

2. Gateway Functions

This chapter defines the functions of the ucode resolution gateway (hereinafter referred to as Gateway). The Gateway is required to provide the ucode resolution/contents acquisition function among the following functions. The remaining functions are as optional.

2.1. ucode Resolution/Contents Acquisition Function

The Gateway has a function to access ucode resolution servers and retrieve information server addresses associated with ucodes. If ucode resolution servers have a hierarchical multilayer structure, resolution is recursively executed for each hierarchy. In addition, the Gateway has a function to access information servers based on ucode resolution information and retrieve contents. This function permits terminals to retrieve contents from ucodes with only a single request to the ucode resolution gateway.

2.2. Cache Function

The Gateway can use a cache to recycle ucode resolution results. However, it must provide a mechanism in which the enabling/disabling of the cache for resolution and resolution results must be settable by the terminal side. In addition, an expired cache must not be used. This document does not specify the cache function for contents.

2.3. Contents Conversion Function

The Gateway can have a function to convert contents into the most optimal format, based on the terminal type which is notified by the terminal.

2.4. Signature Verification Function

The Gateway can have a function to receive and verify ucodes and signature data. However, it must provide a mechanism in which the signature verification function can be enabled/disabled by a Gateway user.

This signature verification function permits users to know the validity of ucode tags. How to store ucodes with signatures into QR Code tags is specified in [4].

2.5. Operation Mode

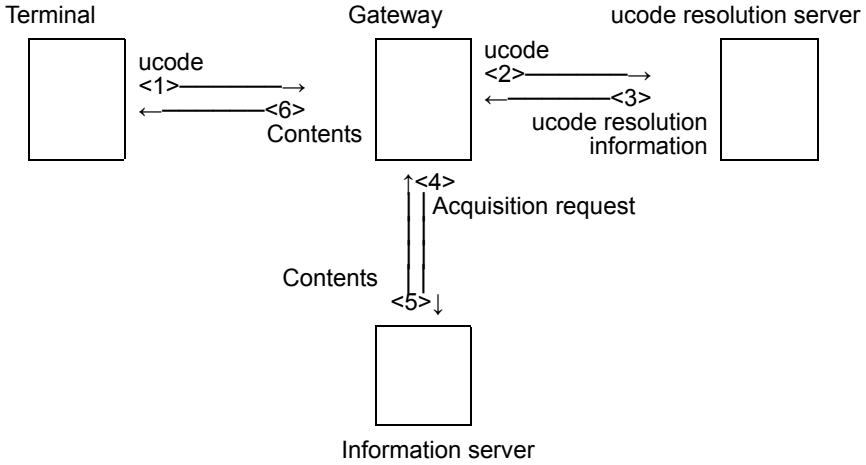
The Gateway can change its behavior by switching operation modes. Each operation mode is described in Section 4.3.

3. Gateway Behavior

This chapter describes Gateway behaviors. The Gateway accesses ucode resolution servers and information servers in place of terminals. Patterns of ucode resolution and contents acquisition by use of the Gateway can be classified in the following three types according to the cache retention status of ucode resolution information. In addition, all of the patterns are described on the assumption that a recursive mode is set as the operation mode (Section 4.3).

3.1. Without a Cache Hit

If there is no cache on both the terminal and the Gateway, the Gateway acquires contents by accessing the ucode resolution server and information server and returns to the terminal. Figure 1 shows the processing procedures.



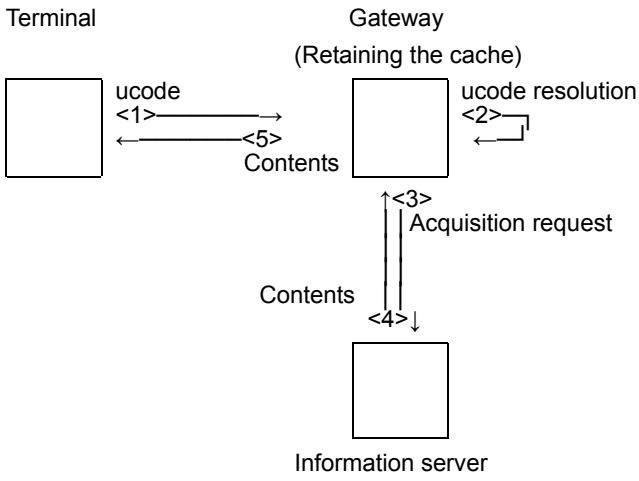
<1> The terminal sends the ucode to the Gateway.
<2> The Gateway sends a ucode resolution request to the ucode resolution server.
<3> The information server address is returned.
<4> The Gateway sends a contents acquisition request to the information server.
<5> The contents are returned.
<6> The Gateway returns the contents to the terminal.

Figure 1: Gateway Operation (Without a Cache)

3.2. With a Cache Hit on the Gateway

If the Gateway retains the cache entry that matches the requested ucode resolution information, it retrieves contents by accessing the information

server based on the resolution information and returns them to the terminal. Figure 2 shows the processing procedures.

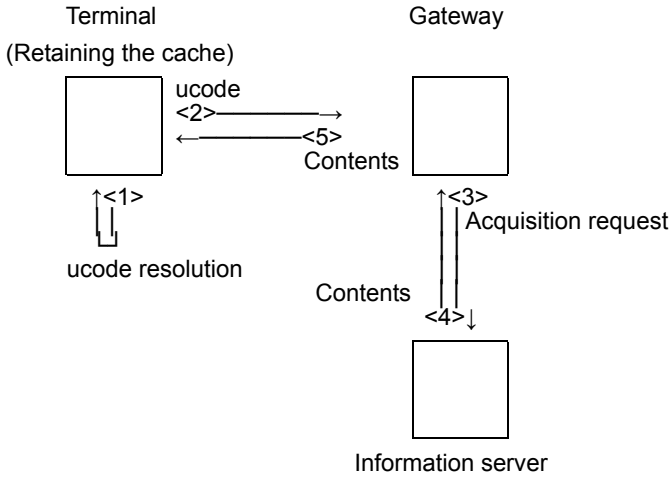


<1> The terminal sends the ucode to the Gateway.
<2> The Gateway executes ucode resolution with the cache search function.
<3> The Gateway sends a contents acquisition request to the corresponding information server.
<4> The contents are returned.
<5> The Gateway returns the contents to the terminal.

