ENSC 835 High Performance Networks
Final Project Presentation
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Analysis and Trace Driven Simulation of
H.323 VoIP Traffic

Nenad Laskovic (nlaskovi@cs.sfu.ca)

Savio Lau (saviol@cs.sfu.ca)

http://www.sfu.ca/~saviol/835proj.htm

**communication
networks
laboratory**

Roadmap

- **Introduction – motivations and overview**
- Related work
- Technical details
- NS-2 implementation details
- Trace analysis
- Discussion and future work

Voice over IP (VoIP)

- Internet telephony
- Uses Internet as transmission medium for phone calls
- Around since late '90s
- Low adoption rate due to bad quality
- Adoption rate is higher in corporate environments
- Widespread broadband connection pushing this technology again

Motivations

- VoIP is gaining adoption in enterprise setting

- Many carriers considering or implementing VoIP (ex. Bell Canada)

- VoIP traffic is different from video streaming or regular Internet traffic

- New methods are improving QoS (broadband connections, MPLS, RSVP)

Related Work

- **Multi-Protocol Label Switching (MPLS)**
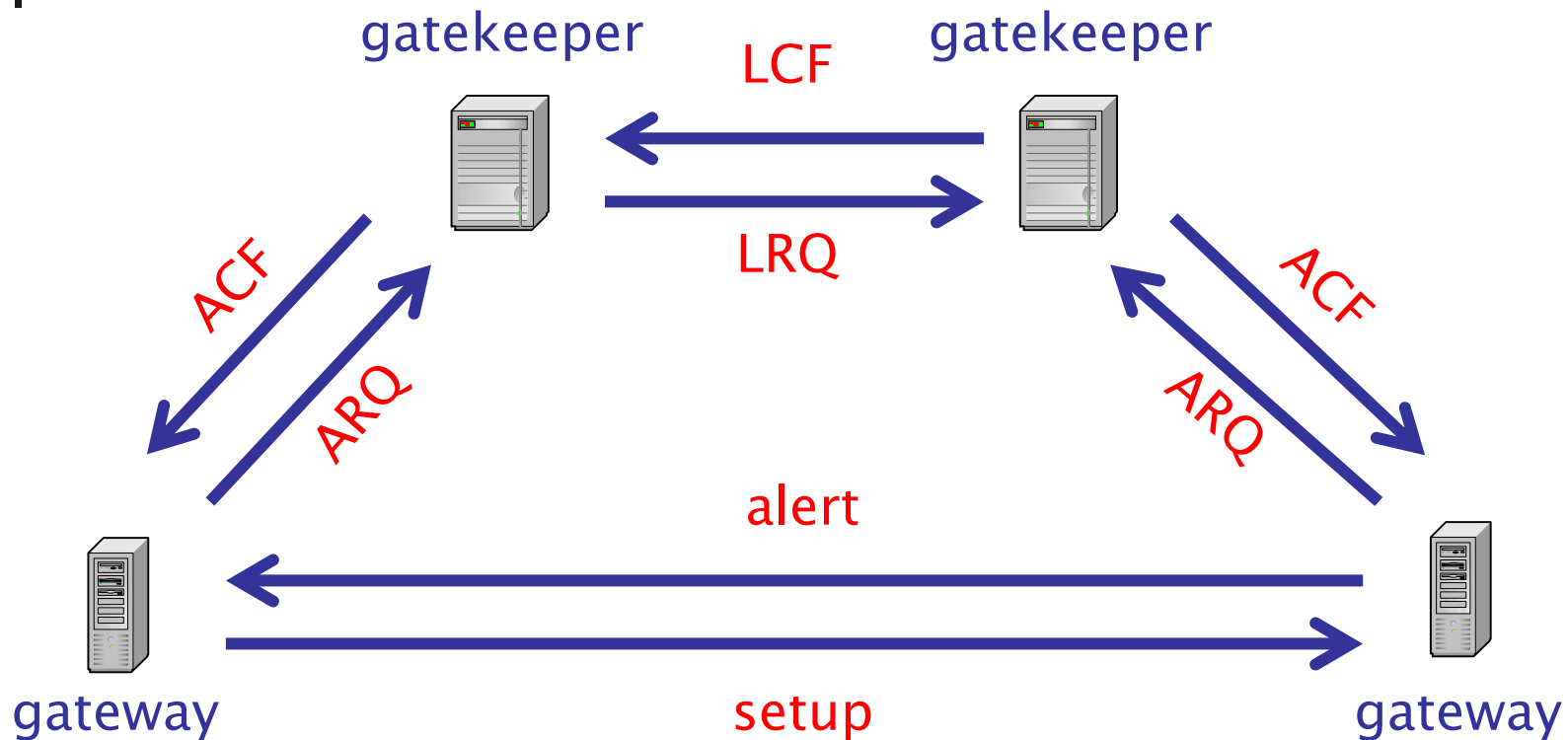- **Reservation Protocol (RSVP)**

