Introduction to
Local Number Portability:

What VoIP Providers Need to Know

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Why VoIP Service Providers Need Number Portability

- Number Portability Saves Money!

- Number Portability Saves A Lot of Money!
  - Optimizes Least Cost Routing
  - Eliminates costly routing errors
  - Minimizes billing disputes with providers
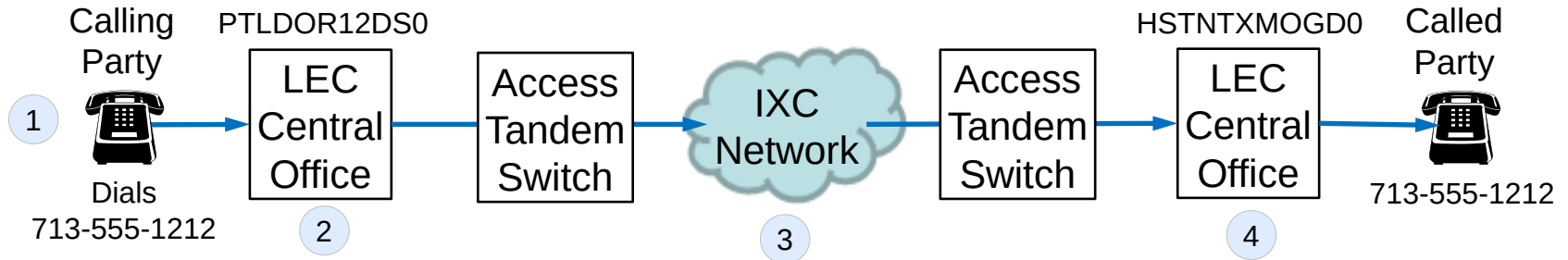 - Enables negotiation for lower termination fees

Telecom Act of 1996

- *Mandates Competition*
- *FCC Action defines:*
  - *Location Portability* 📖 "the ability of users of telecommunications services to retain existing telecommunications numbers without impairment of quality, reliability, or convenience when moving from one physical location to another."
  - *Service Provider Portability* 📖 "the ability of end users to retain the same telephone numbers as they change from one service provider to another."
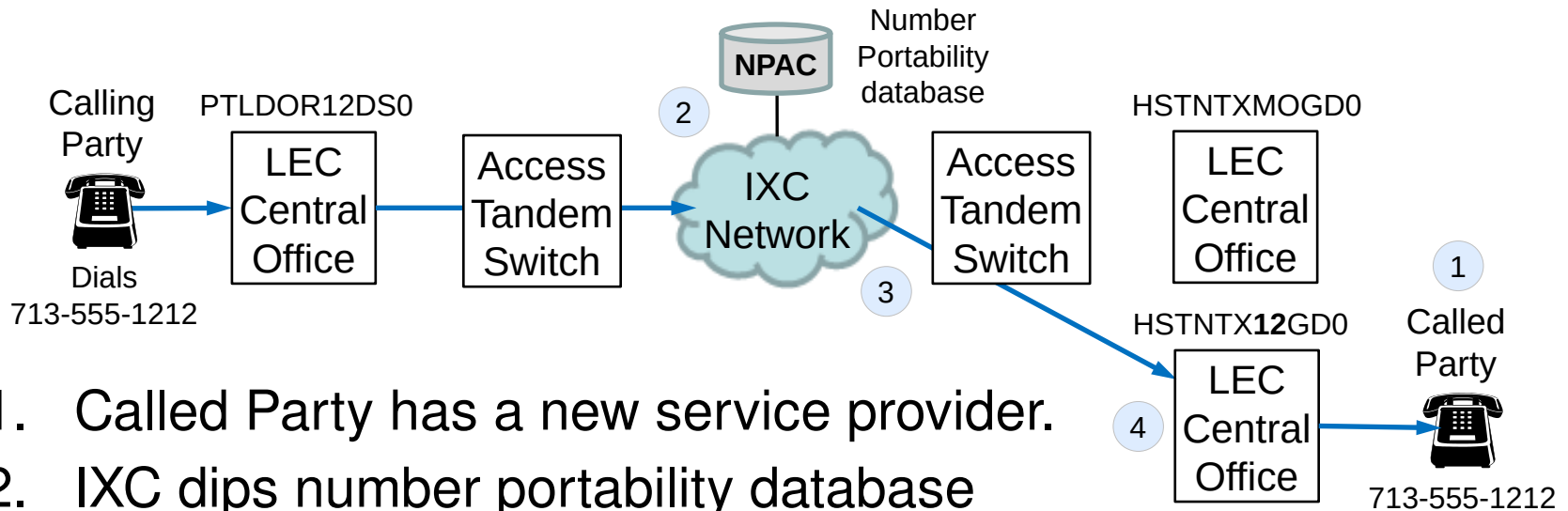
Understanding the LERG

