

Internet2 ENUM (NRENUM.net) implementation

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ENUM Cookbook

Internet2 ENUM (NRENUM.net) implementation
based on Broadsoft Broadworks VoIP solution platform.

Contents

This cookbook is based on the assumption on the following assumptions:

- Working Broadsoft Broadworks solution (Clearspan, network server, Opeasy)
- Working Acme SBC

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Introduction

This paper will describe the basics and benefits of ENUM and implementation on a VoIP enabled network based on the Broadsoft Broadworks solution. Providing the VoIP operators to link the world of telephony with the world of the Internet.

Overview

ENUM is a standard protocol that is the result of work of the Internet Engineering Task Force's (IETF's) Telephone Number Mapping working group. ENUM combines telephone numbers and the Domain Name System to simplify the way that VoIP calls (telephone calls made over the Internet) work. It allows more VoIP calls to be connected directly over the Internet, for no charge, rather than via the traditional PSTN network. ENUM translates a telephone number into a domain name. This allows users to continue to use the existing phone number formats they are familiar with, whilst allowing the call to be routed using DNS. This makes ENUM a quick, stable and cheap link between telecommunications systems and the Internet.

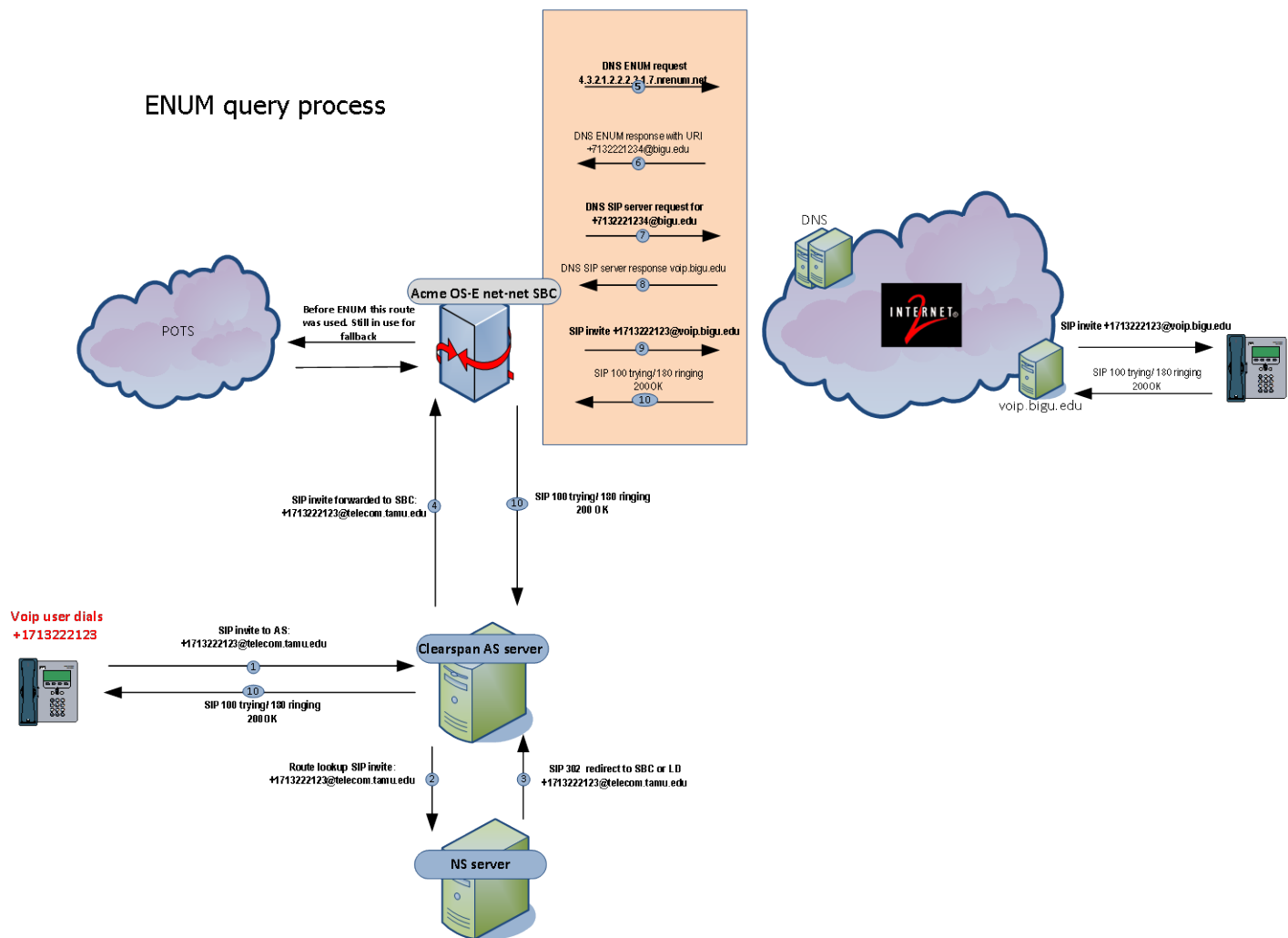
About ENUM and NRENum.net

NRENum.net is a global ENUM service for academia (i.e. the research and education community) that uses a private dialing plan. NRENum.net is considered as a complementary service and a valid alternative to the Golden ENUM tree. NRENum.net provides countries, even if the Golden ENUM Tree is not available there, with the possibility to publish ENUM data. The NRENum.net tree can be queried publicly by anyone but only the registered NRENs of the participating countries can populate the tree.

ENUM enables dynamic user communication

ENUM means major changes in the way we contact one another. The biggest change is that the communication medium is no longer chosen by the person who initiates contact - the caller or message sender - but by the person who takes the message or call. In other words, you can decide how you want to be contacted. It is up to you whether incoming communications arrive as an e-mail, a call to your landline or mobile phone, a text message or a fax. Various combinations are also possible. When someone wants to get in touch with you, all they have to do is select your name from their address book and initiate the contact process. An ENUM application then uses your phone number to retrieve your contact details from the ENUM databases. And the message is delivered