

# Announcements

Project Milestone 2 due today. Undergraduate projects should have 3 students per project group. If you don't have a project, look at the project interests to find someone to work with. If you find a 4 person project interesting, you should join the group so that we can split the group into 3 person groups. If you can't form a group, then I will form a group for you.

Homework 2?



# Outline

1. *Active Names: Flexible Location and Transport of Wide-Area Resources*. Amin Vahdat, Michael Dahlin, Thomas Anderson, and Amit Aggarwal. In Proceedings of the Second USENIX Symposium on Internet Technologies and Systems, October 1999



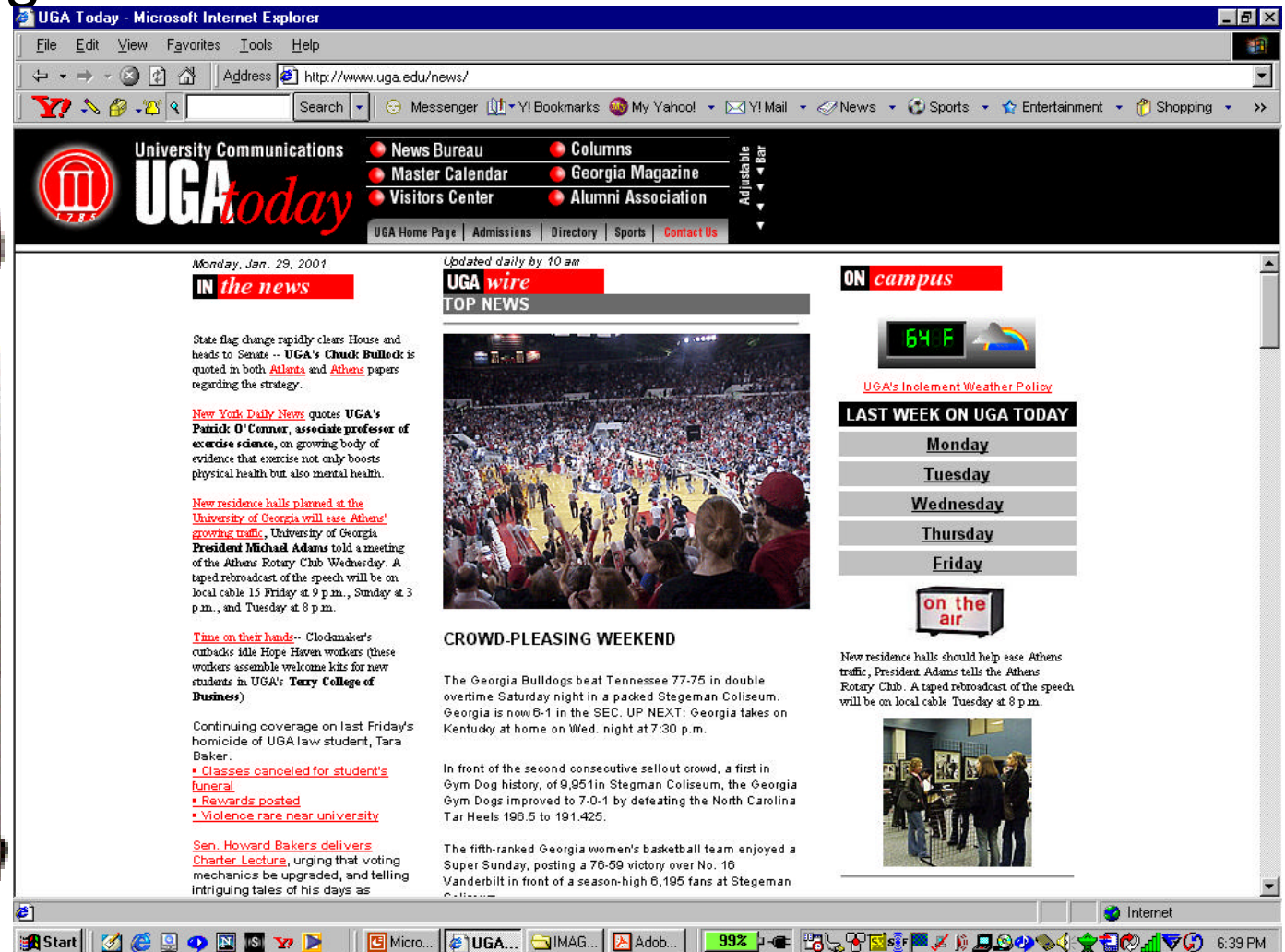
## Naming – brief intro.

