Peer Nets – reinventing the Internet

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Who’s who…

- Napster (files)
  - Dynamic centralized DNS
  - Pseudo-DNS as resource discovery
  - Corollary focus on local caching
- Gnutella (queries)
  - Resource discovery via application broadcast
- Freenet (files)
  - Resource discovery by application forwarding
  - Corollary focus on local caching
What’s significant: Key issues in peering

- Resource discovery
- *Dynamic location registration*
- Application overlay
  - Forwarding
  - Broadcast
- Object caching
- Automation (configure & participate)
# Peer vs. Net Overlays

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<th>Peer</th>
<th>Network</th>
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<tbody>
<tr>
<td><strong>Addressing</strong></td>
<td>Username</td>
<td>IP address</td>
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<td></td>
<td>Hostname</td>
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<td>Host IP addr</td>
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<td>TCP conn.</td>
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<td><strong>Resource Discovery</strong></td>
<td>Application</td>
<td>Google (out of band) DNS</td>
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<td><strong>Routing</strong></td>
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Peering drivers

- Economics
  - Servers pay
  - Implies ISPs must deny clients ability to become servers
    - DHCP – vary IP address to inhibit DNS
    - NAT – hide IP address to inhibit IP as name

- Static network services
  - Lack of user-accessible dynamic DNS
App. solutions – all about $$

- Allegation – scarce IPv4 addresses result in DHCP and NATs which interfere with user-level servers
  - P2P solution – app-layer resource discovery, app-layer forwarding
- Reality – ISP charging model assumes server pays
  - ISPs defeat user-level servers by denying static IP addrs or denying IP addrs altogether
Observations

- Frameworks enable solutions, but are not *the* solution
  - Apps aren’t enough
  - Open systems (e.g., Jabber) aren’t enough
- Need more automation
  - Configuration
  - Participation
- Need tighter coupling with net layer
To NOT work on: Hazards of Peer Nets

- Integration
  - Freenet + Gnutella = broken routing
- Gateways
  - Apps as hacks to circumvent net hacks
- Recapitulation
  - Split horizon, bcast storms, TTLs, …
To work on:
Open networking

- Dynamic DNS
- App-layer resource discovery
- Net-layer overlay services
- Net-layer limited bcast, mcast, anycast
- User-as-provider charging model for ISPs

- Some enabled by Active Nets, but none solved completely