

# Peer Nets – reinventing the Internet

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# Who's who...

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- 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

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- Resource discovery
- *Dynamic location registration*
- *Application overlay*
  - *Forwarding*
  - *Broadcast*
- Object caching
- Automation (configure & participate)

# Peer vs. Net Overlays

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	<b>Peer</b>	<b>Network</b>
<i>Addressing</i>	Username Hostname Host IP addr TCP conn.	IP address
<i>Resource Discovery</i>	Application	Google (out of band) DNS
<i>Routing</i>	Network Handoff App. forwarding	IP routing

# Peering drivers

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- 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 \$\$

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- 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

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- 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

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- Integration
  - Freenet + Gnutella = broken routing
- Gateways
  - Apps as hacks to circumvent net hacks
- Recapitulation
  - Split horizon, bcast storms, TTLs, ...



# To work on: Open networking

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- 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*