- DNS translates from machine names to IP addresses
  - greenhouse.cs.uga.edu  $\Rightarrow$  128.192.4.180
  - static translation (usually valid for a few days)
- DNS round-robin used to dynamically match name to host (based on machine load, for example)
  - www.cnn.com  $\Rightarrow$  207.25.71.23 or 207.25.71.24 or ...
- Network level switch (for e.g. CISCO director)
  - Automatically forward network packets to some server



# Naming Intent

- <http://www.uga.edu/news/>



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## Naming Intent

- The URL is a hint to get the UGA news from some server that is “appropriate” (in terms of locality and access costs) and that fits in my display
- The exact host names and paths can be remapped to the appropriate forms.
- My view of **UGA Today** depends on my device, my advertisement preferences etc. Your view of **UGA Today** may be different from mine

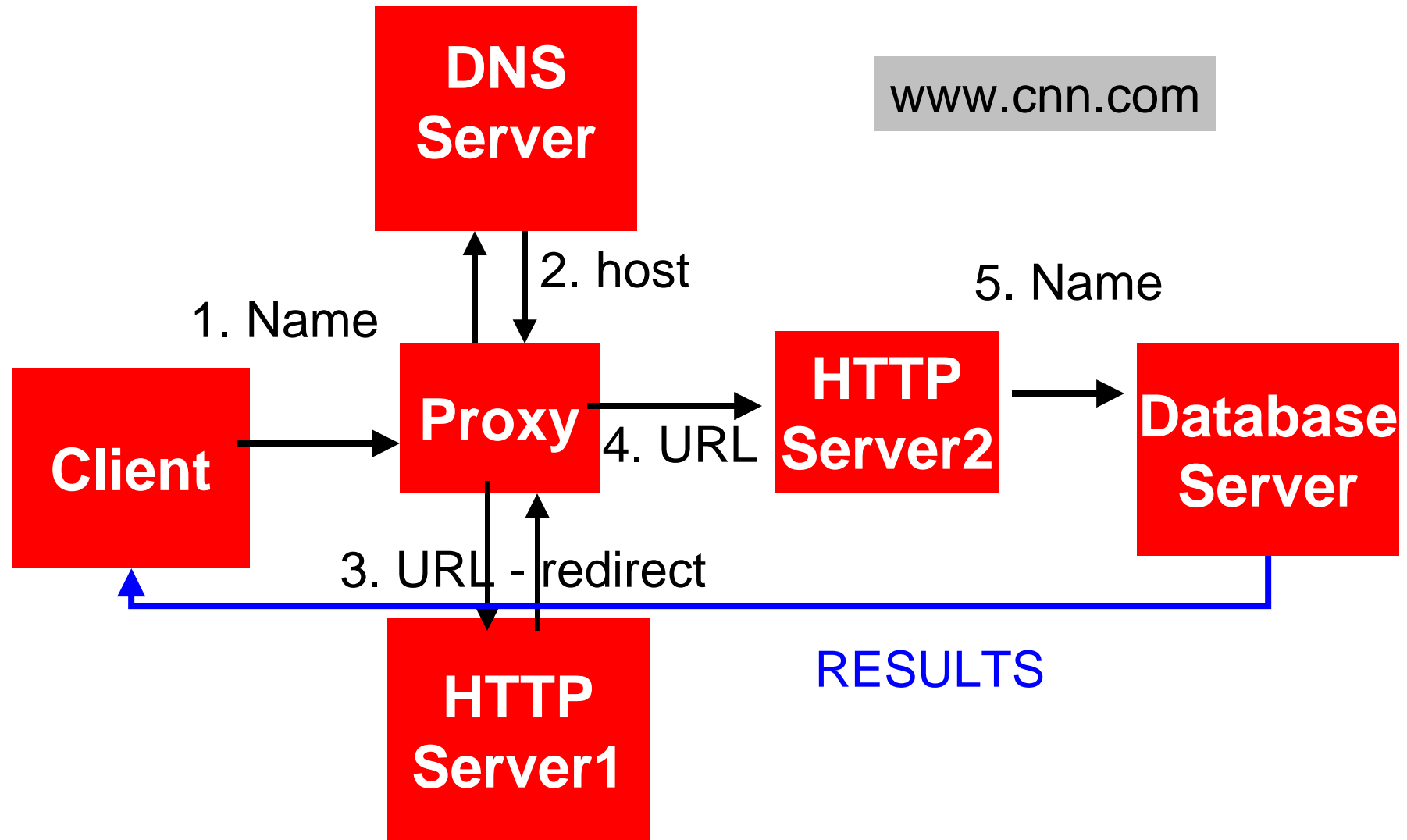


## Active Names Goals

- Server selection – select appropriate server from replicas spread across the Internet
- Client customization – Customize the page for the present client (e.g. Transcoding, customizable portals [e.g. my.yahoo.com])
- Server customization – Advertisements customized for the user, collecting statistics (e.g. hit counts, ad rotation etc.)