VoIP technical details

- **Uses Real-Time Protocol (RTP) over UDP for voice transmission**

- **Two signalling methods H.323 [7] and SIP**
  - H.323
    - H.225 Registration, Admission and Status (RAS)
    - H.225 call signalling
    - H.245 control signalling
  - Session Initiation Protocol (SIP)
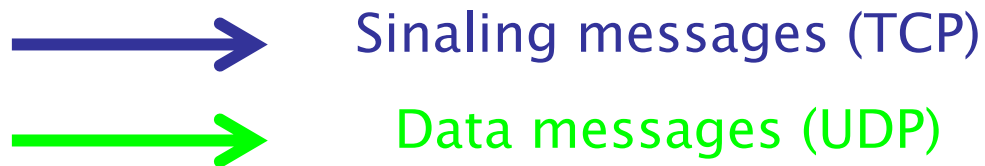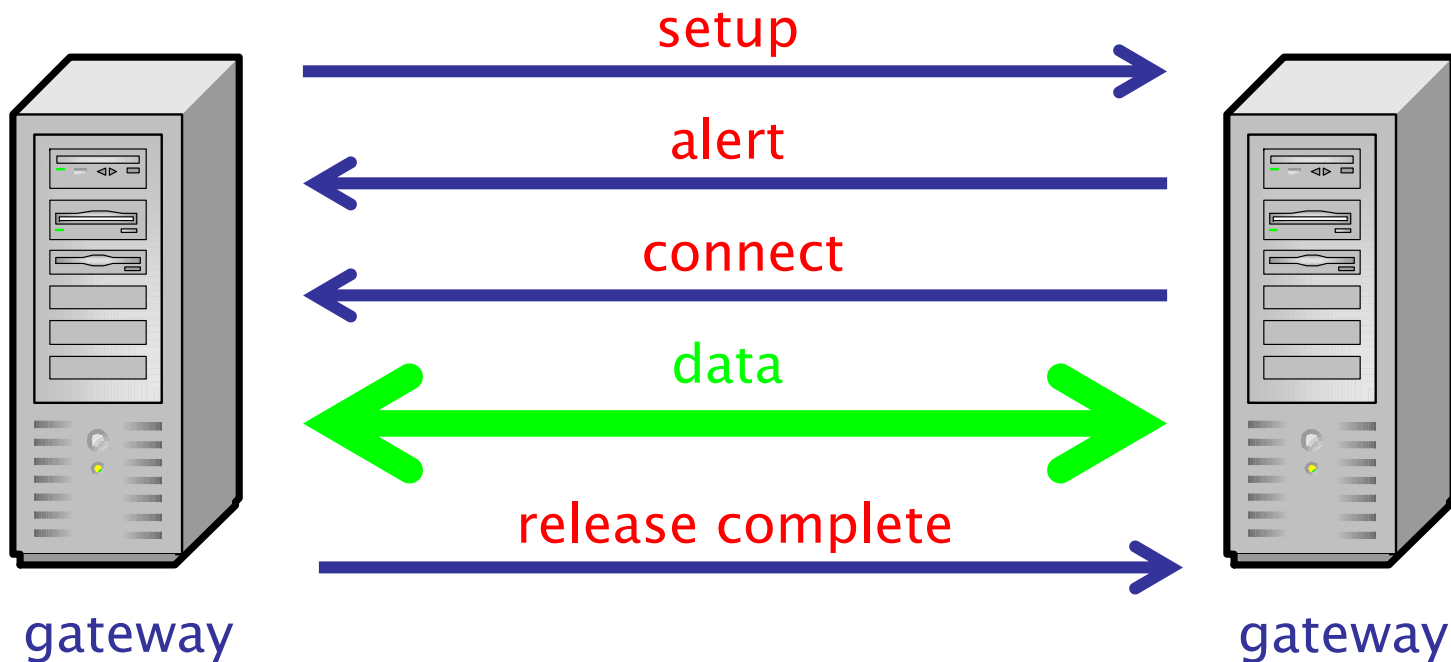   - Less complicated