Figure 2: Gateway Operation (With a Cache Hit on the Gateway)

3.3. With a Cache Hit on the Terminal

If the terminal retains the cache entry that matches ucode resolution information, it sends address information to the Gateway, and the Gateway retrieves contents by accessing the information server based on the specified address information and returns them to the terminal. Figure 3 shows the processing procedures.



<1> The terminal executes ucode resolution with the cache search function.
<2> The terminal sends the corresponding address information on the information server to the Gateway.
<3> The Gateway sends a contents acquisition request to the specified information server.
<4> The contents are returned.
<5> The Gateway returns the contents to the terminal.

Figure 3: Gateway Operation (With a Cache Hit on the Terminal)

4. ucode Resolution Gateway Protocol

4.1. Outline

This chapter defines the ucode resolution gateway protocol which is an interface for sending requests/receiving responses between terminals and the Gateway.

The ucode resolution gateway protocol is an application protocol which operates on HTTP (Hypertext Transfer Protocol) [5]. The HTTP header field, body field, and request URL are used for sending/receiving parameters, so that existing network resources for cellular phones and intranets, etc. and terminal software are usable.

4.2. Parameter Definition

4.2.1. Request Parameters

Terminals send the following three parameters to the Gateway as HTTP requests.

- Gateway parameter

The Gateway parameter is defined as a parameter which directs Gateway operations. It is not forwarded to the ucode resolution server and information server.

- ucode resolution parameter

The ucode resolution parameter is defined as a parameter for the ucode resolution protocol. It is forwarded to the ucode resolution server but not to the information server.

- Information server parameter

The information server parameter is defined as an application parameter which is forwarded to the information server but not to the ucode resolution server.

This document specifies Gateway parameters and ucode resolution parameters only. Table 1 shows the request parameter List, and Table 2 shows the request parameter value List.

Table 1: Request Parameter List

Type	Parameter name	Meaning
Gateway parameter	X-UIDC-GWMODE	Gateway operation mode
	X-UIDC-TERMTYPE	Terminal type
	X-UIDC-GWREQIF	Specification for the request-sending method
	X-UIDC-GWRESIF	Specification for the response-receiving method
	X-UIDC-GWCACHE	Storage/no storage of the cache for resolution results
ucode resolution parameter	X-UIDC-UCODE	ucode to be searched
	X-UIDC-QUERYMASK	Query bitmask of the ucode to be searched
	X-UIDC-UCODETYPE	Bit length type of the ucode
	X-UIDC-QUERYMODE	Search mode for the ucode resolution
	X-UIDC-QUERYATTRIBUTE	Data attribute to be retrieved by the ucode resolution
Signature verification	X-UIDC-SIGNATURE	Signature data
	X-UIDC-ALGORITHM	Algorithm type used for signature verification

Table 2: Request Parameter Value List

Parameter name	Value	Meaning
X-UIDC-GWMODE	"recursive"	ucode resolution and contents acquisition
	"resolveall"	ucode resolution only (all hierarchies)
	"resolve"	ucode resolution only (one hierarchy only)
	"redirect"	ucode resolution and an HTTP redirect
	"portal"	ucode resolution and a portal display
	"proxy"	Contents acquisition only
X-UIDC-TERMTYPE	"default"	Do not convert.
X-UIDC-GWREQIF	"http-header"	Send by a header.
	"http-get"	Send by a GET parameter.
	"http-post"	Send by a POST parameter.
X-UIDC-GWRESIF	"http-header"	Receive by a header.
	"http-body"	Receive by a body.
X-UIDC-GWCACHE	"cache"	Store the query result in the cache.
	"no-cache"	Do not store the query in the cache.
X-UIDC-UCODE	<ucode string>	ucode to be resolved
X-UIDC-QUERYMASK	<ucode string>	ucode query maskbit
X-UIDC-UCODETYPE	"UIDC_DATATYPE_UCODE_128"	128bit ucode type
	"UIDC_DATATYPE_UCODE_256"	256bit ucode type
	"UIDC_DATATYPE_ UCODE_384"	384bit ucode type
	"UIDC_DATATYPE_ UCODE_512"	512bit ucode type
X-UIDC-QUERYMODE (List values by separating with "," (comma))	"UIDC_RSMODE_RESOLUTION"	A normal ucode resolution search
	"UIDC_RSMODE_CACHE"	Use cache resolution
	"UIDC_RSMODE_CASCADE"	Use cascade resolution.
X-UIDC-QUERYATTRIBUTE	"UIDC_ATTR_ANONYMOUS"	Do not specify a node type.
	"UIDC_ATTR_RS"	Specify the ucode resolution server.
	"UIDC_ATTR_IS"	Specify the information server.
	"UIDC_ATTR_USER"	Specify user-defined information.
X-UIDC-SIGNATURE	<sign string>	Signature string
X-UIDC-ALGORITHM	<algo type>	Algorithm used for signature verification

<ucode string> ::= 32HEXDIG※1 ; ex. 0efffec00000000000000000050123
<sign string> ::= 40HEXDIG ; ex. 6455FDB217CFE086953A844DABAC0491B05D91D2
<host string> ::= host [":" port] ; ex. 192.168.0.1:8081
DIGIT = "0"|"1"|"2"|"3"|"4"|"5"|"6"|"7"|"8"|"9"
HEXDIG = DIGIT|"A"|"B"|"C"|"D"|"E"|"F"|"a"|"b"|"c"|"d"|"e"|"f"
<algo type> = <mac type> | " PBEWith" <mac type>
<mac type> = "HmacMD5"|"HmacSHA1"|"HmacSHA256"|"HmacSHA384"|"HmacSHA512"

※1 : n<element> represents that a same element is repeated for a given integral number of times (n).

Default values are set for each parameter. If the specification of each parameter is omitted, each default value is automatically set. Table 3 shows the request parameter default value list.