# Naming today



## Active name system

- Clients generate active names (domain:name) and name of a namespace program to resolve it.
- Clients hand them to a resolver.
- Name space program locates next program to run and then transports data to that program
- Each program acts as a filter that transports and transforms its input to its output.



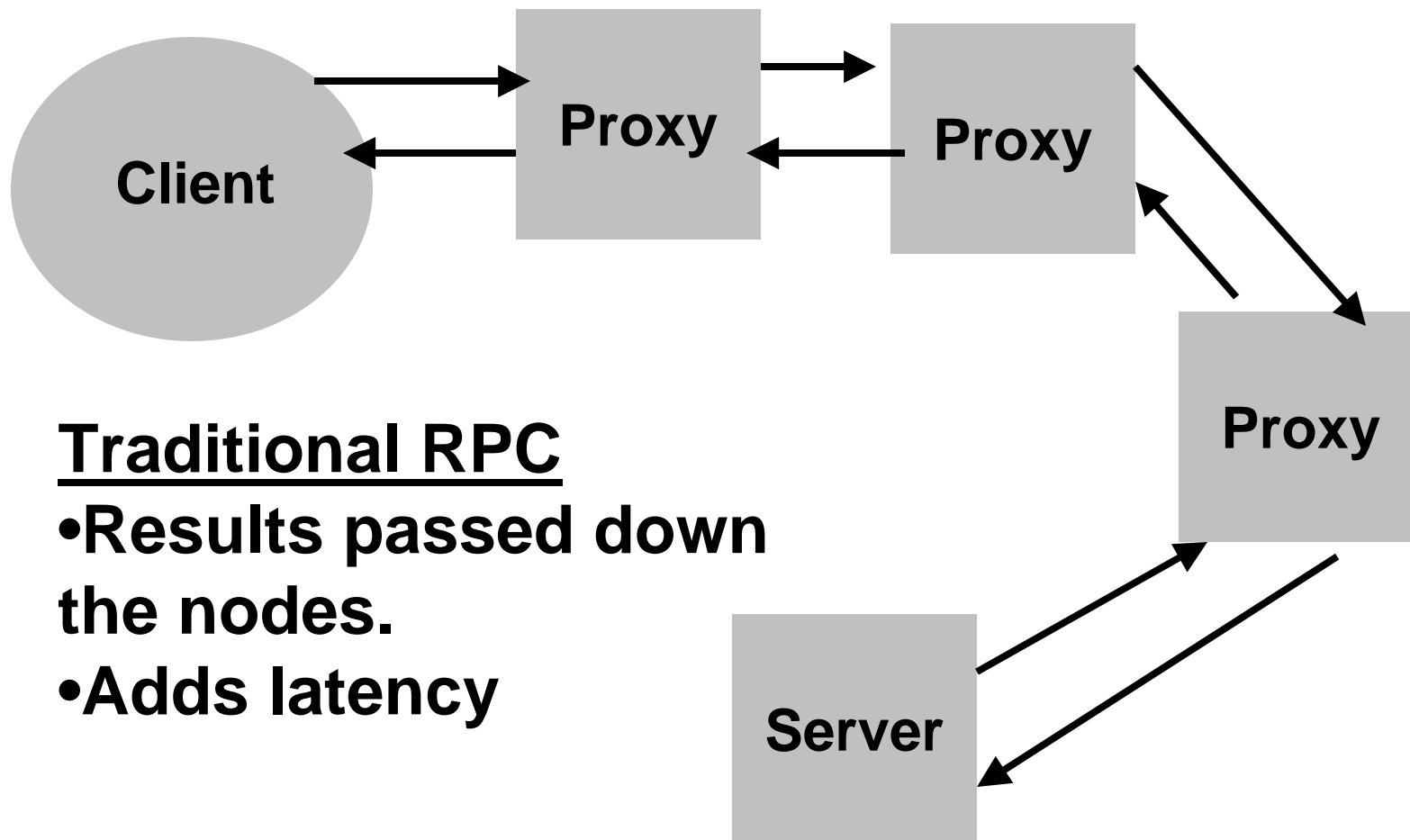


## Active name system

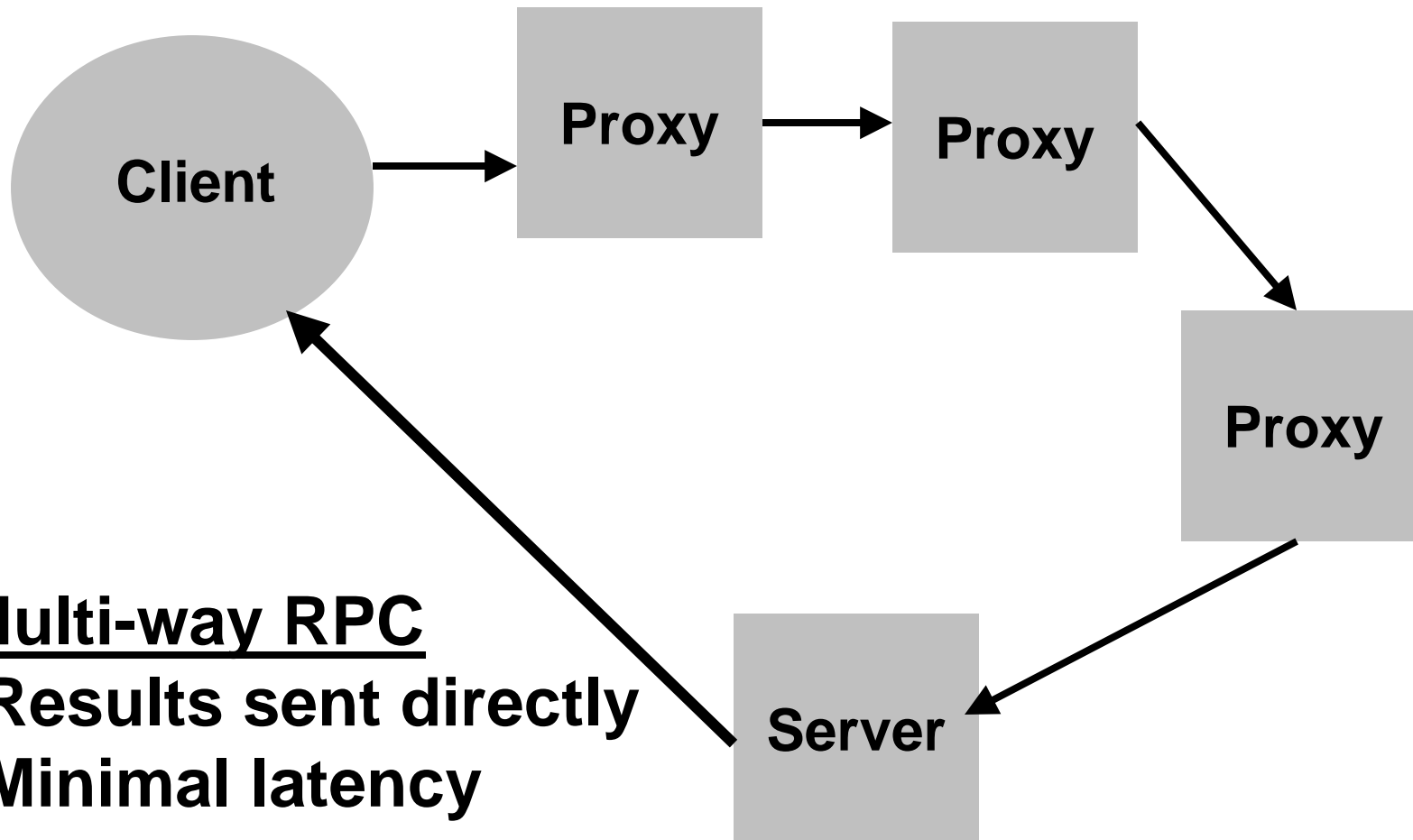
- Active name resolver determines domain-specific program
  - These programs are location independent and can run anywhere
  - Application specific, the name is resolved in domain-specific manner
- Domain specific code (e.g. ad rotation)
- After methods are associated with each active name
  - After methods are a list of programs guaranteed to be called
  - They can perform client-specific transformation of data



# Multi-way RPC for efficiency



# Multi-way RPC for efficiency



## Multi-way RPC

- Results sent directly
- Minimal latency



## Multi-way RPC

- Security implications – someone else responds to your queries
- Use capability certificates to authenticate response
- Resource consumption limit should be managed. Resolvers use compute resources on foreign hosts.
- Hierarchical namespaces.