in the form that you - the recipient - have specified. The unique feature of ENUM is that you define your contact preferences and combine the various options in the way that suits you. You might choose to have all your e-mails delivered to your mobile as text messages or for voice-mail messages to arrive as e-mails. So communication no longer depends on where you are or what platform (phone, Internet, PDA) you are using. ENUM can also be used to make settings or preferences available to applications. This is useful mainly to organizations that are looking for a standard that will enable them to make the most of their applications.

ENUM Diagram



Implementation

The following section will describe the implementation of ENUM in your VoIP enabled network.

This cookbook is written and tested, based on the following platform:

- Broadsoft Broadworks VoIP solution (Clearspan AS + network server) version 19
- OPEASY application software version 3.6.1.5238
- Acme session border controller NET-NET OS-E sw version E3.7.0M1P0 (Virtual-server version)

This cookbook is based on the following assumptions:

- Working Broadsoft Broadworks solution (Clearspan AS, network server, Opeasy)
- Working Acme SBC Net-Net OS-E with connections to DNS servers and working media.

Summary of steps:

- ENUM and DNS
- Configure Broadsoft Broadworks network server
- Configure Session Acme Net-Net OS-E Session Border Controller

-

ENUM and DNS

Howto participate in NRENUM.net?

The following actions need to be taken:

- Configure campus DNS servers
- Allocate phone numbers to be published by Internet2

Configure campus DNS servers

A name of Authority Pointer (NAPTR) records and Service Records (SRV) need to be configured. Please check url for the correct syntax: http://en.wikipedia.org/wiki/NAPTR_record

Allocate phone numbers to be published by Internet2

In North-America +1 (1.nrenum.net) is delegated to Internet2. Internet2 publishes the “phone number domain names” for all NRENUM.net participants. For example : 8.5.4.9.7.9.1.nrenum.net

For example in case of the Texas A&M Universtiy the following domains are added:

8.5.4.9.7.9.1.nrenum.net
5.4.8.9.7.9.1.nrenum.net
7.4.8.9.7.9.1.nrenum.net
2.6.8.9.7.9.1.nrenum.net

DNS requests for domain 8.5.4.9.7.9.1.nrenum.net will be forwarded to the Texas A&M campus DNS and the following NAPTR record will resolve the request for phone number +19794585454 with the SIP URI sip:19794585454@voip.tamu.edu

```
$ORIGIN 8.5.4.9.7.9.1.nrenum.net.4.5.4.5 NAPTR 100 10 "u" "E2U+sip" "!^(.*)$!sip:\\19794585454@voip.tamu.edu!" .
```

Contact information Internet2

Send the delegation request with the “ phonenumbers domains” to: video-support@internet2.edu.
For additional information please contact Ben Fineman bfineman@internet2.edu.