Table 3: Request Parameter Default Value List

Parameter name	Default value (Interpretation if the setting is omitted)
X-UIDC-GWMODE	"redirect"
X-UIDC-TERMTYPE	"default"
X-UIDC-GWREQIF	For the GET method: "http-get" For the POST method: "http-post" For the methods other than the two above: "http-header"
X-UIDC-GWRESIF	If X-UIDC-GWREQIF is http-header: "http-header" If X-UIDC-GWREQIF is http-get/http-post: "http-body"
X-UIDC-GWCACHE	"cache"
X-UIDC-UCODE	(Cannot be omitted)
X-UIDC-QUERYMASK	ffffffffffffffffffffffffffffffff
X-UIDC-UCODETYPE	UIDC_DATATYPE_UCODE_128
X-UIDC-QUERYMODE	UIDC_RSMODE_RESOLUTION
X-UIDC-QUERYATTRIBUTE	UIDC_ATTR_ANONYMOUS
X-UIDC-SIGNATURE	If omitted, the signature verification function is disabled. To enable signature verification, it cannot be omitted.

Among the those in the list, the X-UIDC-UCODE setting cannot be omitted. If it is omitted, a parameter error will be returned.

All parameters other than those shown in Table 1 are interpreted as information server parameters.

4.2.2. Response Parameter

HTTP responses which are returned by the Gateway to terminals include the following three types of data.

(1) Gateway status

The Gateway status is defined as a parameter for Gateway operation

results.

(2) ucode resolution status

The ucode resolution status is defined as a parameter for ucode resolution protocol operation results. The status from the ucode resolution server is forwarded without any changes.

(3) Information server status

The information server status is defined as a parameter for information server operation results. The status from the information server is forwarded without any changes.

(4) Contents

The contents in this document are defined as contents associated with the ucode specified by requests. The contents retrieved from the information server are forwarded without any changes.

This document specifies (1) and (2) only. Table 4 shows the response parameter list, and Table 5 shows the response parameter value list.

Table 4: Response Parameter List

Remarks	Parameter name	Meaning
Gateway status	X-UIDC-GWSTATUS	Gateway status
ucode resolution status	X-UIDC-UCODERP-STATUS	ucode resolution protocol status at the time of ucode resolution
	X-UIDC-DATA	Data retrieved from ucode resolution
	X-UIDC-DATAVERSION	Data version retrieved from ucode resolution
	X-UIDC-DATAATTRIBUTE	Data attribute retrieved from ucode resolution
	X-UIDC-DATATYPE	Data type retrieved from ucode resolution
	X-UIDC-RETURNMASK	Bitmask retrieved from ucode resolution
	X-UIDC-TTL	Expiration date of data retrieved from ucode resolution
	X-UIDC-RESOLVEMODE	Mode executed at the time of ucode resolution

Table 5: Response Parameter Value List

Parameter name	Value	Meaning
X-UIDC-GWSTATUS	<2byte string>	
	0x0000	Normal termination
	0x0001	Conditional normal termination
	0xffef	Request for unsupported function
	0xffdf	Parameter error
	0xfdff	Connection to the ucode resolution server failed
	0xfdfe	Connection to an information server failed
	0xfdfd	Unsupported protocol
	0xfdfc	Signature verification error
	0xfffb	System error
X-UIDC-UCODERP-STATUS	<2byte string>	ucode resolution protocol status code (see [2].)
X-UIDC-DATA	<data string>	Data attribute of the ucode resolution protocol response
X-UIDC-DATAVERSION	<2byte string>	dataVersion attribute of the ucode resolution protocol response
X-UIDC-DATAATTRIBUTE		dataAttribute attribute of the ucode resolution protocol response
	"UIDC_ATTR_RS"	ucode resolution server
	"UIDC_ATTR_IS"	Information server
	"UIDC_ATTR_USER"	User-defined attribute
X-UIDC-DATATYPE		dataType attribute of the ucode resolution protocol response
	"UIDC_DATATYPE_UCODE_128"	128bit ucode
	"UIDC_DATATYPE_UCODE_256"	256bit ucode
	"UIDC_DATATYPE_UCODE_384"	384bit ucode
	"UIDC_DATATYPE_UCODE_512"	512bit ucode
	"UIDC_DATATYPE_IPV4"	IPv4 address
	"UIDC_DATATYPE_IPV6"	IPv6 address
	"UIDC_DATATYPE_URL"	URL
	"UIDC_DATATYPE_HOST"	Host name
	"UIDC_DATATYPE_EMAIL"	e-mail address
	"UIDC_DATATYPE_PHONE"	Phone number
	"UIDC_DATATYPE_TXT"	Text information
	"UIDC_DATATYPE_USER"	User-defined
X-UIDC-RETURNMASK	<ucode string>	returnMask attribute of the ucode resolution protocol response
X-UIDC-TTL	<4byte string>	ttl attribute of the ucode resolution protocol response
X-UIDC-RESOLVEMODE		resolveMode attribute of the ucode resolution protocol response
	"UIDC_RSMODE_RESOLUTION"	Executed a normal ucode resolution search
	"UIDC_RSMODE_CACHE"	Executed cache resolution
	"UIDC_RSMODE_CASCADE"	Executed cascade resolution

```
<2byte string> ::= ("0" ("x"|"X") 1*4HEXDIG※1) | 1*5DIGIT    ; ex. 0x1234
<4byte string> ::= ("0" ("x"|"X") 1*8HEXDIG) | 1*10DIGIT     ; ex. 0x12345678
<data string>    ::= <ucode string> | ; for UIDC_DATATYPE_UCODE_*
                     <IPv4 address in dot decimal notation※2> | ; for UIDC_DATATYPE_IPV4
                     <IPv6 address in string notation※3> | ; for UIDC_DATATYPE_IPV6
                     <URI in string notation※4> | ; for UIDC_DATATYPE_URL
                     <host in string notation※5> | ; for UIDC_DATATYPE_HOST
                     *CHAR                                    ; for other types
CHAR = <US-ASCII characters>

※1 : n*m<element> represents that a same element is repeated for n times or more and
m times.or more
※2 : 4 decimal notation separated with dots (for example, aaa.bbb.ccc.ddd)
※3 : Refer to [6].
※4 : Refer to [7].
※5 : Refer to [8]
```

Among the above response parameters, the Gateway must return at least the "X-UIDC-GWSTATUS" (Gateway status code) parameter. Table 6 lists possible values retrieved as "X-UIDC-GWSTATUS" and their meanings. Other parameters can be omitted according to the provided Gateway functions.