VoIP call admission

ARQ – Admission request   LRQ – Location request
ACF – Admission confirm   LCF – Location confirm

VoIP call setup

setup →

← alert

← connect

← data →

release complete →

gateway

gateway

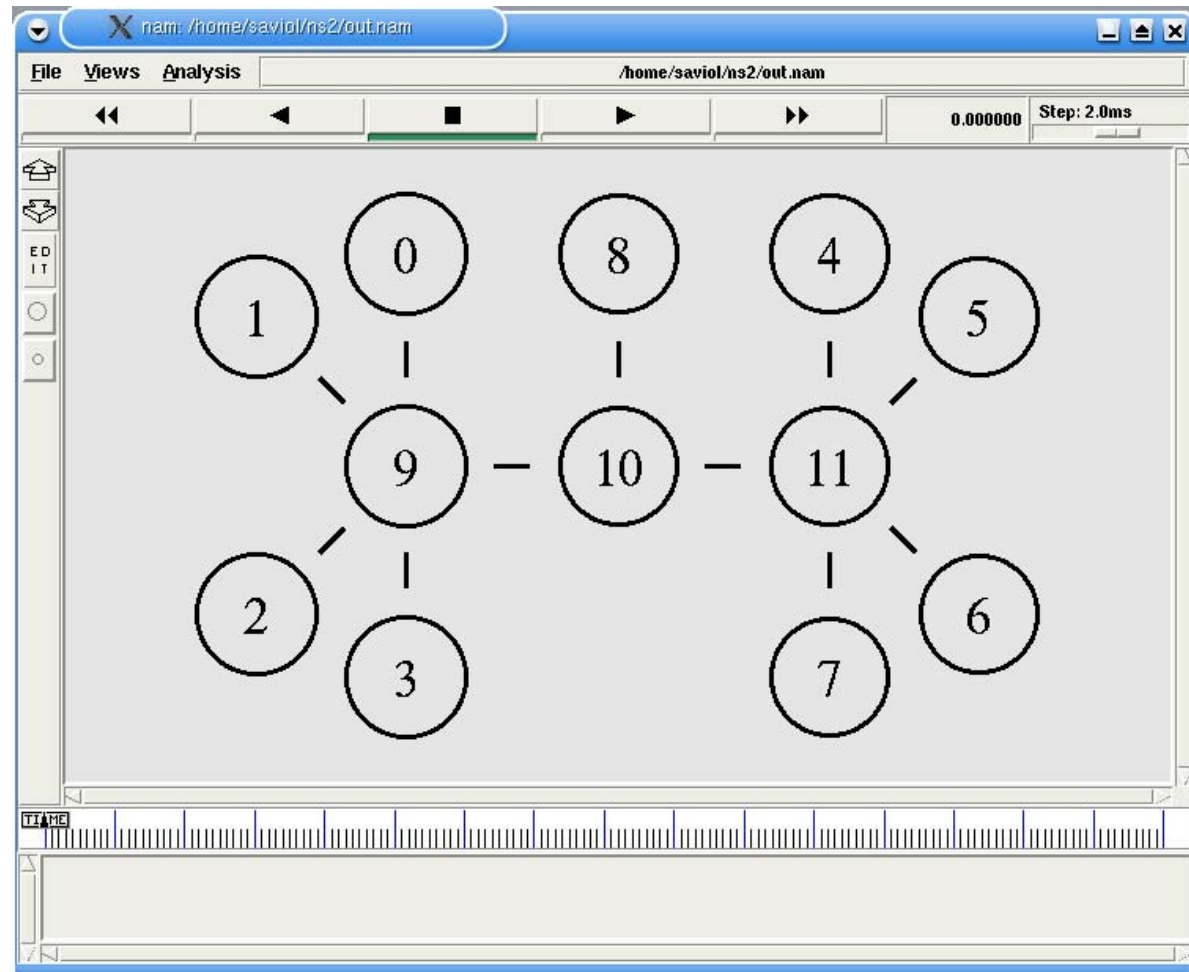→ Sinaling messages (TCP)