Internet2 ENUM (NRENUM.net) implementation

Populate/ update Campus DNS NAPTR records

OPEASY

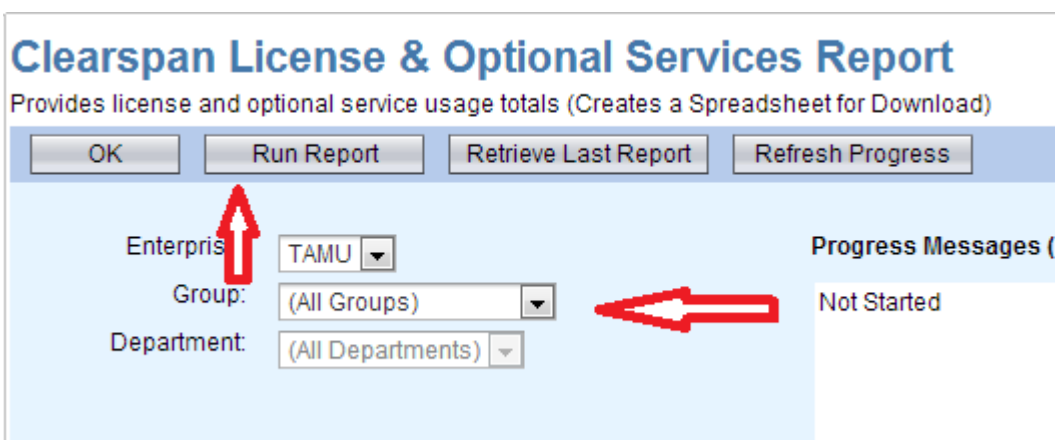
OPEASY is used to generate a list with all active phone numbers.

Export phone numbers to CSV file

- a. connect to OPEASY
select System License Report



- a. select Group (All groups) and Run report



Internet2 ENUM (NRENUM.net) implementation

Refresh Progress every 1 minutes (report will take apprx. 4min)
When message is Report Complete> Retrieve Last Report

Retrieve Last Report Refresh Progress

Progress Messages (Press Refresh Progress to update)

- >> Report Complete - Had Errors (see the ReportErrors column in the report)
- >> Writing System Resources Worksheet
- >> Writing Services Worksheet
- >> Writing Group Licenses Worksheet
- >> Writing User Licenses Worksheet
- >> Creating the Report Spreadsheet File
- >> Getting System Resource Information
- >> Getting System License Information
- >> Processed 5681 Users
- >> - Processed 5600 Users...
- >> - Processed 5400 Users...
- >> - Processed 5200 Users...
- >> - Processed 5000 Users...
- >> - Processed 4800 Users...
- >> - Processed 4600 Users...
- >> - Processed 4400 Users...
- >> - Processed 4200 Users...

gin report processing.
te Progress details
t the completed file

b. click Retrieve Last Report and open this file in Excel

Clearspan System License Report

Provides system licensing information (Creates a Spreadsheet for)

OK Run Report Retrieve Last Report

c. Select TAB Premium users and copy only Colom E
Remove titles
Use data filter and select NO blanks
Copy all row data to new xls file
Remove +1- with the CTRL + H by leaving it blank
Add @voip.tamu.edu in second Colom, use END arrow down to go to the end
Save file as CSV file as importfile and finally remove ", " with CTRL + H by leaving it blank

Output example:

```
19794589160@voip.tamu.edu  
19794580465@voip.tamu.edu  
19798627135@voip.tamu.edu  
19794580454@voip.tamu.edu  
19794583605@voip.tamu.edu
```


Internet2 ENUM (NRENUM.net) implementation

- d. `run script` on a linux server, [see script below](#)

```
# vi importfile{currentdate} and paste all data from CSV file
```

```
Run script enumconvert.sh
```

```
./enumconvert.sh inputfile{currentdate} > outputfile{currentdate}
```

```
Vi outputfile{currentdate} and check format
```

Ouput example:

```
1979458046, 19794580465@voip.tamu.edu
```

```
1979862713, 19798627135@voip.tamu.edu
```

```
1979458045, 19794580454@voip.tamu.edu
```

```
1979458360, 19794583605@voip.tamu.edu
```

```
1979458368, 19794583680@voip.tamu.edu
```

```
1979458492, 19794584928@voip.tamu.edu
```

```
1979458040, 19794580408@voip.tamu.edu
```

Script

Use this script for converting the CSV file.

```
=====
#!/bin/bash
#
#
# usage: `convert.sh inputfilename > outputfilename`

INPUT=$1

while read line
do
echo "1${line:0:1}${line:1:1}${line:2:1}${line:3:1}${line:4:1}${line:5:1}${line:6:1}${line:7:1}${line:8:1}${line:9:1}, $line"
done < $INPUT
=====
```

Configure Broadworks network server

Configuration can be done through CLI or WebGUI:

- Broadworks network server ENUM setup - WebGUI
- Broadworks network server ENUM setup - CLI

Broadworks network server ENUM setup – WebGUI

Follow these 4 steps:

1. Create new Hosting network element (HostingNE)
2. Create HostingNE route match
3. Create route list entry

Create new Hosting network element (HostingNE) for I2 ENUM

- a. Connect to the WebGUI of the network server, login and click *Network*



- b. Click Hosting NE's

BROADSOFT

Administrator, Adm

Network - Hosting NEs

System Provider

Resources

Network

- Carriers
- Carrier Preferred NEs
- Digit Manipulations
- Hosting NEs** ←
- Hosting NE Nodes
- Hosting NE Addr
- Hosting NE Codecs
- Resource NEs
- Resource NE Addr
- Media Server Entries
- Resource NE Codecs
- Routing NEs
- Routing NE Addr
- Routing NE Entries
- Routing NE Codecs