Table 6: Gateway Status Code List

Status	Meaning	Condition
0x0000	Normal termination	Completed a request
0x0001	Conditional normal termination	Normally terminated as a Gateway function but did not complete a request. It means that an abnormal termination occurs in the ucode resolution status or information server status; therefore, each status should be interpreted.
0xffef	Request for unsupported function	Requested a Gateway function which has been defined in the specification but not implemented.
0xffdf	Parameter error	Specified a Gateway parameter value which has not been defined in specification, or a parameter to be specified has not been specified.
0xfdff	Connection to ucode Resolution Server failed	Connection to the ucode resolution server failed.
0xfdfe	Connection to information server failed	Connection to the information server failed.
0xfdfd	Unsupported protocol	URL scheme retrieved from ucode resolution was not a supported protocol.
0xfdfc	Signature verification error	Specified signature was verified, and an error was detected.
0xfffb	System error	Any error other than the above occurred within the Gateway.

4.3. Gateway Operation Mode

4.3.1. Recursive Mode

If “recursive” is specified in the "X-UIDC-GWMODE," the Gateway executes ucode resolution and a contents acquisition for the ucode specified by a request. The ucode resolution may be performed in multiple phases. Regarding the access protocol for the information server, the Gateway makes a judgment based on the ucode resolution information. For example, the access protocol is determined based on the URL scheme (for example, "http," "ftp," etc.).

Shown below is the Gateway processing procedures in case of the recursive mode.

(1) If UIDC_RSMODE_CACHE is specified in "X-UIDC-QUERYMODE," it checks if there is a cache. If a cache exists, it skips (2) and (3).
(2) It makes a query to the ucode resolution server and performs ucode resolution.
(3) If a cache is specified in "X-UIDC-GWCACHE," the ucode resolution information is cached.
(4) Steps (2) and (3) are repeated until the information server address is retrieved.
(5) The information server is accessed, and contents are retrieved.
(6) The ucode resolution information and contents are returned to the request source.

4.3.2. Resolveall Mode

If “resolveall” is specified in "X-UIDC-GWMODE," the Gateway performs ucode resolution and retrieves location information on the information server for the ucode specified by a request. The ucode resolution may be performed in multiple phases.

Shown below is the Gateway processing procedures in case of the resolveall mode.

(1) If UIDC_RSMODE_CACHE is specified in "X-UIDC-QUERYMODE," it checks if there is a cache. If a cache exists, it skips (2) and (3).
(2) It makes a query to the ucode resolution server and executes ucode resolution.

(3) If a cache is specified in "X-UIDC-GWCACHE," the ucode resolution information is cached.
(4) Steps (2) and (3) are repeated until the information server address is retrieved.
(5) The ucode resolution information is returned to the request source.

4.3.3. Resolve Mode

If “resolve” is specified in "X-UIDC-GWMODE," the Gateway performs ucode resolution for the ucode specified by a request. If the ucode resolution has a multiple phase structure, the Gateway performs ucode resolution for the first phase only.

Shown below is the Gateway processing procedures in case of the resolve mode.

(1) If UIDC_RSMODE_CACHE is specified in "X-UIDC-QUERYMODE," it checks if there is a cache. If a cache exists, it skips (2) and (3).
(2) It makes a query to the ucode resolution server and executes ucode resolution.
(3) If a cache is specified in "X-UIDC-GWCACHE," the ucode resolution information is cached.
(4) The ucode resolution information is returned to the request source.

4.3.4. Redirect Mode

If “redirect” is specified in "X-UIDC-GWMODE", the Gateway performs ucode resolution and retrieves location information on the information server for the ucode specified by a request. In addition, the Gateway performs http redirect for the retrieved URL. The ucode resolution may be performed in multiple phases. In the http redirect, the client must read the URL by rewriting the http header location.

4.3.5. Portal Mode

If “redirect” is specified in "X-UIDC-GWMODE," the Gateway executes ucode resolution and retrieves location information on the information server for the ucode specified by a request. Additionally, html pages including anchors to the retrieved URL are structured and returned to the client.

4.4. Method of Sending/Receiving Parameters

4.4.1. Method of Sending Request Parameters

This document specifies the following three methods of sending request parameters to the Gateway.

(1) Request header method

Request parameters are described in the HTTP request header. All header fields other than the Gateway/ucode resolution parameters are forwarded to the information server without any changes.

(2) GET parameter method

Request parameters are described in the HTTP request URL. All GET parameters other than the Gateway/ucode resolution parameters are forwarded to the information server without any changes.

(3) POST parameter method

Request parameters are described in the HTTP request body. All POST parameters other than the Gateway/ucode resolution parameters are forwarded to the information server without any changes.

Terminals can specify the method of sending parameters by using the "X-UIDC-GWREQIF" parameter. The "X-UIDC-GWREQIF" parameter itself must be sent using the request header method. The Gateway interprets the "X-UIDC-GWREQIF" parameter value in the request header and receives the remaining parameters according to the specified method.

However, request headers cannot be freely set in some existing cellular phones; therefore, "X-UIDC-GWREQIF" may not be sent using the request header method. In case of these terminals, the method of sending parameters is automatically judged based on the HTTP request method. For example, if the GET method is requested, it will be judged that parameters are sent using the GET parameter method.

Table 7 shows the criteria for the method of sending request parameters at the Gateway.

Table 7: Criteria of the Method of Sending Request Parameters

	X-UIDC-GWREQIF value	HTTP request method	**Method of Sending Parameters**
X-UIDC-GWREQIF is specified in the request header	http-header	Any	Request header method
	http-get	Any	GET parameter method
	http-post	Any	POST parameter method
X-UIDC-GWREQIF is not specified in the request header	None	GET	GET parameter method
	None	POST	POST parameter method
	None	Others	Request header method

Next, Table 8 shows an example of HTTP payload descriptions when parameters are sent using each method.