- LERG – Local Exchange Routing Guide
- Directory of dial codes assigned to service providers
  - OCN = Operating Company Number
  - NPA = Area Code, NXX = Central Office Code
  - NPA-NXX-**X** = Thousands Block
  - LATA = Local Access and Transport Area
  - LRN = Location Routing Number (NPA-NXX)
  - SWITCH = 11 character code (CLLI)

LERG or Default Routing

Calling Party — PTLDOR12DS0 — LEC Central Office → Access Tandem Switch → IXC Network → Access Tandem Switch → LEC Central Office — HSTNTXMOGD0 — Called Party

Calling Party Dials 713-555-1212

Called Party 713-555-1212

1. Calling Party calls Houston, TX
2. Local Exchange Carrier (LEC) end office switch routes call to Inter-Exchange Carrier (IXC).
3. IXC uses LERG to find the SWITCH serving 713-555. IXC routes the call to SWITCH HSTNTXMODG0
4. The LEC end office switch serving the Called Party routes the call to subscriber line number 1212

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Routing with Number Portability

Number Portability database

NPAC

Calling Party

PTLDOR12DS0

LEC Central Office

Access Tandem Switch

IXC Network

Access Tandem Switch

HSTNTXMOGD0

LEC Central Office

Called Party

Dials 713-555-1212

HSTNTX**12**GD0

LEC Central Office

713-555-1212

1. Called Party has a new service provider.
2. IXC dips number portability database
   LRN = 713444
3. IXC uses LERG to find the SWITCH serving LRN 713-444. IXC routes the call to SWITCH HSTNTX12DG0
4. The LEC end office switch serving the Called Party routes the call to subscriber line number 555-1212
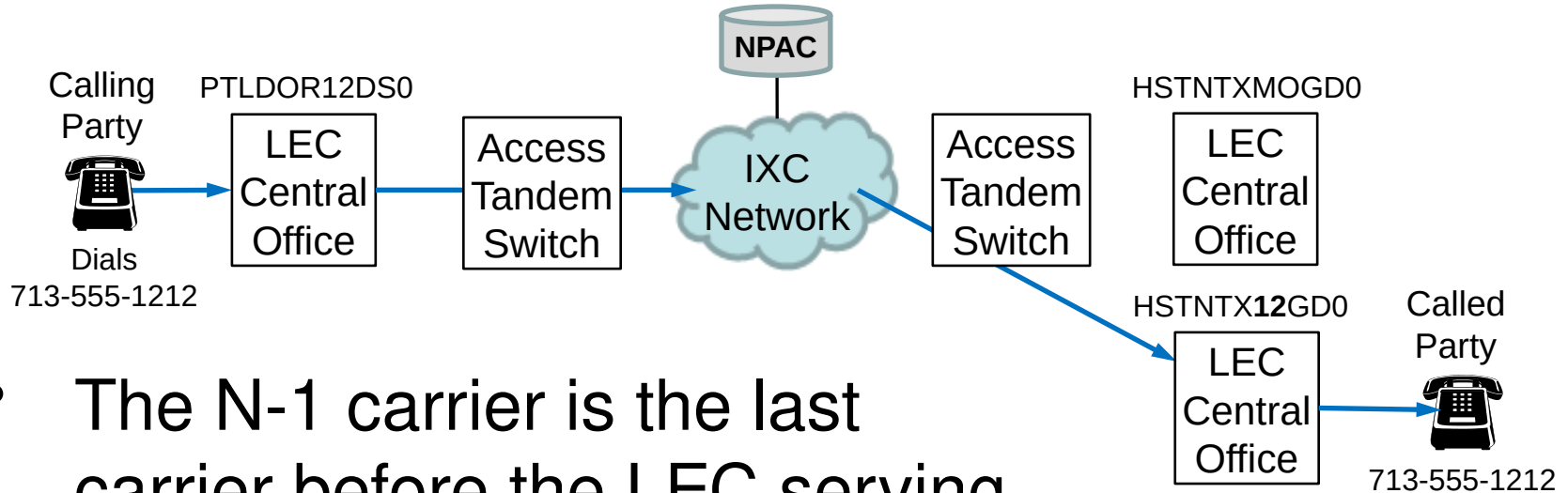
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What is an LRN?

