A-Number validation

Using XConnect's data to prevent surcharges from OBR

What is Origin Based Rating (OBR)?

Origin Based Rating (OBR) requires voice operators to be able to take account of not only the B Number (Destination Number) but also the A Number (Calling Line Identity/CLI- which defines the Origin Country) when rating and routing calls.

OBR is increasingly prevalent in the market with more and more Mobile Network Operators (MNOs) imposing OBR based rates for termination.

Typically in OBR rate sheets, invalid A Numbers are charged at the most expensive surcharge rate, which can be over 500 times the standard termination.

A key problem for voice service providers when offering OBR based pricing is therefore the ability to identify calls with 'Invalid A Numbers' and either block them, or charge at the correct rate.

The XConnect A Number Validator is a simple to implement solution which allows voice SPs to offer OBR based pricing, while being protected from unexpectedly high termination costs and resultant disputes and loss of margin.

The following document focuses on the A Number Validator, which is a real-time query solution to detecting invalid A Numbers using the XConnect Global Number Range (GNR) dataset.

Customers can also download the GNR dataset for integration into their own solutions or work with one of our partners who have the service integrated into their platforms.

Section Two

A Number Validator overview

The A Number Validator is designed to detect Invalid A Numbers via real-time query against the XConnect Global Number Range (GNR) database.

The XConnect GNR database provides a comprehensive list of global valid E.164 number ranges, including min/max digit length and allocation status, and is continually updated by XConnect's number management teams.

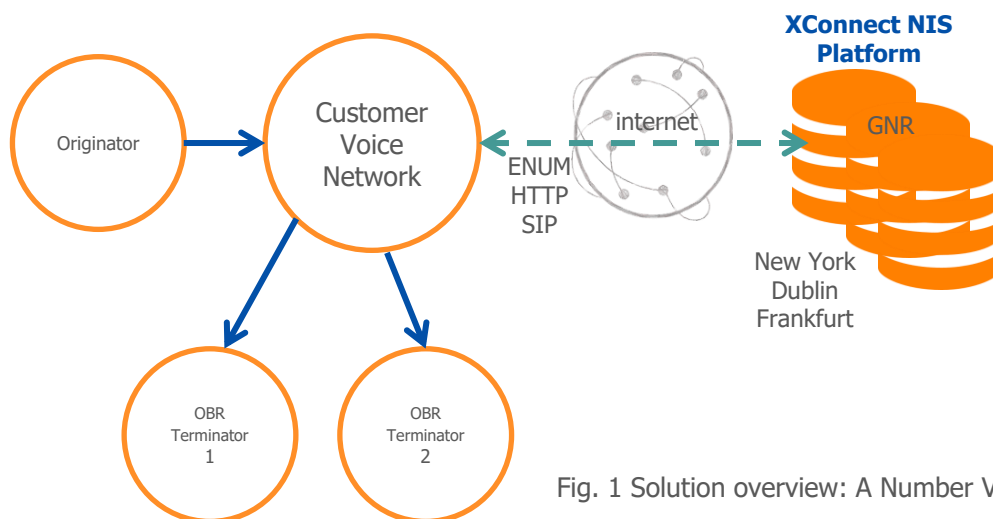Figure 1 below shows an overview of the solution.

Fig. 1 Solution overview: A Number Validator

Voice customers wanting to validate A numbers for OBR based calls 'connect' their voice network to an XConnect PoP (New York, Dublin or Frankfurt) via the public Internet (note multiple PoPs can be connected to provide geographic resilience and minimise latency).

For every call which requires A Number validation, the customer voice network sends a query, containing the A Number to be validated, to an XConnect PoP.

Queries can be sent via ENUM, HTTP or SIP protocols and the flows are shown later in this document.

The XConnect PoP will check the A Number against the GNR database and return a valid/invalid response allowing the customer to reject the call, or continue to terminate and bill correctly depending on their routing and service requirements.

Availability, latency and support

The XConnect service has been designed to be 'carrier class' to support real-time, mission critical traffic.

The solution is used by leading industry providers and handles billions of queries per month of traffic for both voice and messaging service providers.