Table 8: Example of HTTP Payload Descriptions (Request)

Method	HTTP Payload
Request header method	GET /resolve.cgi HTTP/1.1 Host: gw.uidcenter.org X-UIDC-GWREQIF: http-header X-UIDC-UCODE: 0efffec00000000000000000000050123
GET parameter method	GET /resolve.cgi?X-UIDC-UCODE=0efffec00000000000000000000050123 (→continued) HTTP/1.1 Host: gw.uidcenter.org X-UIDC-GWREQIF: http-get // can be omitted
POST parameter method	POST /resolve.cgi HTTP/1.1 Host: gw.uidcenter.org X-UIDC-GWREQIF: http-post // can be omitted (Blank line) X-UIDC-UCODE=0efffec00000000000000000000050123

(described minimum headers only.)

4.4.2. Method of Receiving Response Parameters

This document specifies the following two methods of receiving response parameters from the Gateway.

(1) Response header method

Response parameters are described in the HTTP response header.

(2) Response body method

Response parameters are described in the HTTP response body.

Terminals can specify the method of receiving parameters by using the "X-UIDC-GWRESIF" parameter. The "X-UIDC-GWRESIF" parameter as well as other parameters is sent to the Gateway using the method specified by the

"X-UIDC-GWREQIF" parameter.

However, in the response body method, both response parameters and contents can not be received simultaneously. When "http-body" is specified as the "X-UIDC-GWRESIF" parameter in a request, and when contents are returned, the response parameter is omitted, and only the contents are returned. When it is requested to receive both contents and response parameters, it is required to specify "http-header" as the "X-UIDC-GWRESIF" request parameter and to receive the response parameter using the response header method.

Table 9 shows an example of HTTP payload descriptions when parameters are received by each method.

Table 9: Example of HTTP Payload Descriptions (Response)

Method	HTTP Payload
Response header method	200 OK Host: gw.uidcenter.org X-UIDC-GWSTATUS: 0x0000 X-UIDC-UCODERP-STATUS: 0x0000 X-UIDC-DATA: http://www.uidcenter.org/getinfo.cgi ... (Blank line) --Contents
Response body method	200 OK Host: gw.uidcenter.org ... (Blank line) X-UIDC-GWSTATUS: 0x0000 X-UIDC-UCODERP-STATUS: 0x0000 X-UIDC-DATA: http://www.uidcenter.org/getinfo.cgi

4.4.3. HTTP Parameter

(1) HTTP response status code

Returned HTTP payloads include HTTP status codes. Table 10 shows possible HTTP status codes returned from the Gateway and the Gateway conditions at that time.

Table 10: HTTP Status Code List

Status code	Meaning	Condition
200	Normal termination	Completed request
	Gateway error	X-UIDC-GWSTATUS value is other than 0x0000/0x0001.
	ucode resolution error	X-UIDC-UCODERP-STATUS value is other than 0x0000.
Other than those above	GatewayHTTP error (When X-UIDC-GWSTATUS does not exist)	Indicates an HTTP layer error which occurred while accessing the Gateway
	Information server error (When X-UIDC-GWSTATUS exists)	Indicates an HTTP layer error which occurred while accessing the information server

(2) HTTP header field

All HTTP header fields in a request are forwarded to the information server except for the Gateway/ucode resolution parameter. In addition, all header fields in a response from the information server are forwarded to the terminal. However, if the header shown in Table 11 is included, the Gateway should rewrite the headers as an exception to the appropriate value.

Table 11: Header Fields required to be rewritten

Header name		Setting method
Content-Length	Request	Since the Gateway/ucode resolution parameter is not forwarded to the information server, if the parameter is included in the body field, the Gateway rewrites the size of the entity-body excluding the Gateway/ucode resolution parameter.

4.5. Cache

When the same request is received more than once, the Gateway can execute a high-speed processing without making a re-query to the ucode resolution server by locally caching ucode resolution information. However, the cache resolution can be performed only for the requests where cache resolution is permitted.

4.5.1. Cache Method

When the Gateway receives a request where cache resolution is permitted from the terminal, it searches cache records held inside based on the request parameter. The cache records are collections of records with the attributes

shown in Table 12.

Table 12: The List of Attributes included in Cache Records

Attribute	Description
ucode	ucode indicated by the record
ucodemask	Bit mask indicating effective bits in ucodes
data	Location information corresponding to ucodes
ttl	Expiration date of the cache (seconds)
resolvemode	Search mode used when the cache data is searched
dataversion	Cache information version
dataattribute	Location information feature indicated by the data
datatype	Data representation type

The cache record is a record keyed by the ucode & ucodemask (bitwise logical AND) group. A cache information search is executed by the same method as an entry search method in the ucode resolution server which is specified in the ucode resolution protocol.

However, this document does not specify the behavior executed by the Gateway when multiple cache records are matched during a search.

There are following two types of Gateway cache retention.

(1) Dynamic cache

The Gateway can dynamically cache ucode resolution request results to the ucode resolution server. At this time, each field value included in the ucode resolution protocol response is stored as cache information as shown in Table 12.

(2) Static cache

The Gateway can have static cache information set offline. The static cache information is often set up in advance by an administrator.

4.5.2. TTL

The Gateway must not use a cache that is beyond the expiration date in a TTL attribute included in a cache record. As an implementing method for checking the effective period, it is considered possible to check if the difference between the cache storage time and the current time exceeds the TTL when using a cache or subtract a TTL value within a record in real time.

However, ucode resolution information cannot be cached if its TTL value is 0. In addition, ucode resolution information does not have the cache retention

period if its TTL is 0xFFFFFFFF(-1).

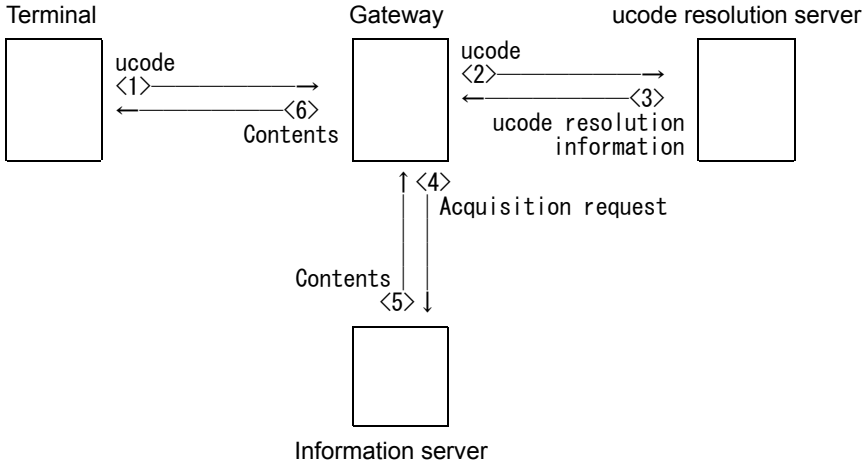
4.6. Contents Conversion

Terminals can direct the Gateway to convert contents using the "X-UIDC-TERMTYPE" parameter. However, in the current version, only "No conversion (X-UIDC-TERMTYPE is set to default)" is defined (for future extension).

