

ENUM INTEGRATION MANUAL

CONTENTS

INTRODUCTION	3
CONNECTIVITY	3
TECHNICAL SPECIFICATION	4
<i>Valid format for ENUM server query</i>	4
<i>ENUM server responses</i>	6
<i>ENUM responses in case of error processing ENUM query</i>	7
<i>ENUM responses in case of successfully processed ENUM query</i>	8

INTRODUCTION

This document will provide information how to use Infobip's ENUM interface for HLR lookups.

CONNECTIVITY

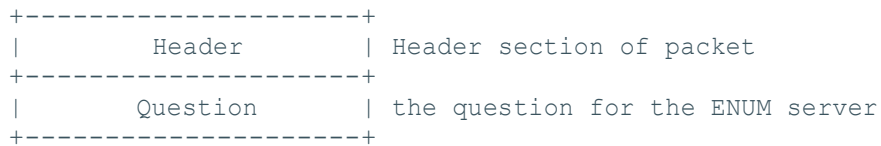
To enable connectivity between Infobip ENUM interface and Client system the client needs to provide a list of IP addresses which will be whitelisted in Infobip's ENUM system.

TECHNICAL SPECIFICATION

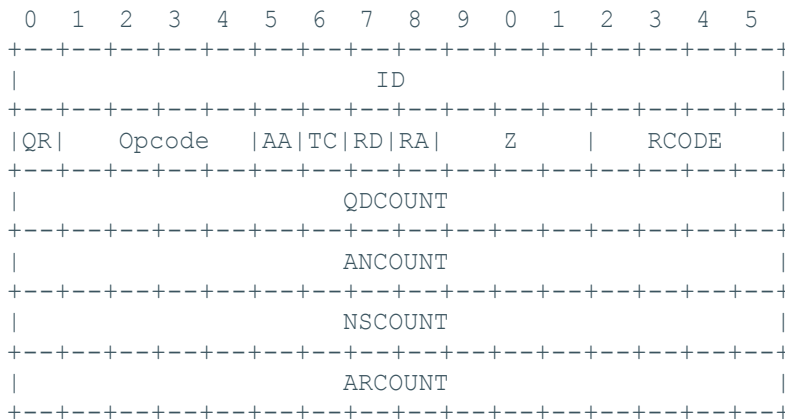
Valid format for ENUM server query

There are requirements that each ENUM query must fulfil, so **QTYPE** in ENUM query must be **NAPTR** and there are additional restrictions to ENUM query parameters that must be complied so that query is not rejected by ENUM server.

ENUM query packet format:

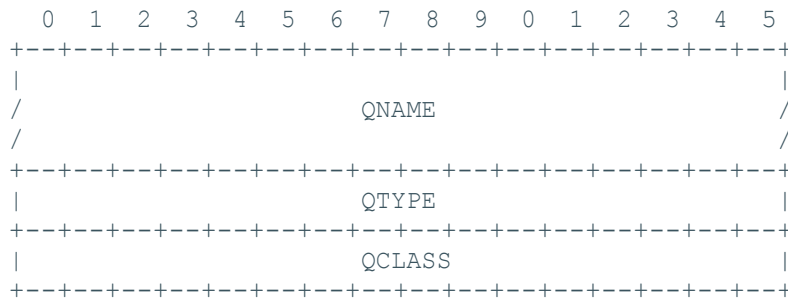


HEADER section of ENUM query packet:



1. **QR** bit must be set to **0** representing DNS query.
2. **Opcode** must be **0** representing a standard DNS query.
3. It is only possible to make one ENUM query per DNS packet, therefore **QDCOUNT** value must be **1**.
4. **ANCOUNT**, **NSCOUNT** and **ARCOUNT** must be **0**.

QUESTION section of ENUM query packet:



1. **QNAME** must be as specified in RFC 3761. It is E.164 number on which first well known rule is applied with mandatory appended Infobip ENUM root (for ex. +442079460148 after applying first well known rule and appending Infobip ENUM root is 8.4.1.0.6.4.9.7.0.2.4.4.infobip.net).
2. **QTYPE** must be NAPTR specified in RFC 2168.
3. **QCLASS** can be any defined in RFC 1035, standard for this service should be the internet class (IN).

Example of Valid ENUM query using dig is:

```
dig naptr 5.4.3.7.1.0.5.1.9.5.8.3.infobip.net @x.x.x.x
```

Where X.X.X.X represents IP address of ENUM server

ENUM server responses

ENUM server response format is compliant to [RFC 1035](#) and [RFC 3761](#) which means that RR that are returned only contain [NAPTR RDATA](#), also ENUM error responses are returned in case of error while processing ENUM query.