XConnect's service metrics include:

- **Sub 15ms response times for all GNR queries**
- **99.99% service availability (when connecting to two PoPs)**
- **24/7/365 service monitoring and customer help desk — with 1 hour response time**

> Smaller carriers that are only carrying a few thousand dollars of transit traffic per month can incur losses of
> # $100,000
> per month

Section Three
Connecting to the Validator via SIP

XConnect offers the ability to check A Number validation via SIP.

This solution has been designed to provide a simple way for voice service providers to validate A Numbers without the need for a separate ENUM or HTTP query (although these are also an option for customers if required), and therefore minimises any development and operational impact at the customer end.

SIP Validation – Valid A Number

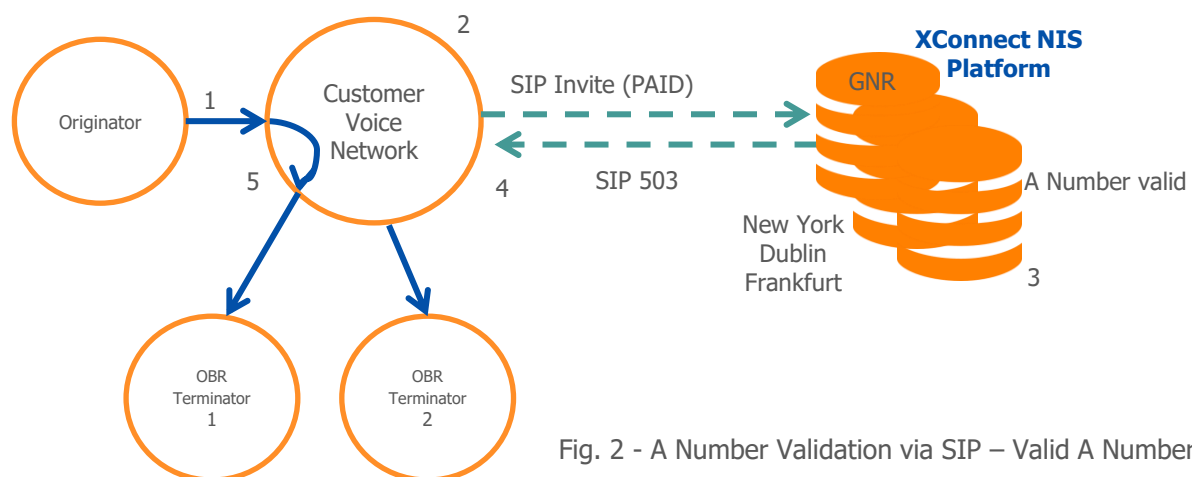Figure 2 below shows the call flow for A Number validation via SIP for a Valid A Number.

Fig. 2 - A Number Validation via SIP – Valid A Number

Customers connect to the XConnect platform using a standard SIP interconnect (i.e. the NIS platform appears as a standard SIP terminator to the customer network), however the Validator will never terminate a call.

The NIS SIP trunk is placed in first choice above the LCR terminators for any destination where the customer wants to validate the A Number. (i.e. where OBR terminator 1 is the first choice for terminating traffic, and OBR terminator 2 is second choice, the NIS Validator will be placed in first choice above these two terminators).

The NIS Validator, is agnostic to destinations and only looks at the A Number, and could therefore be placed in route for all destinations if required.

An example call flow for a valid A Number would be:

1. A call is received from an originator trunk.

2. The destination of the call is an OBR destination and the NIS Validator is placed into first choice in routing. A standard SIP Invite is sent to the NIS Validator containing the PAID header.

3. The contents of the PAID header are checked against the GNR database. Checking includes:

    a. Conforming to E.164 format (e.g. no letters or characters)

    b. Correct Number length (min-max check)

    c. The A Number is within a range positively allocated to a Service Provider.

    d. Note – only the PAID header is checked, not the FROM address.

4. In this case the A Number in the PAID header is valid, a SIP 503 (Service Unavailable) is returned to the customer network.

5. On receiving the SIP 503, the customer network 'second choices' to the preferred terminator for the OBR destination, and the call continues.