Advanced



click Add

c. Follow the example below (*customer specific*)

Internet2 ENUM (NRENUM.net) implementation

Hosting NE Name: I2_ENUM

* Type: broadworks other

* Cluster Type: primary-secondary load-balancing

* Cluster Capacity: Thousand Users

Provisioning Capable

Call Processing Capable

* Routing Profile:

* Default Synch Enterprise:

* Default Routing Enterprise:

* Default Synch Site:

* Default Routing Site:

* State: On Line Off Line

Poll

* Country Code:

XSP Version Equal

Session Replication Enabled

Signaling Attributes

<input type="checkbox"/> Supports Source ID	<input type="checkbox"/> EntSubLocation Call Category Override
<input checked="" type="checkbox"/> E.164 Compliant	<input type="checkbox"/> Subscriber Location Bypass
<input type="checkbox"/> Forking	<input checked="" type="checkbox"/> Supports NS Reason
<input checked="" type="checkbox"/> Call Type Info Required	<input type="checkbox"/> Requires Network Indication
<input type="checkbox"/> Requires Charge Indication	<input type="checkbox"/> Requires E164 Number

Internet2 ENUM (NRENUM.net) implementation

Create HostingNE route match

- a. Click Network> Hosting NE Addr

BROADSOFT
Administrator, Admin
Network - Hosting NE Addresses

System Provider

Resources

Network

- Carriers
- Carrier Preferred NEs
- Digit Manipulations
- Hosting NEs
- Hosting NE Nodes
- Hosting NE Addr** ←
- Hosting NE Codecs
- Resource NEs
- Resource NE Addr
- Media Server Entries
- Resource NE Codecs
- Routing NEs
- Routing NE Addr
- Routing NE Entries
- Routing NE Codecs

Advanced

- b. Follow the example below (*customer specific*)

Hosting NE Name: I2_ENUM

Node ID: 0

* Address: 165.91.168.166

* Type: Dual Routing Signaling Access Alias

Routing Parameters

* Cost: 1

* Weight: 50

Include Port in Contacts

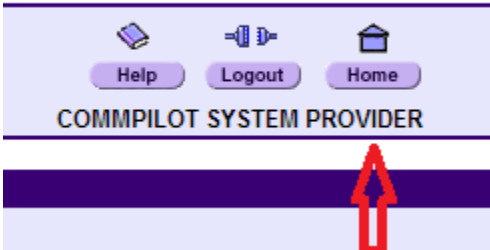
*Port: 49000

Internet2 ENUM (NRENUM.net) implementation

Create route list entries

For International and Domestic Toll calls that are preferred over default LD provider. Make sure that number is converted into E.164 format.

a. select Home



b. select the enterprise in which you want to setup the routes

Enterprise Name	Description
AastraTest	
ENT	Default Hosting Enterprise
I2_Demo	Internet 2 Demo Enterprise
ITEC	ITEC
NIL_ENTERPRISE	Default enterprise
TAMUlab	

Navigation: << first page | < previous | [Page 1 of 1]

Filters: Enterprise Name ▼ | Starts With ▼ |

Internet2 ENUM (NRENUM.net) implementation

c. select Ent NGW Routing



d. add a new route entry for Toll Call and follow the example below (*customer specific*)

The image shows a configuration form for a Toll Call route entry. The form is set against a light blue background. The configuration details are as follows:

- Site ID: DFLT_SITE
- Call Type: Toll Call
- Hosting NE: I2_ENUM
- * Cost: 4
- * Weight: 50
- Digit Manipulation 1: PREPEND (Value: +)
- Digit Manipulation 2: None
- Digit Manipulation 3: None
- Digit Manipulation 4: None
- Digit Manipulation 5: None
- Digit Manipulation 6: None
- Digit Manipulation 7: None
- Digit Manipulation 8: None

Internet2 ENUM (NRENUM.net) implementation

e. add a new route entry for International Call and follow the example below (*customer specific*)

Site ID:	DFLT_SITE	
Call Type:	International Call	
Hosting NE:	I2_ENUM	
* Cost:	4 ▼	
* Weight:	50 ▼	
Digit Manipulation 1:	LEFT TRIM ▼	Value: 011
Digit Manipulation 2:	PREPEND ▼	Value: +
Digit Manipulation 3:	None ▼	
Digit Manipulation 4:	None ▼	
Digit Manipulation 5:	None ▼	
Digit Manipulation 6:	None ▼	
Digit Manipulation 7:	None ▼	
Digit Manipulation 8:	None ▼	

