Multiple Call Opportunities

Alice Calls Bob How? One Way:
- Alice’s UA can set up a SIP trapezoid.
  - Corners: Alice’s phone, Acme SIP Proxy, Hugecorp SIP Proxy, Bob’s phone.
  - Requires:
    » Alice knows how to put bob@hugecorp.com into her phone
    » hugecorp.com sip addresses be in DNS

Alice Calls Bob How? Another Way:
- Alice’s UA can use the PSTN.
  - SIP call to Acme SIP gateway.
  - PSTN call to Hugecorp SIP GW
  - SIP call from Hugecorp SIP GW to Bob’s UA.
  - Requires:
    » Alice knows Bob’s PSTN phone #
    » Bob has DID # or Hugecorp has an operator.
Wait, we have phone numbers…
- We have a nice system of international phone numbers
- One way to design a wide-area VoIP system:
  - Use the dialed phone number to figure out how to make the call
  - This system is called ENUM
- But first, a reminder....

E.164
- E.164 is the ITU standard for int’l dialable telephone numbers.
  - Format:
    - "+ “CountryCode” “NationalNumber”
    - Countries may have substructure within the national number format.
    - Dashes and parentheses are for visual appearance only, are never dialed.
  - Examples:
    - +1 (740)593-4890 for the ITS office
    - +44 771-159-4628 -- a number in the UK
      (don’t call it, I have no idea who owns it)

Enum
- Relates E.164 numbers to IETF URIs.
  - Among other things, see RFCs 2916 and 3761.
- In its simplest form:
  1. Remove non-digits
  2. Insert dots between the digits
  3. Reverse the order
  4. Append e164.arpa
- Our UK number becomes:
  8.2.6.4.9.5.1.1.7.7.4.4.e164.arpa

Now What?
- Let’s call Nemox.net in Innsbruck, Austria
- E.164: +43 5 0234-0
- Enum: 0.4.3.2.0.5.3.4.e164.arpa
- DNS gives: sip:nemox.net@sip.nemox.net
- DNS of sip.nemox.net is: 83.137.41.34
- In short, we started with a phone number and found out what we need to make a SIP phone call.
But Wait, There’s More

• DNS can give us multiple records when we send in the .arpa lookup request.
  • E.g.: send in:
    – 0.4.3.2.0.5.3.4.e164.arpa
  • And get out:
    – mailto:info@nemox.net
    – sip:nemox.net@sip.nemox.net
    – http://nemox.net/
  • Prioritized alternatives for this number.

Nice in Theory, But…

• This is a collaboration of sort between the IETF and the ITU; it is a slow process!
• Only a few countries have started ENUM registrations for public numbers.
• Users need to have their carriers establish registries for their numbers
• Try enumquery.com

Back to Alice and Bob

• Alice’s Proxy would:
  – Convert Bob’s number (let’s say it’s 313-567-1234) to
    4.3.2.1.7.6.5.3.1.3.1.e164.arpa
  – Hit DNS
  – It might return something like this:
    » sip:bob@hugecorp.com
    » tel:+13135671234
  – In effect, this says try sip first, then the PSTN.
  – Set up the call.

Calling Carol
Calling Carol

• In principle, a third party could operate a SIP gateway to the PSTN.
• Non-trivial in practice:
  – PSTN calls aren’t free - billing needed.
  – implies several gateways are best
  (close to the called number is better).
  – Equipment must be bought, maintained.
  – DNS updated as necessary.
  – Several such gateway services exist in conjunction with public SIP servers.

PXB Replacement

• Surely the most common use of SIP.
• In practice:
  – No ENUM mapping.
  – External callers only know phone numbers.
  – Internal users only know phone numbers and extension numbers.
  – Internal users may not register as users, just as phones.
  – Configuration varies vastly!
  – Telephony features vary vastly!

Some Enterprise Possibilities: SOHO
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- If we use our corporate WAN (VPN) for transport, we can extend our ‘sip space’ to any location.
- In the config drawn, all voice traffic goes to the PSTN at HQ.
  - 911 is problematic.
  - Local calls to/from SOHO location are also through HQ – not so good.

Some Enterprise Possibilities: Branch Office

- A branch office can have its own SIP gateway and/or proxy. This allows local traffic to hit the PSTN locally.
- Can have many corporate locations:
  - Route traffic on WAN instead of PSTN.
Service Provision via SIP

• Your service provider can deliver traffic via SIP.
• In this drawing, the SIP ‘triangle’ consists of the AT&T SIP GW, the Acme SIP proxy, and one of the Acme agent phones.