Connecting to the Validator via SIP

SIP Validation – Invalid A-Number

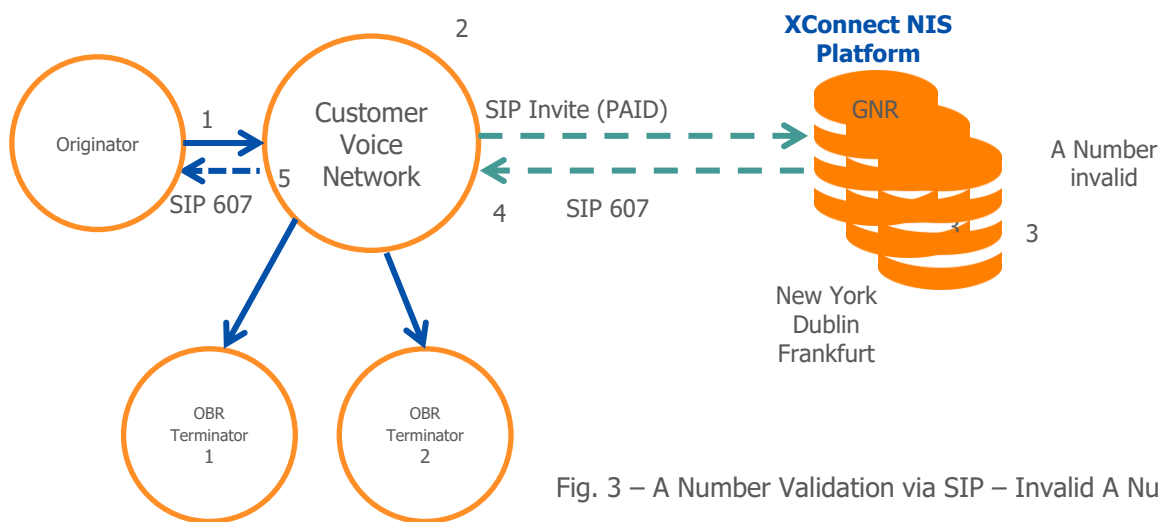Figure 3 below shows the call flow for A Number validation via SIP for an invalid A Number.

Fig. 3 – A Number Validation via SIP – Invalid A Number

1. A call is received from an Originator trunk.

2. The destination of the call is an OBR destination and the NIS Validator is placed into first choice in routing. A standard SIP Invite is sent to the NIS Validator containing the PAID header.

3. The contents of the PAID header are checked against the GNR database. Checking includes:

    a. Conforming to E.164 format (e.g. no letters or characters)

    b. Correct Number length (min-max check)

    c. The A number is within a range positively allocated to a Service Provider.

    d. Note – only the PAID header is checked, not the FROM address.

4. In this case the A Number in the PAID header is Invalid, a SIP 607 (Unwanted) is returned to the customer network.

5. On receiving the SIP 607, the customer network 'drops the call back' to the Originator trunk with a SIP 607, and the call is dropped.

Possible customisations for SIP Validation

XConnect is happy to consider alternate 'customised' implementations which may make integration into a specific customer network simpler.

XConnect's Sales and Engineering teams work with our customers to understand, specify and scope out any customisations required, and provide an estimate of effort and timeframe to deliver.

These could include:

- Different SIP response codes for 'Valid' and 'Invalid'.

- Modifications to the rules of what is 'Valid' and 'Invalid'.

- Customised blocking based on PAID Header. Screening A Number countries to reject 'high cost' originations countries.

- Returning SIP 302 with a new contact address depending on A and B Number validity, origin and destination.

- Screening destination numbers against GNR as part of fraud prevention.

Connecting to the Validator via ENUM or HTTP

Customers who don't want to use the SIP method of validating A Numbers, have the option of accessing the Validator via ENUM or HTTP.

