

# P2PI Traffic Localization

---

Yu-Shun Wang

See-Mong Tan

Rich Groves

Microsoft

# Problems with P2P Traffic

---

- Symmetric delivery (peer distribution)  
vs. Asymmetric download (client-server)
- Multiple, concurrent, dynamic connections  
vs. Single, static connection
- Routing at multiple layers (Net, App)  
vs. End-to-end connection at single layer
- Growing content sizes  
→ Capacity is falling behind demand

# Solution Areas

---

- Bandwidth provisioning
- Content optimization for media
  - Codec Optimization
  - Selective dropping with layered encoding
- Signaling & admission control
  - Congestion control
  - Fairness
- Traffic localization & caching ←

# Why Localization

---

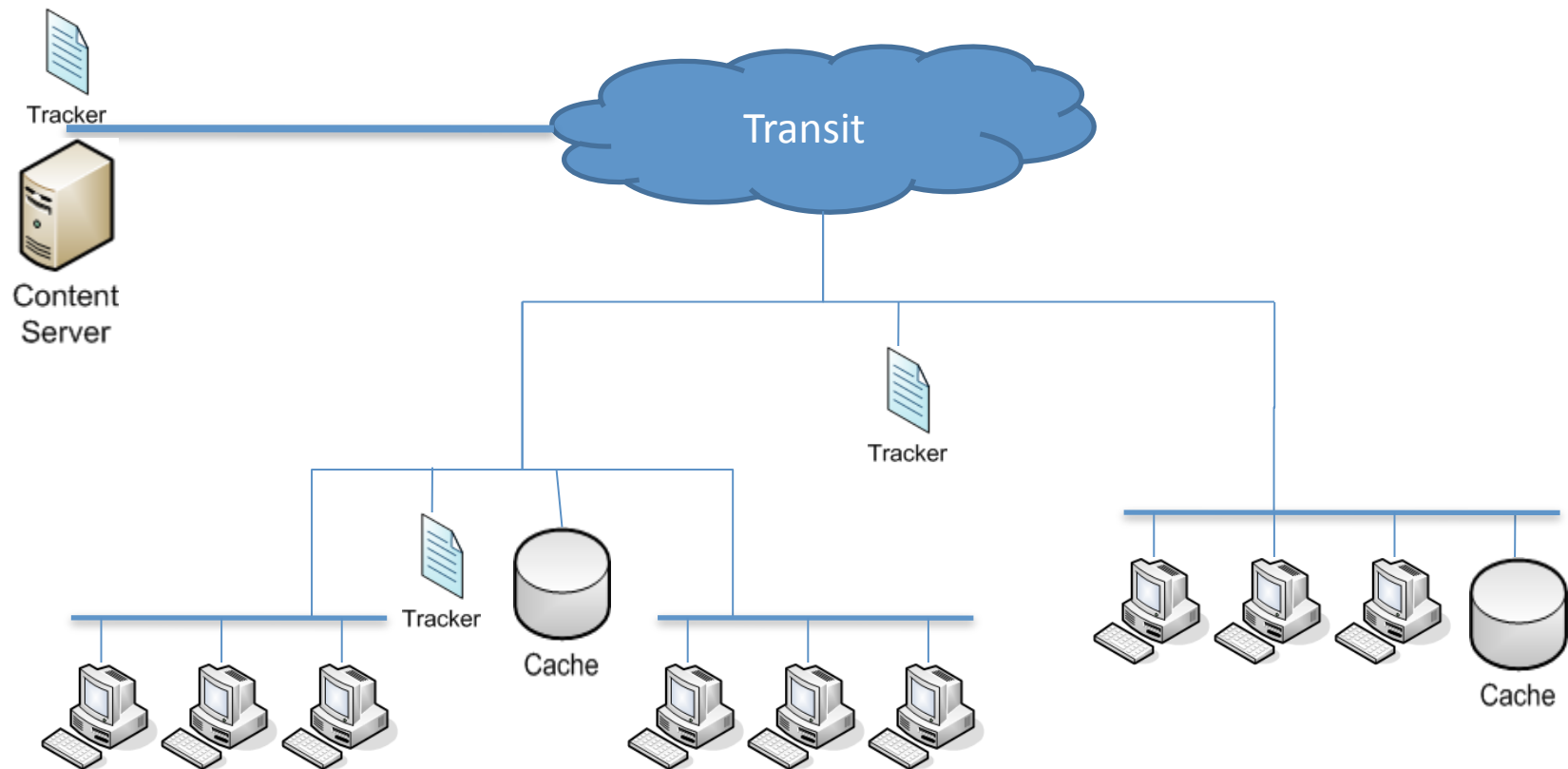
- Mitigate asymmetric capacity provisioning
- Limit traffic within an administrative scope
  - Apply QoS policy within the scope  
Throttling, admission control, etc.
- Why NOT localization
  - Non-uniform experience (depends on your scope or location)

# Multi-Layer Tracker Based Architecture

---

- Straw man architecture
  - Keep it simple & generic; highlight the missing pieces
- Global Tracker
  - Unique for the content
- Local Trackers
  - Redirected / Delegated from the global tracker
  - Multi-Layer (more than 2) trackers possible
- Hybrid Architecture
  - Global Tracker can also be content source
  - Provisioned local caches among seeds & peers
  - Edge-Assisted CDN

# Architecture Diagram



# Work Areas – Locality

---

- Network locality
  - Determine the local tracker
  - Select local seeds, peers, and (ISP) caches
- Mechanisms
  - Dynamic measurements
  - Static (provisioned) maps – Oracles
- Challenges
  - Traffic conditions & Load balancing
  - Administrative aspects – Policy & Scopes
  - Metrics
    - delay, hop count, scopes (geographic, operator, subnet, ... )

# Work Areas – Topology & Caching

---

- Topology Matching
  - Between **Link** Layer and **Application** Layer!  
Esp. *ad hoc* wireless networks
  - Optimize the physical traffic flows (minimize the duplicate flows on the same physical link)
  - (Streaming services)
- Caching
  - Caches = Long-lived or pre-provisioned peers
  - Cache placement is crucial
    - Back to the locality & topology matching problems



# Work Areas – Redirection

---

- Tracker Redirection/Delegation
  - Standardize on the generic tracker format
  - Off Path
    - Explicit delegation
    - Implicit interception/redirection
  - On Path: Proxy-based
    - Breaks end-to-end authentication (depends also on the layers)
    - Not practical in all deployment
    - Potential bottleneck

# Out of Scope (for this talk)

---

- Security
  - Federated authentication & authorization
- Signaling & Packet Marking
  - Diffserv, admission control (RSVP)
  - Aggregated fairness (a.k.a bandwidth cap)
  - May work within a limited scope
  - Issues for Internet Scale
    - Scalability
    - Tragedy of the commons