Internet2 ENUM (NRENUM.net) implementation

Broadworks network server ENUM setup – CLI

Follow these 4 steps:

1. Create new Hosting network element (HostingNE)
2. Create HostingNE route match
3. Create route list entry

1. Create new Hosting network element (HostingNE) for I2 ENUM

a. on network server CLI issue bwcli

```
bwadmin@bwns.itec.tamu.edu$ bwcli
```

```
=====
BroadWorks Command Line Interface
  Type HELP for more information
=====
Reading initial CLI command file...
NS_CLI>
```

```
login as administrator:
```

```
NS_CLI> login admin
Password:xxxx
```

b. add element, consists of 3 steps

```
NS_CLI/System/Device/HostingNE> add I2_ENUM hosting TAMUlab TAMUlab DFLT_SITE DFLT_SITE 1 true OnLine
false false primarySecondary 999999 ProvisioningCapable,CallProcessingCapable
```

```
NS_CLI/System/Device/HostingNE> set I2_ENUM Signaling E164Compliant, CallTypeInfoRequired,
NSReasonSupported
```

```
NS_CLI/System/Device/HostingNE> set I2_ENUM type other
```

Internet2 ENUM (NRENUM.net) implementation

c. verify settings

```
NS_CLI/System/Device/HostingNE> get hostNE I2_ENUM
Hosting Network Element I2_ENUM
Type = other
Profile = enterprise
Default Enterprise = TAMUlab
Default Routing Enterprise = TAMUlab
Default Site = DFLT_SITE
Default Routing Site= DFLT_SITE
Poll = false
OpState = enabled
State = OnLine
Signaling Attributes= E164Compliant, CallTypeInfoRequired, NSReasonSupported
Country Code = 1
XSP Version Equal = false
Session Replication Enabled= false
Cluster Type = primarySecondary
User Capacity (thousands) = 999999
Hosting NE Capabilities = ProvisioningCapable, CallProcessingCapable
```

Internet2 ENUM (NRENUM.net) implementation

1. Create HostingNE route match

a. assign the Internal IP address of the Acme Packet Net-Net OS-E SBC and a unique UDP port to the routing table of the NS:

```
NS_CLI/System/Device/HostingNE /Address> add I2_ENUM 0 165.91.168.166 DualRouting 1 50 49000
unspecified
```

b. verify settings

```
NS_CLI/System/Device/HostingNE/Address> get hostNE I2_ENUM
```

Retrieving data... Please wait...

HostingNe	NodeID	Address	type	cost	weight	port	transport
I2_ENUM	0	165.91.168.166	DualRouting	1	50	49000	unspecified

c. show complete routing table

```
NS_CLI/System/Device/HostingNE/Address> get
```

About to access 7 entries. Continue?

Please confirm (Yes, Y, No, N): y

Retrieving data... Please wait...

HostingNe	NodeID	Address	type	cost	weight	port	transport
I2_ENUM	0	165.91.168.166	DualRouting	1	50	49000	unspecified
Level3_HostNE	0	165.91.168.166	Signaling	5	50	48001	udp
Level3_HostNE	0	ssm.itec.tamu.edu	Alias	-	-	-	-
TAMUlabAS	0	165.91.168.162	DualRouting	1	99	5060	udp
TAMUlabAS	0	as	Alias	-	-	-	-
TAMUlabAS	0	bwas.itec.tamu.edu	Alias	-	-	-	-
testguido	0	165.91.168.166	DualRouting	1	50	49002	unspecified

2. Create route list entries

For International and Domestic Toll calls that are preferred over default LD provider.
Make sure that number is converted into E.164 format.

a. add new route for International calls

```
NS_CLI/SubscriberMgmt/Enterprise/Policy/EntNGWRouting/RoutingList> add ITEC DFLT_SITE IN I2_ENUM 4
50 "LTR(011),PRE(+)"
```

Internet2 ENUM (NRENUM.net) implementation

b. add new route Toll free

```
NS_CLI/SubscriberMgmt/Enterprise/Policy/EntNGWRouting/RoutingList> add ITEC DFLT_SITE TO I2_ENUM 4 50 PRE(+)
```

c. verify settings

```
NS_CLI/SubscriberMgmt/Enterprise/Policy/EntNGWRouting/RoutingList> get ITEC  
Policy: EntNGWRouting Enterprise: ITEC Table: RoutingList
```

Site	Call Type	Authorized Host	Cost	Weight	OutDM
DFLT_SITE	{DA}	Level3_HostNE	5	50	
DFLT_SITE	{EM}	Level3_HostNE	5	50	
DFLT_SITE	{IN}	I2_ENUM	4	50	LTR(011),PRE(+)
DFLT_SITE	{IN}	Level3_HostNE	5	50	
DFLT_SITE	{LO}	Level3_HostNE	5	50	DEL(3)
DFLT_SITE	{SV}	Level3_HostNE	5	50	PRE(1)
DFLT_SITE	{TF}	Level3_HostNE	5	50	
DFLT_SITE	{TO}	I2_ENUM	4	50	PRE(+)
DFLT_SITE	{TO}	Level3_HostNE	5	50	

10 entries found.