→ Data messages (UDP)

NS-2 implementation

- **VoIP Client**
  - **2 UDP connections**
    - H.225 RAS signalling
    - Voice data (RTP/UDP/IP)
  - **TCP connection for H.225/H.245 signalling**
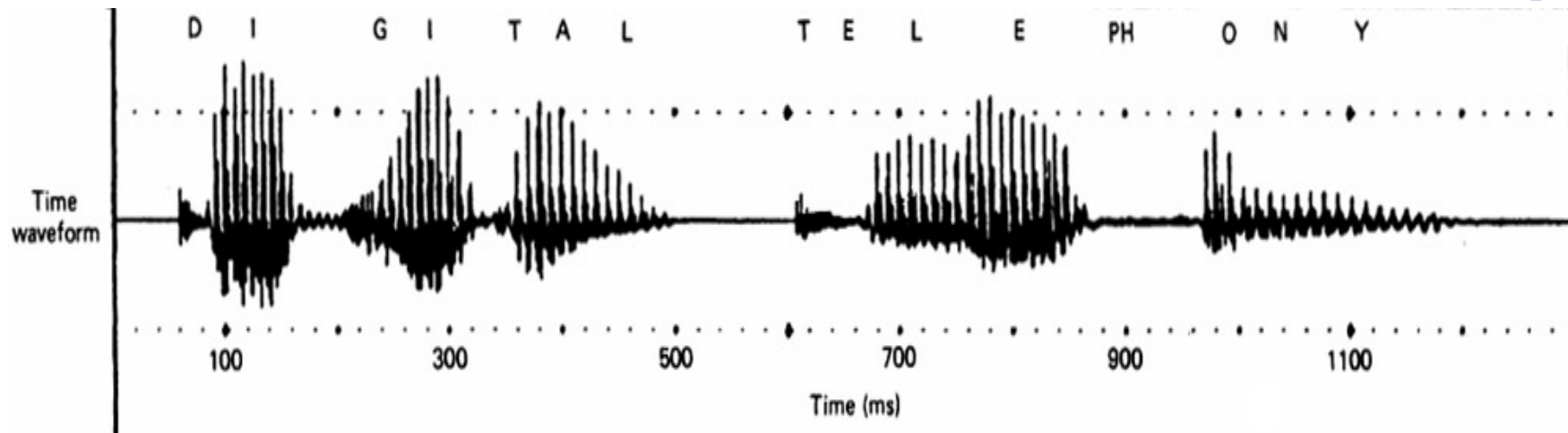- **VoIP Gatekeeper**
  - **UDP connection and admission control**
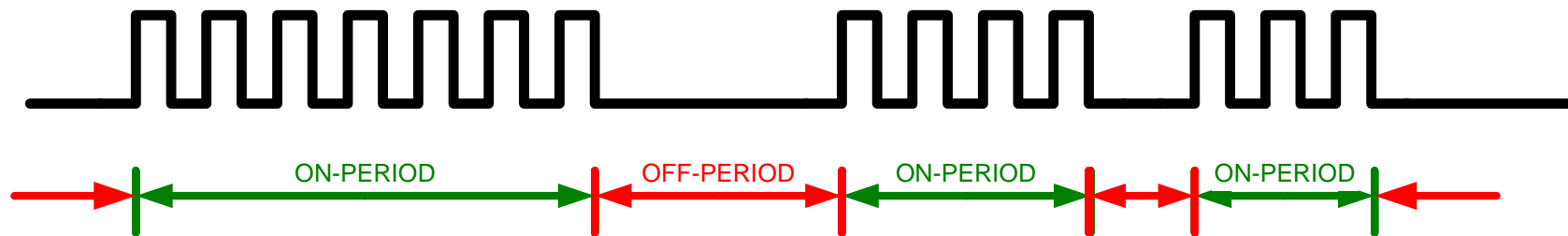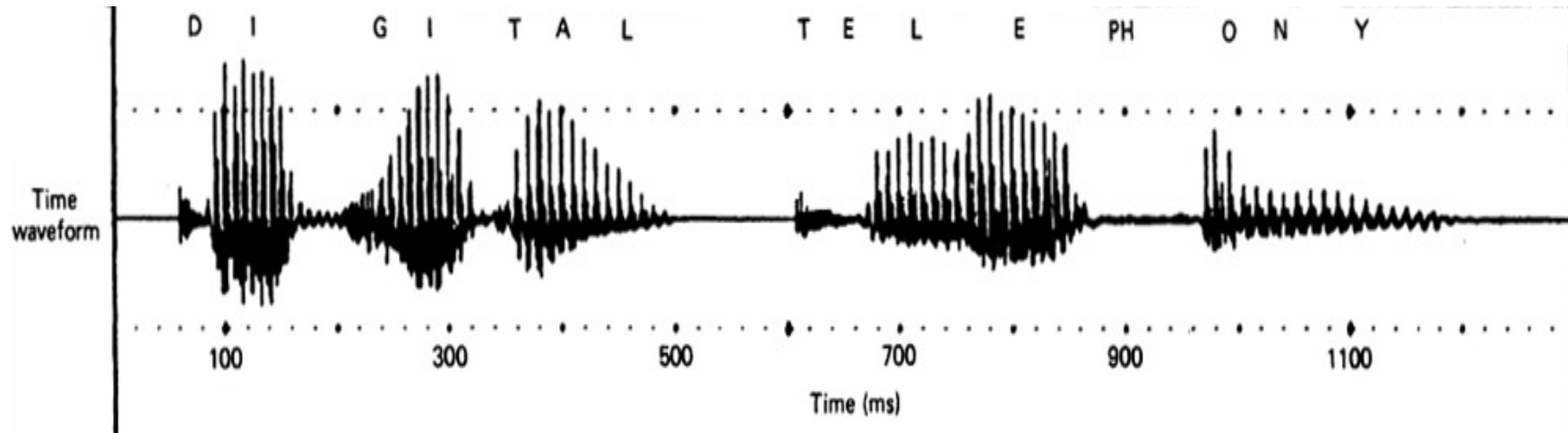
NS-2 NAM Topology