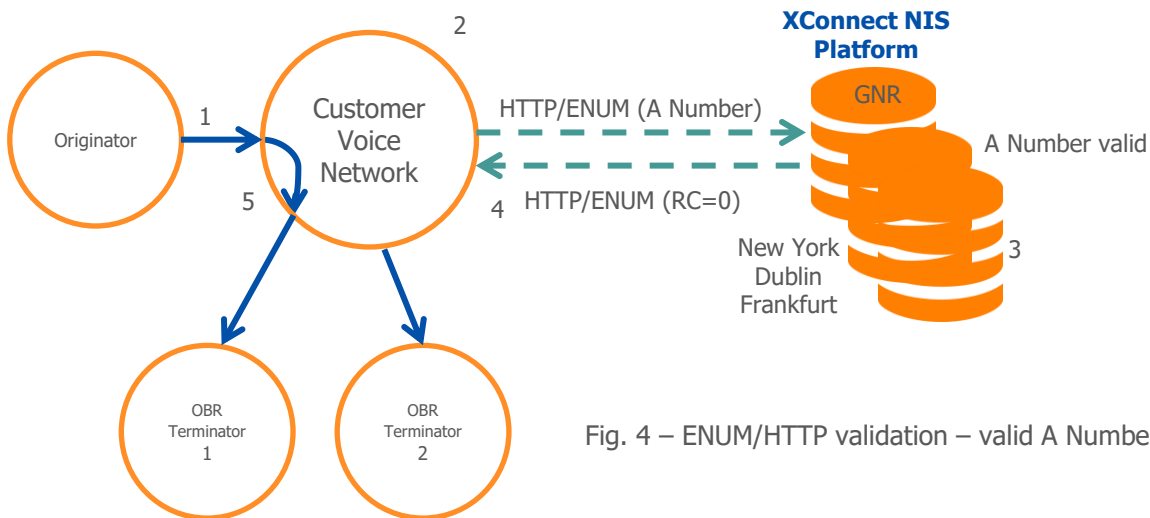Figure 4 and Figure 5 below show the flows for Valid and Invalid A Numbers when using ENUM or HTTP.

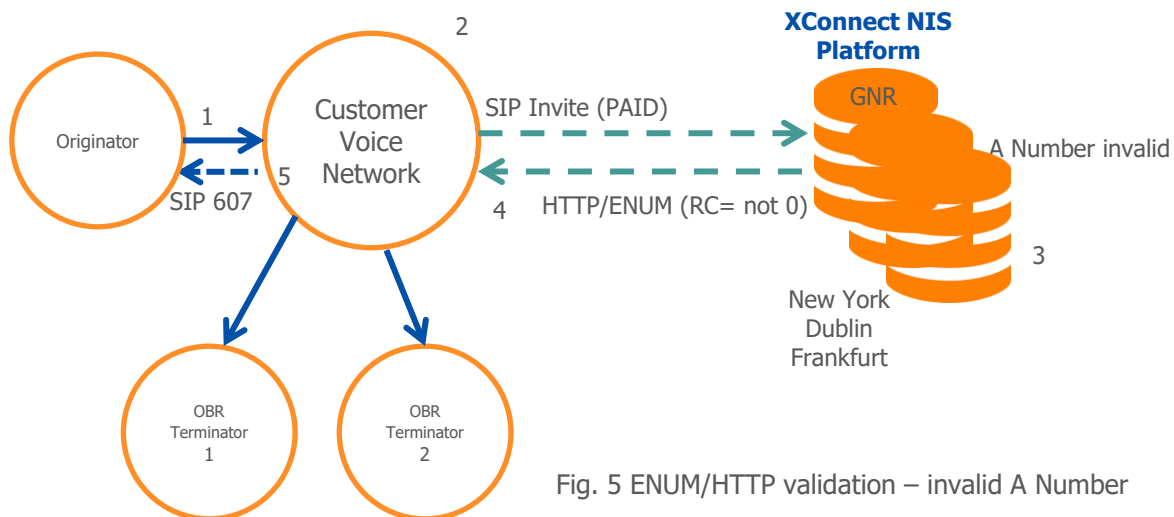Fig. 4 – ENUM/HTTP validation – valid A Number

Fig. 5 ENUM/HTTP validation – invalid A Number

Note that the only differences between the SIP and ENUM/HTTP cases are:

- The customer needs to be able to extract the A Number from the PAID header (exactly) and place that into the HTTP/ENUM query as the number to be checked. (Note: using the FROM Address would not validate the A Number as far as the MNO terminators are concerned).
- The response back from the NIS Validator comes in the form of a Reason Code (RC), where RC=00 means that the number is valid, and RC= anything else means that the number is invalid.

XConnect Sales and Engineering teams will provide a full set of ENUM and HTTP interface documents if customers are interested in this access method.

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