Internet Peering and PSTN Access

Merit VoIP Seminar

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Outline

• It’s all SIP!
• SIP.edu
• ISN
• PSTN Access
Well You Are Using SIP Anyway

- What is SIP
  - IETF Standard defined by RFC 3261
  - “The Session Initiation Protocol (SIP) is an application-layer control (signaling) protocol for creating, modifying and terminating sessions with one or more participants.”

- Can be used for voice, video, instant messaging, gaming, etc., etc., etc.

- Uses URIs for addressing – single communications identity
  - mailto:dbaron@MIT.edu for email
  - xmpp:dbaron@MIT.EDU for instant messaging
  - sip:dbaron@MIT.EDU for voice and video

- Usernames just replaced by numbers for telephone applications
Soft and Hard SIP Clients

• “Hard phones”

• “Soft phones”
Why Phone NUMBERS?

• Users should not be burdened with device addresses, when it’s people they really care about

• Addresses should be mnemonic and empower enterprises to manage the identities of their users

  sip:dbaron@mit.edu

• It’s time to put E.164 phone numbers behind us!

• A.G. Bell did not say:

  “+1-617-252-1232, come here. I need you!”
SIP User Agent

DNS SRV query
sip.udp.bigu.edu

SIP Proxy

INVITE
(sip:bob@bigu.edu)

telephoneNumber
where mail="bob"

Campus Directory

SIP-PBX Gateway

PRI / CAS
bigu.edu

PBX

Bob's Phone
DNS SRV query: sip.udp.bigu.edu

If Bob has registered, ring his SIP phone; Else, call his extension through the PBX.
How to SIP from a 12-key phone?

Old World*

- IP Desk Phones
- Legacy Desk Phones
- Cell Phones
- PSTN

Emerging New World

Solution: numeric aliases

* Transitional period during which we have to support these devices will last a long time!
ITAD Subscriber Numbers (ISN)

- 21232*270
  - locally assigned
  - IP Telephony Administrative Domain (ITAD)

- ITADs
  - Defined by Telephony Routing over IP (TRIP) [IETF RFC3219]
    - Globally unique
    - Lots of them ($2^{32} - 256$)
    - IANA is already set up to allocate

- ISN resolution works just like ENUM
Assigned ITADs (as of 3/15/06)

**Academic**
- Internet2
- Hofstra University
- UCLA
- MIT
- Stanford
- University of Alaska Fairbanks
- University of California, Berkeley
- Florida State University
- University of Manitoba
- University of Oregon
- Royal Institute of Technology
- NE Worcestershire College
- Trent University
- University of North Carolina
- University of Texas, Austin
- Columbia University
- UCSD
- Taiwan Academic Network

**Corporate Enterprises**
- Sterling National Bank
- Apple Computer

**Government**
- State of Oregon

**VoIP Service Providers**
- Free World Dialup
- Stealth Communications
- SIPcall.com
- RCN Corporation
- VolPteq
- SIP Broker

**VoIP Solution Providers**
- Tello
- Iotum
- Digium

**Other**
- BizFu (web hosting)
- Manitoba New Democratic Party
- Packet Clearing House
- +36 others
How Does Peering Work?

Peering

diagrams courtesy of Stealth Communications
Options for PSTN Termination

• May be an evolution or combination of different interconnect options
  – Transit via gateway to campus PBX
  – Direct IP connection to carriers
  – Access via regional or national networks
  – Access via commodity Internet
  – Brokers for peering and PSTN termination

• PSTN-to-VoIP and VoIP-to-PSTN traffic can use different options
Types of Peering Connections

- Direct interconnection at a carrier hotel ("private peering").

- Peering typically done over Layer-2 Fabrics (also known as a NAP or IX).

Diagrams courtesy of Stealth Communications
ENUM for Peering

- IETF RFC 3761
- Single number for multiple services

+1-212-232-2020

- sip: info@stealth.net
- h323: info@stealth.net
- h323: info@stealth.net
- http: www.stealth.net
- ...

Diagrams courtesy of Stealth Communications
ENUM for Peering (cont.)

Query-Response technology

1. User initiates phone call
2. Query sent to ENUM database
3. Routing information (URL) returned
4. If “true”, call established between the organizations

Initiate calls using telephone numbers

diagrams courtesy of Stealth Communications
Broker Example (Arbinet)

Diagram courtesy of Arbinet

Broker Example (Arbinet)
Considerations for Peering

• Things to think about
  – Signaling and media can take separate routes
  – Diversity of paths – failover
  – Quality of service issues
  – Options for flexible services

• And opportunities to consider
  – Disaster recovery options
  – Flexibility in choosing carriers
  – Control routing yourself in real-time
  – Trade minutes like a carrier
Questions?