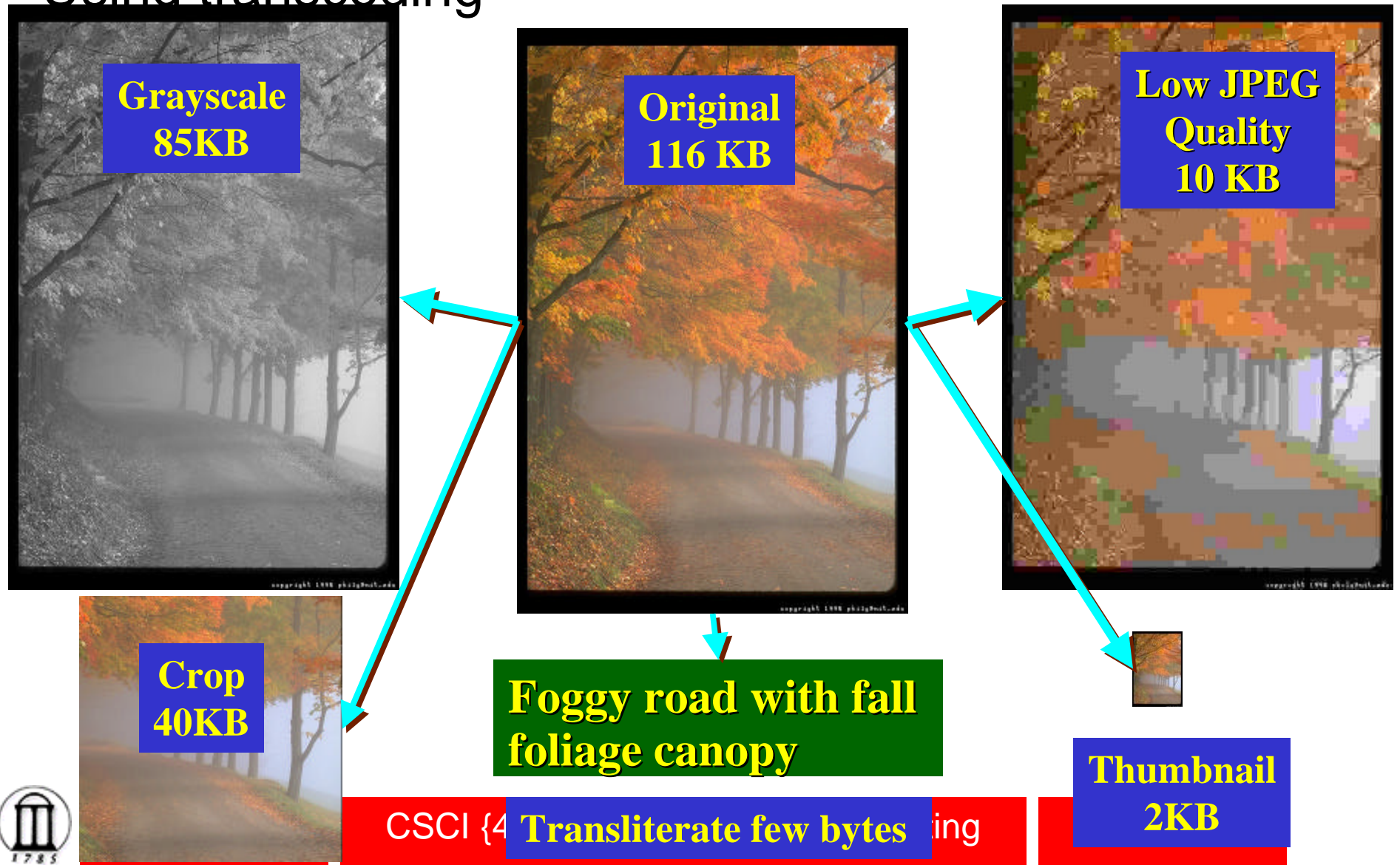
# Applications

- Extensibility
  - Compared DNS round robin (next server), distributed director (closest server as measured by hop count) and Active names (number of hops; biased by a decaying histogram of previous performance)
  - Average latency follows Distributed Director at low load and DNS round robin at high load



# Location Independence

- Using transcoding



## Decision on where to transcode

- Can transcode either on the server or proxy
- Proxy is closer to client
- Wide area network from server to proxy could be congested. Tradeoff between sending a smaller image across the country vs performing transcoding at the proxy
- Active name migrates based on the current load



# Composability

1. Use server-side include to update page based on the current request
  2. Banner ad rotation
  3. Logs cookies
- Implemented using server side and active namespaces.
  - Active namespaces are shown to be composable





# Discussion



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