Visualizing the Global Topology of the MBone

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joint work with

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What is the MBone?

- multicast backbone of the Internet
- often used for audio/video
- send packets to multiple destinations efficiently

  (DVMRP constructs spanning tree)

tunnels:

  virtual overlay on existing (unicast) Internet

Why visualize the MBONE?

microcosm of the Internet

- no central authority
- exponential growth
- growing pains...

network maintainers need better tools

good first step towards broader goals

Why geographic positioning?

true goal: unicast hops underneath tunnels

- data very difficult to obtain
- order of magnitude more complexity

assumption:
logical unicast topology related
to physical geography

- immediate user comprehension
- certain misconfigurations very obvious
- hides co–located nodes

Geographic Network Visualization
Previous Work

[Becker, Eick, Wilks] ’95

2D interactive software

[Cox, Eick] ’95

3D interactive software

[Cox, Patterson] ’91

video

[Lamm, Reed, Scullin] ’96

VR software

Geographic Visualization

draw tunnels as arcs on globe

resolve hostname to latitude/longitude

"manually intensive methods"

- InterNIC database (for simple domains)
- Web search
- traceroute
- personal knowledge
- personal communication
- InterNIC database (for simple domains)

future: distribute/update through multicast

Visualization: VRML

encode hypertext information in arc

- hostname
- placename
- latitude/longitude

follow URL on click

medium for wide distribution

Platform

pipeline of lightweight modules

- geographical resolvers
- grouping and coloring filters
- geometric constructors
- visualization engines

development:

- adapted Geomview/WebOOGL platform
- SGI

distribution:

- standard VRML
- PC

Future Directions

animation of archived data

automated nightly updates

larger scale problems:

- unicast framework underneath tunnels

nongeographic layout

- hyperbolic space
- standard graph drawing programs

IPv6 (aka IPNG)

tunnels lash together next–generation Internet