- An LRN is an NPA-NXX
- Operating Companies (OCNs) are assigned number blocks (NPA-NXX) in the LERG
- Each switch (CLLI code) is assigned one or more NPA-NXXs
- The OCN assigns one NPA-NXX to be the LRN for each switch.

Who 'Owns' a Ported Number

- Number blocks are assigned to OCNs
- When a subscriber ports their phone number to a new service provider, the number is still assigned to the original OCN
- No limit on how many times a subscriber can port their telephone number.
- If a subscriber terminates their service, the number 'snaps' back to the original OCN
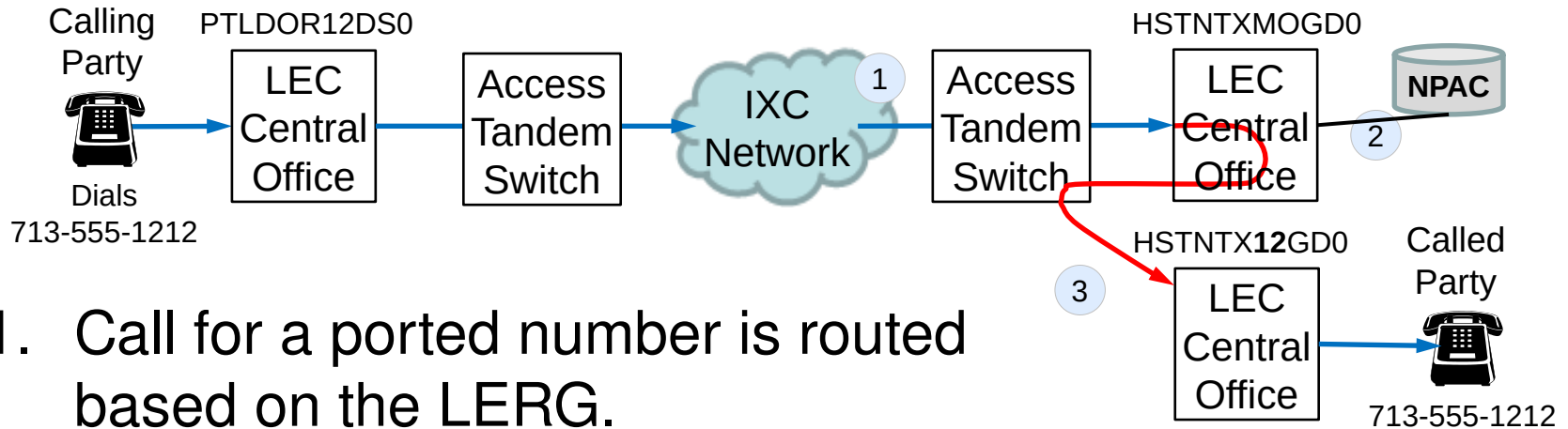
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N-1 Carrier Must Make Portability Dip

NPAC

Calling Party

PTLDOR12DS0

LEC Central Office

Access Tandem Switch

IXC Network

Access Tandem Switch

HSTNTXMOGD0

LEC Central Office

Dials 713-555-1212

HSTNTX**12**GD0

Called Party

LEC Central Office

713-555-1212

- The N-1 carrier is the last carrier before the LEC serving the Called Party.
- The IXC is always the N-1 carrier.
- A wireless carrier is the N-1 carrier for calls from the wireless carrier when an IXC is not used