4.7. Operation Example

(1-a) Request header method/recursive mode (normal system)

In case of the request header method and recursive mode, an example of the normal system flow is shown below. The terminal receives ucode resolution information in the response header and contents in the response body.



Number	Parameter
<1>	GET /resolve.cgi?ucode=0efffec000000000000000000050123&param=1 HTTP/1.1 Host: gw.uidcenter.org X-UIDC-GWREQIF : http-header X-UIDC-UCODE : 0efffec000000000000000000050123

<2>	ucode = 0efffec000000000000000000050123
	queryMask = ffffffffffffffffffffffffffffffff // Default value applied
	ucodeType = UIDC_DATATYPE_UCODE_128 // Default value applied
	queryMode = UIDC_RSMODE_RESOLUTION // Default value applied
	queryAttribute = UIDC_ATTR_ANONYMOUS // Default value applied

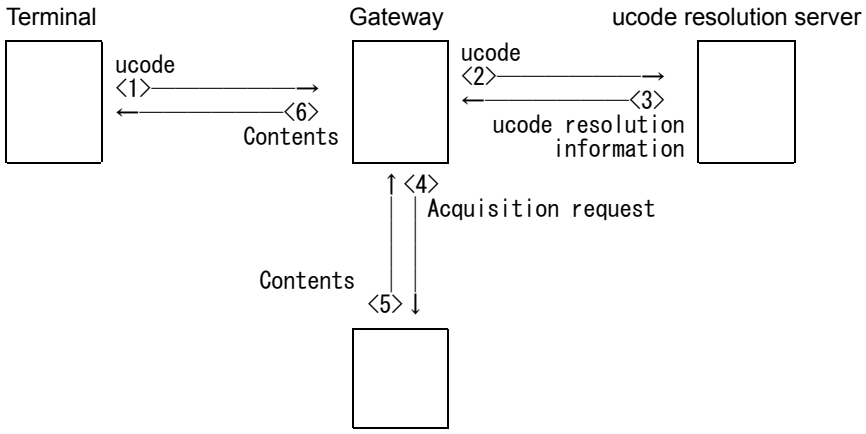
<3>	data = http://www.uidcenter.org/getinfo.cgi returnMask = ffffffffffffffffffffffff0000 TTL = 86400 dataVersion = 0x0001 resolveMode = UIDC_RSMODE_RESOLUTION dataAttribute = UIDC_ATTR_IS dataType = UIDC_DATATYPE_URL
<4>	GET /getinfo.cgi?ucode=0efffec000000000000000000050123&param=1 HTTP/1.1 Host: www.uidcenter.org
<5>	HTTP/1.1 200 OK ... (Blank line) <<Contents>>
<6>	HTTP/1.1 200 OK X-UIDC-GWSTATUS: 0x0000 X-UIDC-UCODERP-STATUS: 0x0000 X-UIDC-DATA: http://www.uidcenter.org/getinfo.cgi ... (Blank line) <<Contents>>

Figure 4: Parameter Example When a Header Field is Used

(1-b) POST parameter method/recursive mode (normal system)

In case of the POST parameter method and recursive mode, an example of the normal system flow is shown below. Since the terminal receives contents

in the response body, it cannot receive ucode resolution information.



Number	Parameter
<1>	POST /resolve.cgi HTTP/1.1 Host: gw.uidcenter.org ... (Blank line) X-UIDC-UCODE=0efffec00000000000000000000050123& (→Continued) ucode=0efffec00000000000000000000050123&param=1

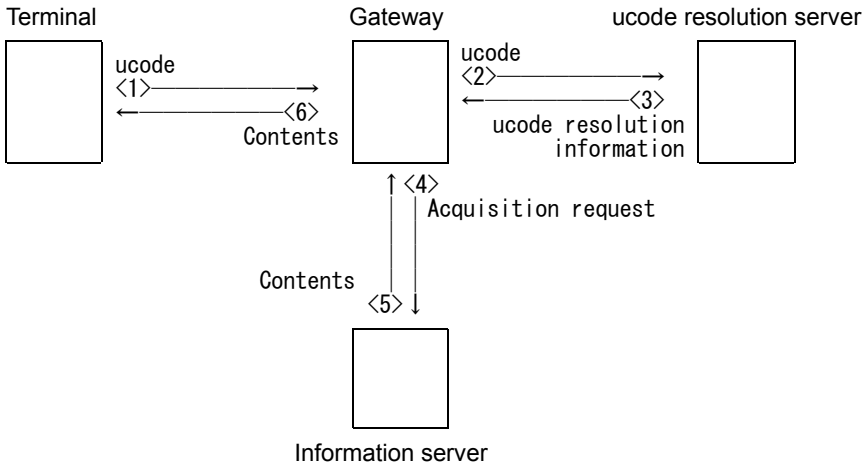
<2>	ucode = 0efffec00000000000000000000050123
	queryMask = ffffffffffffffffffffffffffffffff // Default value applied
	ucodeType = UIDC_DATATYPE_UCODE_128 // Default value applied
	queryMode = UIDC_RSMODE_RESOLUTION // Default value applied
	queryAttribute = UIDC_ATTR_ANONYMOUS // Default value applied

<3>	data = http://www.uidcenter.org/getinfo.cgi returnMask = ffffffffffffffffffffffffffff0000 TTL = 86400 dataVersion = 0x0001 resolveMode = UIDC_RSMODE_RESOLUTION dataAttribute = UIDC_ATTR_IS dataType = UIDC_DATATYPE_URL
<4>	POST /getinfo.cgi HTTP/1.1 Host: www.uidcenter.org (Blank line) ucode=0efffec00000000000000000000050123&param=1
<5>	HTTP/1.1 200 OK ... (Blank line) <<Contents>>
<6>	HTTP/1.1 200 OK ... (Blank line) <<Contents>>

Figure 5: Parameter Example when a POST Method is Used

(1-c) GET parameter method/recursive mode (normal system)

In case of the GET parameter method and recursive mode, an example of the normal system flow is shown below. Since the terminal receives contents in the response body, it cannot receive ucode resolution information.



