Cross-Domain Cooperation for Small Clients

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Overview

- Problem: DNS overhead
- Solution: Web-DNS Cooperation
- Experiment: Squid log analysis
- Conclusions
- Future Work
DNS Overhead in Web Transactions

- DNS request is a large part of web transaction
- DNS request dominates as:
  - Bandwidth increases
  - Persistent connections reduce overhead
  - Latency increases

\[
\frac{C}{A + B + C} < \frac{C}{A + B + C}
\]

- DNS is multiple RTTs
Web Connection Components
DNS overhead with low latency

LAN/remote requests

LAN/local requests
DNS overhead with high latency

ISDN/remote requests

ISDN/local requests
DNS Reuse and Costs

- Squid logs: 10-15% DNS misses
- 2MB cache upper bound
Cache Anticipation

- **Web Cache**
  - Request stream related to item content
  - Anticipation possible

- **DNS Cache**
  - No item relation to request stream
  - No anticipation opportunity
Web-DNS Cooperation

- **Opportunity**
  - Web request requires DNS information
  - Cooperation possible

- **Solution**
  - DNS cache on local client
  - Web lookahead to anticipate DNS requests
DNS Anticipated Cache Size

DNS Cache Size / Time
DNS Misses and Reduction

DNS Miss Rate

Miss Rate Change
DNS Miss Reduction

Anticipation Benefit

Magnification of MISS Rate Change
Prior and Related Work

- Web Log Analysis
- Web Anticipation
- Web Cooperation
  - Squid
  - LSAM
  - Adaptive Web Caching
Conclusions

- DNS caches must be local on client machines to be useful
  - 90% benefit
  - esp on ISDN connections

- DNS-Web cooperation needs more exploration
  - 15% reduced misses
  - 3x space increase (<6MB total)
Future Work

- Analyze real-time client traces
  - Squid logs wrong place in cache hierarchy
  - Real-time tracing allows examination of time components

- Define DNS hits and misses
  - Some DNS misses are partial hits due to multiple RTTs

- Implementation of Cross-Domain system
  - Measure real benefits
  - Examine DNS aggregation