Configure Session Acme Session Border Controller

SBC – WebGUI setup

Follow these 2 steps:

1. Configure DNS servers
2. Create dial-plan Enum Normalization

1. Configure DNS servers

a. on the SBC main page choose Configuration> VSP> DNS

b. match the following settings (replace DNS with yours)

The screenshot shows the configuration page for a DNS resource named 'resolver'. The page is organized into sections for configuration and management.

Configuration Section:

- admin:** A dropdown menu set to 'enabled' with the note '(Resource is active)'.
- server:** A table listing two DNS servers:

	server	protocol	port	preference	type	name
Edit Delete	server 128.194.254.1	UDP	53	100	both	nrenum.net
Edit Delete	server 128.194.254.2	UDP	53	100	both	nrenum.net
- server-scheme:** A dropdown menu set to 'preference-order' with the note '(Try DNS lookups to the most preferred server)'.
- query-timeout:** A text input field containing '2' with the unit 'seconds(from 1 to 10,default=2)'.
- query-retries:** A text input field containing '2' with the unit '(from 0 to 10,default=2)'.
- cache-poll-interval:** A text input field containing '60' with the unit 'seconds(from 1 to 65,535,default=60)'.
- dead-threshold:** A text input field containing '6' with the unit '(from 1 to 65,535,default=6)'.
- not-available-ttl:** A text input field containing '3600' with the unit 'seconds'.
- use-nnos-domain-in-search:** A dropdown menu set to 'enabled' with the note '(Resource is active)'.
- additional-search-domains:** A link labeled '[Edit additional-search-domains](#)'.
- enum-domain:** A text input field containing 'nrenum.net'.

Management Section:

- host:** [Add host](#)
- service:** [Add service](#)
- naptr:** [Add naptr](#)
- enum-mapping:** [Add enum-mapping](#)
- reject:** [Add reject](#)
- cname:** [Add cname](#)

Internet2 ENUM (NRENUM.net) implementation

c. match the following settings

The screenshot shows a configuration page for 'vsp/default-session-config/dns-client-settings'. On the left is a navigation tree under 'Configuration: all' with tabs for 'Configuration', 'Setup', and 'View'. The tree includes 'cluster', 'box 1', 'vsp', 'default-session-config', 'sip-settings', 'request-uri-specification', 'media', 'dns-client-settings' (highlighted), 'sip-directive', 'accounting', 'log-alert', 'refer-settings', and 'pre-session-config'. The main content area has a title 'Configure vsp/default-session-config/dns-client-settings' and a 'Show advanced' button. Below the title are 'Set', 'Reset', 'Back', and 'Delete' buttons. The configuration table has three rows: 'admin' with a dropdown set to 'enabled' (Resource is active), 'client-timeout' with a text input '2000' and 'milliseconds' label, and 'routing-last-resort-dns' with a dropdown set to 'enabled' (Resource is active). Below the table are 'Set', 'Reset', and 'Back' buttons, and links for 'Help' and 'Index'.

Parameter	Value	Notes
admin	enabled	(Resource is active)
client-timeout	2000 milliseconds	
routing-last-resort-dns	enabled	(Resource is active)

Internet2 ENUM (NRENUM.net) implementation

2. Create dial-plan ENUM normalization

a. on the SBC main page choose Configuration> VSP> dial-plan

normalization	normalization	descripti
Edit Delete	normalization I2 NRENUM	

[Add normalization](#)

b. click Add normalization

c. choose a name

Please provide some basic information for normalization. Then press "Create".

general:

* name


general:

* name	<input type="text" value="ENUM"/>
description	<input type="text"/>
match	* type <input type="text" value="default"/>
priority	<input type="text" value="100"/> (from 0 to 999,999,default=100)
condition-list	Configure
condition-list-match-secondary	<input type="text" value="false"/>

d. add condition list

Configure vsp/dial-plan/normalization ENUM [Help](#) [Index](#)

general:

* name	<input type="text" value="ENUM"/>
description	<input type="text"/>
match	* type <input type="text" value="default"/>
priority	<input type="text" value="100"/> (from 0 to 999,999,default=100)
condition-list	Configure 
condition-list-match-secondary	<input type="text" value="false"/>