Default Routing with a Ported Number

Calling Party

PTLDOR12DS0

HSTNTXMOGD0

Dials 713-555-1212

LEC Central Office → Access Tandem Switch → IXC Network → **1** → Access Tandem Switch → LEC Central Office → **2** → NPAC

HSTNTX**12**GD0

3 → LEC Central Office → Called Party 713-555-1212

1. Call for a ported number is routed based on the LERG.

2. No subscriber line for the ported number. LEC performs number portability dip to get the LRN

3. The LEC re-routes the call to the LEC serving the Called Party.

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Default Routing is Not an Option

- Default routing of ported numbers causes significant additional expense
  - Two IXC-LEC trunks are used for nothing
  - Unnecessary additional transport
- LEC will charge N-1 carrier to recover expense
- The FCC allows LECs to block default routed calls

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Why VoIP needs Number Portability

- Most major VoIP terminators provide rates in terms of LATA and OCN – not NPA-NXX.

- Different OCNs have different rates for the same LATA.

- Rates based on OCN, require routing based on LRN, not LERG routing based on the dialed telephone number

LATA	OCN	Jurisdiction	Rate
*	*	INTERSTATE	0.01000
*	*	INTRASTATE	0.01000
120	0003	INTERSTATE	0.02606
120	0003	INTRASTATE	0.01790
120	0004	INTERSTATE	0.01691
120	0004	INTRASTATE	0.01684
120	0005	INTERSTATE	0.02589
120	0005	INTRASTATE	0.01729
120	0007	INTERSTATE	0.02682
120	0007	INTRASTATE	0.04246
120	0010	INTERSTATE	0.01562
120	0010	INTRASTATE	0.02435

VoIP Routing & Number Portability
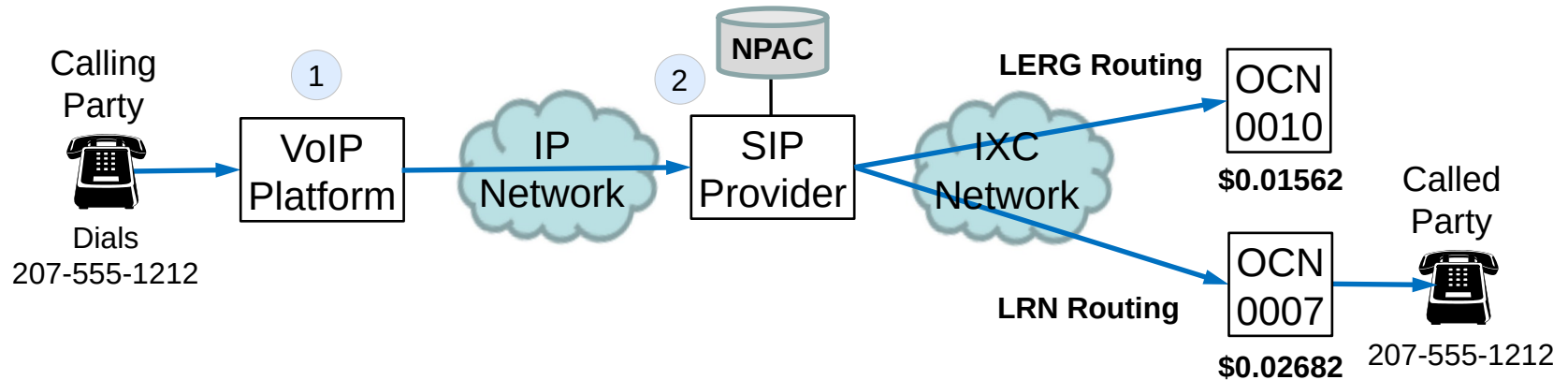
1. Default routing, calls to 207-555 routed to OCN 0010. Rate = $0.01562
2. SIP Provider makes number portability dip. OCN 0007 is assigned to LRN for 207-555-1212. Rate = $0.02682
3. SIP Provider routes call to OCN 0007 and correctly charges **72% more** than what the VoIP provider expects.