Number	Parameter
<1>	GET /resolve.cgi?X-UIDC-UCODE=0efffec00000000000000000000050123& (→Continued) ucode=0efffec00000000000000000000050123&param=1 HTTP/1.1 Host: gw.uidcenter.org ...

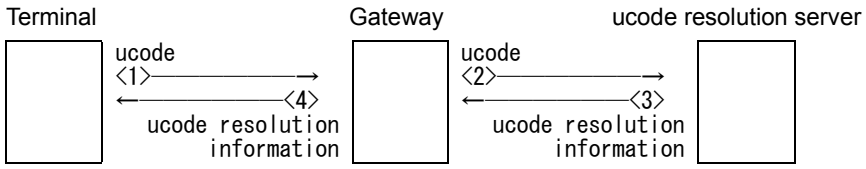
<2>	ucode = 0efffec00000000000000000000050123
	queryMask = ffffffffffffffffffffffffffffffff // Default value applied
	ucodeType = UIDC_DATATYPE_UCODE_128 // Default value applied
	queryMode = UIDC_RSMODE_RESOLUTION // Default value applied
	queryAttribute = UIDC_ATTR_ANONYMOUS // Default value applied

<3>	data = http://www.uidcenter.org/getinfo.cgi returnMask = ffffffffffffffffffffffffffff0000 TTL = 86400 dataVersion = 0x0001 resolveMode = UIDC_RSMODE_RESOLUTION dataAttribute = UIDC_ATTR_IS dataType = UIDC_DATATYPE_URL
<4>	GET /getinfo.cgi?ucode=0efffec00000000000000000000050123&param=1 HTTP/1.1 Host: www.uidcenter.org
<5>	HTTP/1.1 200 OK ... (Blank line) <<Contents>>
<6>	HTTP/1.1 200 OK ... (Blank line) <<Contents>>

Figure 6: Parameter Example when a GET Method is Used

(1-d) Request header method/resolveall mode (normal system)

In case of the request header method and resolveall mode, an example of the normal system flow is shown below. The terminal receives ucode resolution information in the response header and does not receive contents.



Number	Parameter
<1>	GET /resolve.cgi HTTP/1.1 Host: gw.uidcenter.org X-UIDC-GWMODE : resolveall X-UIDC-GWREQIF : http-header X-UIDC-UCODE=0efffec000000000000000000050123 ...

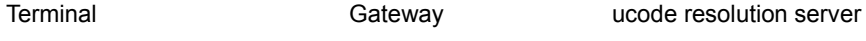
<2>	ucode = 0efffec000000000000000000050123
	queryMask = ffffffffffffffffffffffffffffffff // Default value applied
	ucodeType = UIDC_DATATYPE_UCODE_128 // Default value applied
	queryMode = UIDC_RSMODE_RESOLUTION // Default value applied
	queryAttribute = UIDC_ATTR_ANONYMOUS // Default value applied

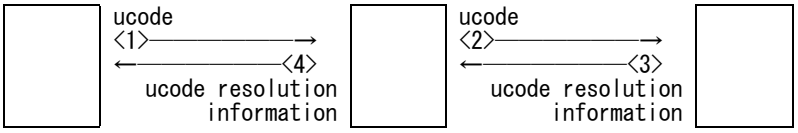
<3>	data = http://www.uidcenter.org/getinfo.cgi returnMask = ffffffffffffffffffffffffffff0000 TTL = 86400 dataVersion = 0x0001 resolveMode = UIDC_RSMODE_RESOLUTION dataAttribute = UIDC_ATTR_IS dataType = UIDC_DATATYPE_URL
<4>	HTTP/1.1 200 OK X-UIDC-GWSTATUS: 0x0000 X-UIDC-UCODERP-STATUS: 0x0000 X-UIDC-DATA: http://www.uidcenter.org/getinfo.cgi ...

Figure 7: Parameter Example in the resolveall mode

(1-e) Request header method/resolve mode (normal system)

In case of the request header method and resolve mode, an example of the normal system flow is shown below. The terminal receives ucode resolution information in a response header, and its ucode resolution information is only based on a resolution result of the first phase. The terminal does not receive contents.





Number	Parameter
<1>	GET /resolve.cgi HTTP/1.1 Host: gw.uidcenter.org X-UIDC-GWMODE : resolve X-UIDC-GWREQIF : http-header X-UIDC-UCODE=0efffec00000000000000000000050123 ...

<2>	ucode = 0efffec00000000000000000000050123
	queryMask = ffffffffffffffffffffffffffffffff // Default value applied
	ucodeType = UIDC_DATATYPE_UCODE_128 // Default value applied
	queryMode = UIDC_RSMODE_RESOLUTION // Default value applied
	queryAttribute = UIDC_ATTR_ANONYMOUS // Default value applied

<3>	data = 0xC0A80001 // Binary format of 192.168.0.1
	returnMask = ffffffffffffffffffffffffffff0000
	TTL = 86400
	dataVersion = 0x0001
	resolveMode = UIDC_RSMODE_RESOLUTION
	dataAttribute = UIDC_ATTR_RS
	dataType = UIDC_DATATYPE_IPV4

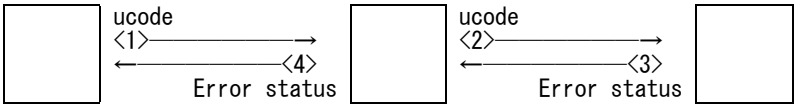
<4>	HTTP/1.1 200 OK X-UIDC-GWSTATUS: 0x0000 X-UIDC-UCODERP-STATUS: 0x0000 X-UIDC-DATA: 192.168.0.1 ...