Internet2 ENUM (NRENUM.net) implementation

operation	AND ▼
mode	evaluate ▼ (The Net-Net OS-E runs the conditions to determine whether to apply session configuration settings.)
sip-message-condition	Add sip-message-condition 
from-uri-condition	Add from-uri-condition
to-uri-condition	Add to-uri-condition
request-uri-condition	Add request-uri-condition
date-time-condition	Add date-time-condition
named-variable-condition	Add named-variable-condition

e. match the following

Configure vsp\dial-plan\normalization I2_NRENUM\condition-list\sip-message-condition

Set

Reset

Back

Delete

* attribute	local-port ▼
* match	eq ▼ (allow values which match the specified expression)
* local-port	49000 (at minimum 1)

Set

Reset

Back

[Help](#) [Index](#)

f. next match the following items

admin	enabled ▼ (Resource is active)
apply-to-headers	<input checked="" type="checkbox"/> request-uri <input checked="" type="checkbox"/> to-header <input type="checkbox"/> from-header Select All Unselect All
alter-tel-scheme	yes ▼ (alter TEL scheme to SIP scheme)
enum-operation	enabled ▼ (Resource is active)


Internet2 ENUM (NRENUM.net) implementation

g. add enum-server

Configure vsp/dial-plan/normalization ENUM [Show advanced](#) [Help](#) [Index](#)

[Set](#) [Reset](#) [Back](#) [Copy](#) [Delete](#)

general:	
* name	ENUM <input type="text"/>
description	<input type="text"/>
match	* type <input type="text" value="default"/>
priority	100 (from 0 to 999,999,default=100)
condition-list	Configure
condition-list-match-secondary	false <input type="text"/>

other properties:	
admin	enabled <input type="text"/> (Resource is active)
apply-to-headers	<input checked="" type="checkbox"/> request-uri <input type="checkbox"/> to-header <input type="checkbox"/> from-header <hr/> Select All Unselect All
alter-tel-scheme	no <input type="text"/> (Do not alter TEL scheme to SIP scheme)
enum-operation	disabled <input type="text"/> (Resource is inactive)
enum-server	Add enum-server 
synchronize-phone-group	type <input type="text" value="no"/> (Do not synchronize phone numbers in the same group)

h. set nrenum.net

Please provide some basic information for enum-server. Then press "Create".

* server-name	<input type="text"/>
* domain-name	<input type="text"/>
Create Reset Cancel	

Internet2 ENUM (NRENUM.net) implementation

i. verify settings with following output

general:																					
* name	<input type="text" value="i2_NRENUM"/>																				
description	<input type="text"/>																				
match	* type <input type="text" value="condition-list"/>																				
priority	<input type="text" value="90"/> (from 0 to 999,999, default=100)																				
+ condition-list [Delete]	<table><tr><td>operation</td><td><input type="text" value="AND"/></td></tr><tr><td>mode</td><td><input type="text" value="evaluate"/> (The Net-Net OS-E runs the</td></tr><tr><td>sip-message-condition</td><td><table><tr><td><input type="text"/></td><td><input type="text" value="attribute"/></td></tr><tr><td>Edit Delete</td><td>local-port eq 49000</td></tr></table> Add sip-message-condition</td></tr><tr><td>from-uri-condition</td><td>Add from-uri-condition</td></tr><tr><td>to-uri-condition</td><td>Add to-uri-condition</td></tr><tr><td>request-uri-condition</td><td>Add request-uri-condition</td></tr><tr><td>date-time-condition</td><td>Add date-time-condition</td></tr><tr><td>named-variable-condition</td><td>Add named-variable-condition</td></tr></table>	operation	<input type="text" value="AND"/>	mode	<input type="text" value="evaluate"/> (The Net-Net OS-E runs the	sip-message-condition	<table><tr><td><input type="text"/></td><td><input type="text" value="attribute"/></td></tr><tr><td>Edit Delete</td><td>local-port eq 49000</td></tr></table> Add sip-message-condition	<input type="text"/>	<input type="text" value="attribute"/>	Edit Delete	local-port eq 49000	from-uri-condition	Add from-uri-condition	to-uri-condition	Add to-uri-condition	request-uri-condition	Add request-uri-condition	date-time-condition	Add date-time-condition	named-variable-condition	Add named-variable-condition
operation	<input type="text" value="AND"/>																				
mode	<input type="text" value="evaluate"/> (The Net-Net OS-E runs the																				
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from-uri-condition	Add from-uri-condition																				
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request-uri-condition	Add request-uri-condition																				
date-time-condition	Add date-time-condition																				
named-variable-condition	Add named-variable-condition																				
condition-list-match-secondary	<input type="text" value="false"/>																				
other properties:																					
admin	<input type="text" value="enabled"/> (Resource is active)																				
apply-to-headers	<input checked="" type="checkbox"/> request-uri <input checked="" type="checkbox"/> to-header <input type="checkbox"/> from-header <input type="button" value="Select All"/> <input type="button" value="Unselect All"/>																				
alter-tel-scheme	<input type="text" value="yes"/> (alter TEL scheme to SIP scheme)																				
enum-operation	<input type="text" value="enabled"/> (Resource is active)																				
enum-server	<table><tr><td><input type="text"/></td><td><input type="text" value="enum-server"/></td><td><input type="text" value="domain-name"/></td></tr><tr><td>Edit Delete</td><td>enum-server nrenum.net</td><td>nrenum.net</td></tr></table> Add enum-server	<input type="text"/>	<input type="text" value="enum-server"/>	<input type="text" value="domain-name"/>	Edit Delete	enum-server nrenum.net	nrenum.net														
<input type="text"/>	<input type="text" value="enum-server"/>	<input type="text" value="domain-name"/>																			
Edit Delete	enum-server nrenum.net	nrenum.net																			
synchronize-phone-group	type <input type="text" value="no"/> (Do not synchronize phone numbers in the same group)																				
apply-to-methods	<table><tr><td><input type="checkbox"/> INVITE</td></tr><tr><td><input type="checkbox"/> REFER</td></tr><tr><td><input type="checkbox"/> MESSAGE</td></tr><tr><td><input type="checkbox"/> INFO</td></tr></table> <input type="button" value="Select All"/> <input type="button" value="Unselect All"/>	<input type="checkbox"/> INVITE	<input type="checkbox"/> REFER	<input type="checkbox"/> MESSAGE	<input type="checkbox"/> INFO																
<input type="checkbox"/> INVITE																					
<input type="checkbox"/> REFER																					
<input type="checkbox"/> MESSAGE																					
<input type="checkbox"/> INFO																					
request-user	* type <input type="text" value="no"/> (No normalization applied to phone numbers)																				
to-user	* type <input type="text" value="no"/> (No normalization applied to phone numbers)																				
from-user	* type <input type="text" value="no"/> (No normalization applied to phone numbers)																				
normalize-again	<input type="text" value="disabled"/> (Resource is inactive)																				