Least Cost Routing & Ported Numbers

- Least Cost Routing for calls to ported numbers must be based on the LRN, not the dialed telephone number.

- Calls to Ported Numbers, routed based on the dialed number, will NEVER be routed to the Lowest Cost Route

- If 40% of calls are to ported numbers, then LERG LCR is wrong for 40% of all traffic.

Net Profit Increase Analysis

Percent of Calls with Ported Numbers

	20%	30%	40%	50%	60%
5%	0.94%	1.44%	1.94%	2.44%	2.94%
10%	1.94%	2.94%	3.94%	4.94%	5.94%
15%	2.94%	4.44%	5.94%	7.44%	8.94%
20%	3.94%	5.94%	7.94%	9.94%	11.94%
25%	4.94%	7.44%	9.94%	12.44%	14.94%
30%	5.94%	8.94%	11.94%	14.94%	17.94%

Difference between lowest cost & 2nd lowest cost termination (row axis label)

1) Average termination cost = $0.01 per <u>call</u> (two minute call at $0.005 per minute)
2) Cost per number portability dip - $.0003
3) ASR = 50%
4) Profit would be greater if the benefit of lower rates,due to npdi flag, were included.
5) Profit would be greater if the terminating carrier charges a penalty for mis-routed calls

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One Dip is Enough

- When a Call is "Dipped" the LRN and Dip Indicator are added to the SIP Header.

```
INVITE sip:7065683640;npdi;rn=7068104002@24.13.25.3:5061
SIP/2.0
```
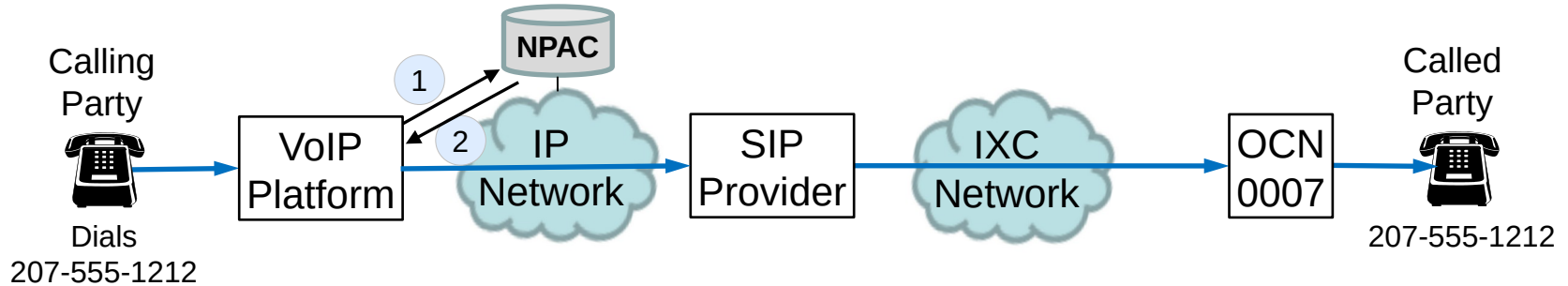
- LRN = RN (Routing Number)
- VoIP providers can negotiate lower termination rates for SIP calls that have been "dipped" and have **npdi** and **rn**.

How to Dip?

Three ways to check if a number has been ported and get the RN (Routing Number)

1. SIP Redirect Message
2. ENUM Query
3. Host the Number Portability database locally

Dips Using SIP

Calling Party — Dials 207-555-1212 → VoIP Platform ⟷ NPAC (1, 2) → IP Network → SIP Provider → IXC Network → OCN 0007 → Called Party 207-555-1212