ENUM response packet format:

```
+-----+
|      Header      | header section of packet
+-----+
|      Question    | the question from ENUM query
+-----+
| Answer (optional) | RRs answering the question (RR with NAPTR DATA)
+-----+
```

HEADER section of ENUM response:

1. [QR](#) bit is set to **1**, representing DNS response.
2. [RCODE](#) value can be any value as per specification.

QUESTION section of ENUM response packet: It is same as Question in ENUM query that response is for. **ANSWER** section is present in case that there was no error while processing ENUM query request.

ENUM responses in case of error processing ENUM query

In case that ENUM query is successfully processed and HLR query was successful (there was no timeout reached) an ENUM server sends response which contains Answer section. Answer section contains HLR query result in RR for which **RDATA** type is **NAPTR**.

ENUM error response packet format:

```

+-----+
|      Header      | header section of packet
+-----+
|      Question    | the question from ENUM query
+-----+
```

HEADER section of ENUM error response:

1. **QR** bit is set to **1**, representing DNS response.
2. **RCODE** value representing error, zero value in ENUM error response will never be returned.

RCODE values in case of specific error are shown in Table 8.

RCODE value	ERROR CAUSE
Packet discarded	HEADER section parsing error
FORMERR	Any other ENUM query section parsing error
SERVFAIL	Invalid Query
SERVFAIL	Failed sending HLR query
SERVFAIL	Timeout while waiting HLR query response
NXDOMAIN	Invalid E.164 number in ENUM query Validity of E.164. number is checked based on prefix (Country Code and Identification Code of number). List of all valid number prefixes which is updated on daily basis is maintained. In case that number prefix which is submitted via ENUM is not in that list HLR query is not sent to SS7 network and ENUM server responds with NXDOMAIN error.

Table 8. RCODE values for specific errors

ENUM responses in case of successfully processed ENUM query

In case that ENUM query is successfully processed and HLR query was successful (there was no timeout reached) an ENUM server sends response which contains Answer section. Answer section contains HLR query result in RR for which RDATA type is NAPTR.

ENUM successful response packet format:

Header	header section of packet
Question	the question from ENUM query
Answer	RRs answering the question (RR with NAPTR DATA)

RR format:

0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5
NAME															
TYPE															
CLASS															
TTL															
RDLENGTH															
NAPTR															

1. **NAME** represents **RR** name, it same as ENUM query **QNAME**.
2. **TYPE** is same as ENUM query **QTYPE** which is **NAPTR**.
3. **CLASS** default returning class is internet class (**IN**).
4. **TTL** default value is 86400 seconds (24h).
5. **RDLENGTH** represents length in bytes of **NAPTR**

RDATA. NAPTR RDATA values returned by ENUM server are:

Order	10
Preference	100
Flags	"u"
Services	"E2U+pstn:tel"
Regular Expression	"!^.*!tel:\\1\\;hlr=xxxxxx\\;imsi=xxxxxx\\;msc=xxxxxx\\;msisdn=xxxxxx\\;status=xxxx"
Replacement	.

Where:

hlr=xxxxxx	HLR GT which is returned in the HLR response.
imsi=xxxxxx	IMSI which is returned in the HLR response.
msc=xxxxxx	serving MSC GT which is returned in the HLR response (last 4 digits of MSC are not returned because of possibility of SMS Fraud/Spoof using obtained all routing information).
status=xxxxxx	status of HLR query (HLR error code).
Regular Expression	"!^.*!tel:\\1\\;hlr=xxxxxx\\;imsi=xxxxxx\\;msc=xxxxxx\\;msisdn=xxxxxx\\;status=xxxx"

Example of ENUM query response using dig in case of successful HLR query:

```
;; Got answer:
;; ->HEADER<<- opcode: QUERY, status: NOERROR, id: 195
;; flags: qr rd; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 0
;; QUESTION SECTION:
;;5.4.3.7.1.0.5.1.9.5.8.3.infobip.net. IN      NAPTR
;; ANSWER SECTION:
5.4.3.7.1.0.5.1.9.5.8.3.infobip.net. 86400 IN NAPTR 10 100 "u" "E2U+pstn:tel" "!^
.*!tel:\\1\\;hlr=385915017345\\;imsi=219101100165275\\;msc=3859\\;msisdn=38591501734 5\\;status=00
00" .
;; Query time: 546 msec
```

Example of ENUM query response using dig in case of HLR query error:

```
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 1696
;; flags: qr rd; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 0
;; QUESTION SECTION:
;7.0.0.0.6.8.9.5.8.3.infobip.net. IN NAPTR
;; ANSWER SECTION:
7.0.0.0.6.8.9.5.8.3.infobip.net. 86400 IN NAPTR 10 100 "u" "E2U+pstn:tel" "!^.*
!tel:\\1\\;msisdn=38598600007\\;status=0006" .
```