Internet2 ENUM (NRENUM.net) implementation

Test Enum setup

The following numbers can be used for testing.

TERENA

On Terena website <https://confluence.terena.org/display/NRENum/How+to+participate>

University of Michigan

Call 734-615-7540 or 734-763-0035 (send an email to Pradip Patel ppatel@umich.edu before testing)

nrenum crawler

This crawler searches the NRENUM.NET to discover new published ENUM's phone numbers.

Link: <https://crawler.nrenum.net>



NRENum.net crawler

searching nrenum.net for NAPTR sets

This is a DNS-based crawler which crawls through nrenum.net, the top level domain designated to this ENUM service. Specifically, it looks for NAPTR resource records sets and tries to discover the whole NRENum.net tree.

Status: 172688 ENUM numbers (containing 184813 NAPTR records). Crawling speed: 711 numbers in the last minute.

What is the ENUM crawler?

The ENUM crawler uses certain properties of the nrenum.net namespace to discover all numbers for which ENUM entries (NAPTRs) exist. A full crawling round takes a little longer than a week, currently, so that new numbers should appear after approximately that delay. However, certain nameserver implementations might prevent the crawler to discover all enum-enabled numbers.

top country codes

#	country name	E.164	ENUMs
1.)	Hungary	+36	58350
2.)	Portugal	+351	45833
3.)	Switzerland	+41	31301
4.)	Brazil	+55	10097
5.)	Croatia	+385	7722
6.)	Spain	+34	6904
7.)	North American Numbering Plan	+1	5107
8.)	Argentina	+54	3272
9.)	Australia	+61	1757
10.)	Italy	+39	1278
11.)	Greece	+30	901
12.)	United Kingdom	+44	49
13.)	New Zealand	+64	31
14.)	Netherlands	+31	27
15.)	Latvia	+371	21
16.)	Hong Kong	+852	15
17.)	Belgium	+32	11
18.)	France	+33	8
19.)	Colombia	+57	2
20.)	Poland	+48	1
21.)	Romania	+40	1

recently discovered

- [+54 81111146](#) (13 hours ago, 1 NAPTR)
- [+54 81111145](#) (13 hours ago, 1 NAPTR)
- [+54 81111149](#) (13 hours ago, 1 NAPTR)
- [+54 81111147](#) (13 hours ago, 1 NAPTR)
- [+39 0649623924170](#) (1 day ago, 1 NAPTR)
- [+39 0649623927212](#) (1 day ago, 1 NAPTR)
- [+39 0649623993015](#) (1 day ago, 1 NAPTR)
- [+39 0649623927211](#) (1 day ago, 1 NAPTR)
- [+39 0649623993011](#) (1 day ago, 1 NAPTR)
- [+39 0649623993014](#) (1 day ago, 1 NAPTR)