The Internet Real-Time Laboratory

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http://www.cs.columbia.edu/IRT
Overview

- 13 PhD students, 2 visitors, 5 MS students, 14 project students
- goal: design & build network protocols, algorithms and software for enabling new services on the Internet
- themes:
  - Internet multimedia and telephony
  - wireless services
  - service location and directories
  - content distribution
  - security
What is Internet Telephony?

- carriage of real-time voice and multimedia
- IP: private networks or public Internet
- interconnected to existing phone network
- low latency, high availability
- likely to start replacing existing phone system in \( \approx \) ten years
- landline and mobile ("third-generation wireless")
Columbia Efforts in Internet Telephony

- signaling protocols: SIP + extensions (QoS, mobility, events, caller preferences, …)
- programming languages and interfaces: CPL and sip-cgi
- software and hardware VoIP platforms ➤ million calls/hour
- locating services and servers
- statistical packet voice characterization
- combining forward error correction (FEC) and playout delay adaptation

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Events: SIP for Appliances

(SIP user agent)

SUBSCRIBE door@alice.home.net
NOTIFY alice@work.com
DO light@alice.home.net
INVITE camera@alice.home.net

(SIP proxy (RGW))

(Work with Telcordia)
Columbia Internet Extensible Multimedia Architecture

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Columbia e*phone

DSP-based, single-processor Ethernet phone; being commercialized
Ad-Hoc Wireless Networks

- meet people
  - walking
  - subway
  - airports, train stations, ...

and exchange data wirelessly – web pages, music, images, applets, ...

- “Napster without wires”

- information spreads rapidly in dense urban areas

- searchable by type, URL and content
search request
UDP multicast
files, glimpe index
search engine
web browser
UDP
HTTP over TCP
proxy server
store incoming web pages
get request for data
return summaries
request URL
search engine
request for data not in cache
response from network
response from cache
response from other users
request from other users
periodic request for data
summaries from network
proxy server
display page listing all available information, dynamically generated by proxy server
deliver from proxy cache or from network
requestor
requestor
automatically request new “interesting” URLs
Quality of Service

- make sure important Internet traffic get through
- need resource reservation protocols ➔ YESSIR, BGRP, RNAP
- QoS pricing for adaptive multimedia services
- need management infrastructure
Examples of Spring 2001 Projects

- Linux device driver enhancements for wireless networks;
- speech recognition for Internet telephony;
- shared web browsing;
- mobility proxy;
- virtual reality conferencing system;
- audio delay and quality measurements;
- anonymizer for Internet telephone calls;
- pricing network resources;
- Internet radio station;

http://www.cs.columbia.edu/~hgs/teaching/project/spring01.html