1. VoIP Platform sends SIP INVITE to Number Portability database
2. Database returns a SIP Redirect Message with the RN (Routing Number) & Number Portability Dip Indicator (npdi)

```
302 Moved Temporarily
Contact:sip:12075551212@neustar.biz;RN=12165350000;npd
i
```
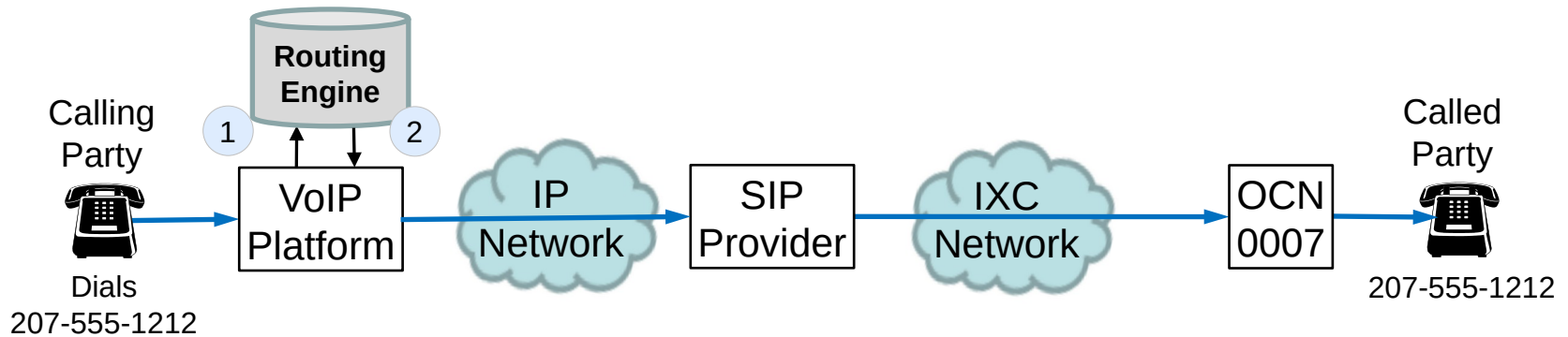
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Dips Using ENUM
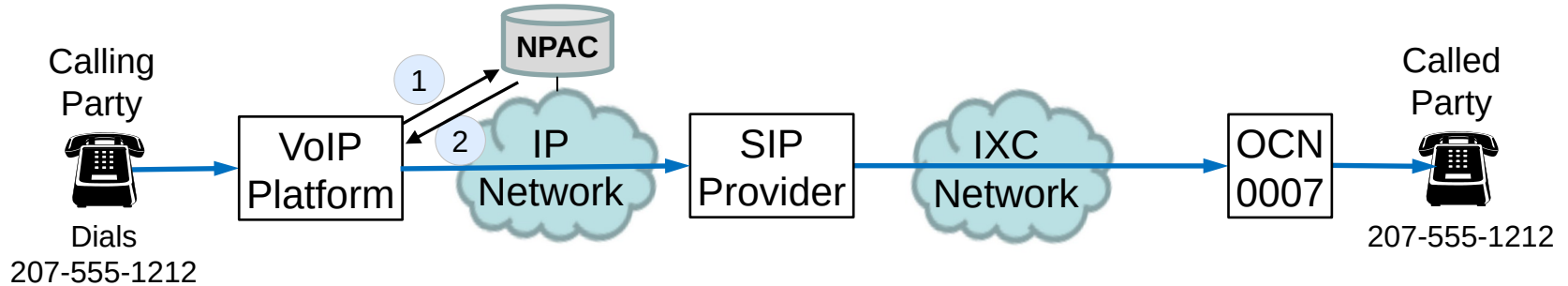
1. VoIP Platform sends ENUM Query to Number Portability database

2. Database returns an ENUM response with the RN (Routing Number) & Number Portability Dip Indicator (npdi)

```
2.1.2.1.5.5.5.7.0.2.1.sipix.biz. 900 IN NAPTR   10 50 "u"
"E2U+pstn:sip" "!^(.*)$!sip:
+1\\1@iottest.com\;RN=+12165350000\;npdi\!"
```

Locally Hosted

1. VoIP Platform queries Routing Engine
2. Routing Engine hosts Number Portability database and performs routing based on Routing Number
3. Routing Engine automatically get periodic updates to the Number Portability database.

Who Manages Number Portability?

- NPAC – The Number Portability Administration Center
- NPAC is operated by NeuStar under contract from the FCC
- Go to www.npac.com to subscribe to Number Portability service.