Figure 8: Parameter Example in the resolve Mode

(2-a) Request header method/recursive mode (abnormal system)

In case of the request header method and recursive mode, shown below is an example of the abnormal system flow used when the ucode resolution server fails in ucode resolution

Terminal Gateway ucode resolution server



Number	Parameter
<1>	GET /resolve.cgi HTTP/1.1 Host: gw.uidcenter.org X-UIDC-GWREQIF : http-header X-UIDC-UCODE=0efffec00000000000000000050123 ...

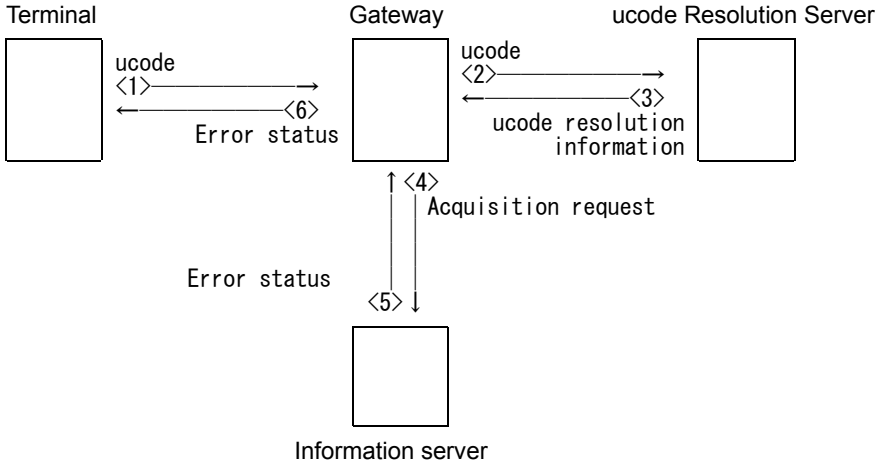
<2>	ucode = 0efffec00000000000000000050123
	queryMask = ffffffffffffffffffffffffffffffff // Default value applied
	ucodeType = UIDC_DATATYPE_UCODE_128 // Default value applied
	queryMode = UIDC_RSMODE_RESOLUTION // Default value applied
	queryAttribute = UIDC_ATTR_ANONYMOUS // Default value applied

<3>	ErrorCode = 0xffcc // ucode Resolution Protocol status code
<4>	HTTP/1.1 200 OK X-UIDC-GWSTATUS: 0x0001 X-UIDC-UCODERP-STATUS: 0xffcc ...

Figure 9: Parameter Example in case the ucode Resolution Fails

(2-b) Request header method/recursive mode (abnormal system)

In case of the request header method and recursive mode, shown below is an example of the abnormal system flow used when the information server returns an error.



Number	Parameter
<1>	GET /resolve.cgi?ucode=0efffec000000000000000000000050123&param=1 HTTP/1.1 Host: gw.uidcenter.org X-UIDC-GWREQIF : http-header X-UIDC-UCODE : 0efffec000000000000000000000050123

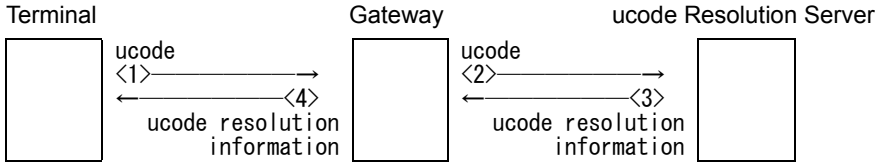
<2>	ucode = 0efffec000000000000000000000050123
	queryMask = ffffffffffffffffffffffffffffffff // Default value applied
	ucodeType = UIDC_DATATYPE_UCODE_128 // Default value applied
	queryMode = UIDC_RSMODE_RESOLUTION // Default value applied
	queryAttribute = UIDC_ATTR_ANONYMOUS // Default value applied

<3>	data = http://www.uidcenter.org/getinfo.cgi returnMask = ffffffffffffffffffffffffffff0000 TTL = 86400 dataVersion = 0x0001 resolveMode = UIDC_RSMODE_RESOLUTION dataAttribute = UIDC_ATTR_IS dataType = UIDC_DATATYPE_URL
<4>	GET /getinfo.cgi?ucode=0efffec000000000000000000000050123&param=1 HTTP/1.1 Host: www.uidcenter.org
<5>	HTTP/1.1 404 Not Found ...
<6>	HTTP/1.1 404 Not Found X-UIDC-GWSTATUS: 0x0001 X-UIDC-UCODERP-STATUS: 0x0000 X-UIDC-DATA: http://www.uidcenter.org/getinfo.cgi ...

Figure 10: Parameter Example when the Information Server Returns an Error

(2-c) Request header method/recursive mode (abnormal system)

In case of the request header method and recursive mode, shown below is an example of the abnormal system flow used when the information server is not accessed by the http protocol method which is not supported by the Gateway.



Number	Parameter
<1>	GET /resolve.cgi HTTP/1.1 Host: gw.uidcenter.org X-UIDC-GWREQIF : http-header X-UIDC-UCODE=0efffec00000000000000000050123 ...

<2>	ucode = 0efffec00000000000000000050123
	queryMask = ffffffffffffffffffffffffffffffff // Default value applied
	ucodeType = UIDC_DATATYPE_UCODE_128 // Default value applied
	queryMode = UIDC_RSMODE_RESOLUTION // Default value applied
	queryAttribute = UIDC_ATTR_ANONYMOUS // Default value applied

<3>	data = https://www.uidcenter.org/getinfo.cgi returnMask = ffffffffffffffffffffffffffff0000 TTL = 86400 dataVersion = 0x0001 resolveMode = UIDC_RSMODE_RESOLUTION dataAttribute = UIDC_ATTR_IS dataType = UIDC_DATATYPE_URL
<4>	HTTP/1.1 200 OK X-UIDC-GWSTATUS: 0xfdfd X-UIDC-UCODERP-STATUS: 0x0000 X-UIDC-DATA: https://www.uidcenter.org/getinfo.cgi ...

Figure 11: Parameter Example when used an Unsupported Protocol

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