Digitalizing voice

- Typical conversation contains **35-50 percent silence**. [1]

- Silence suppression with Voice Activity Detection (VAD)

Digitalizing voice (2)

Modeling VoIP traffic

- **Constant Bit Rate (CBR) traffic**
  - Does not capture off-periods

- **Exponential-on/exponential-off traffic**
  - Different mean values for duration of on and off-periods
  - Within on-periods packets are sent with constant bit rate
  - We will compare this one with real data

VoIP traces [2] (topology)

Cisco AS5300 access server [3]

line 1

line 2

line 24

VoIP providers
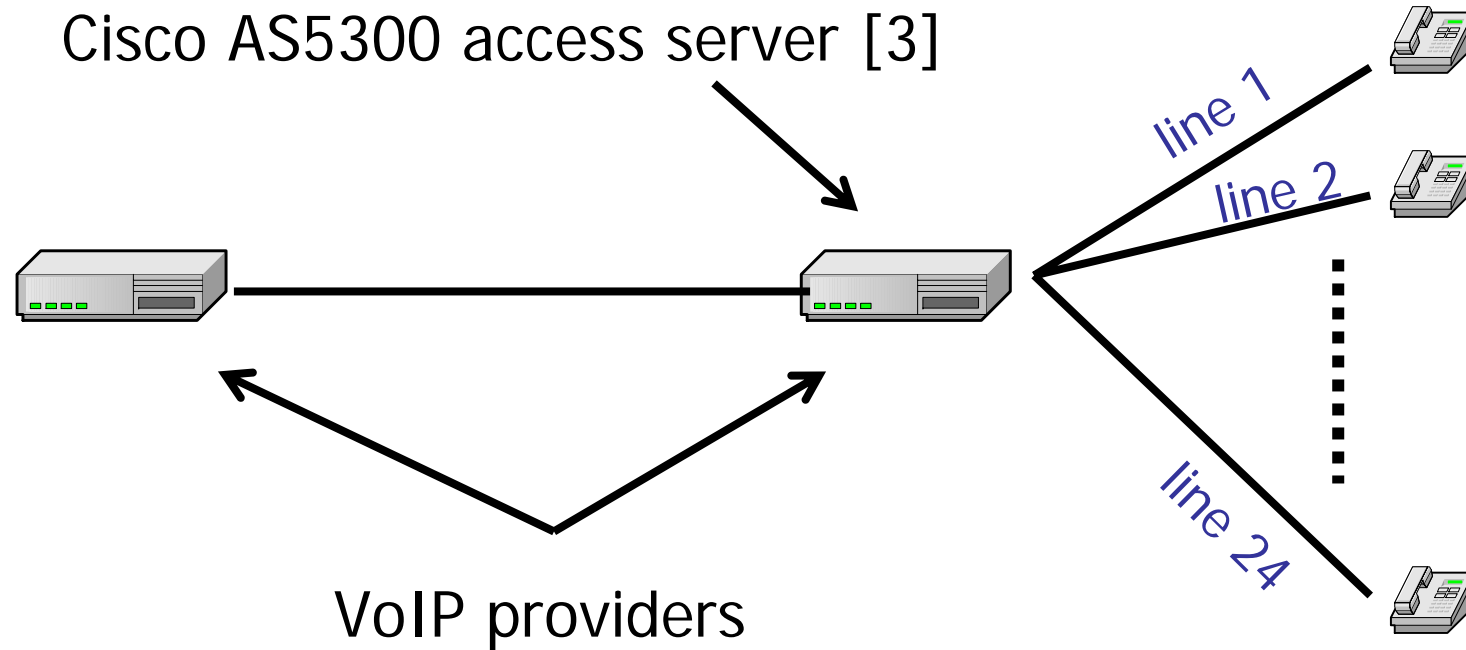
VoIP traces

- **NetFlow traces (Cisco standard [4])**

  - Flow - unidirectional stream of packets between a given source and destination defined by a IP address and port numbers.

- **TCPdump files [5][6]**

  - TCPdump the protocol packet capture and dumper program.
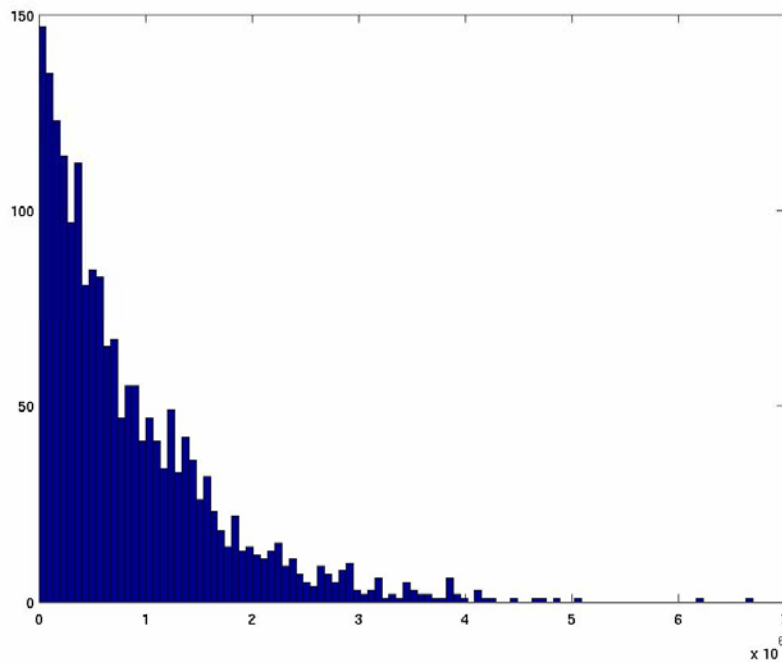
VoIP traces analysis

- **From tcpdump file (~700Mb, ~35min of traffic) we derived :**
  - 37 calls (5min-35min, total duration ~ 9h)
  - on and off-periods of calls
  - distribution of packet in on-periods
- **From NetFlow files (~2Mb, ~3days) we derived:**
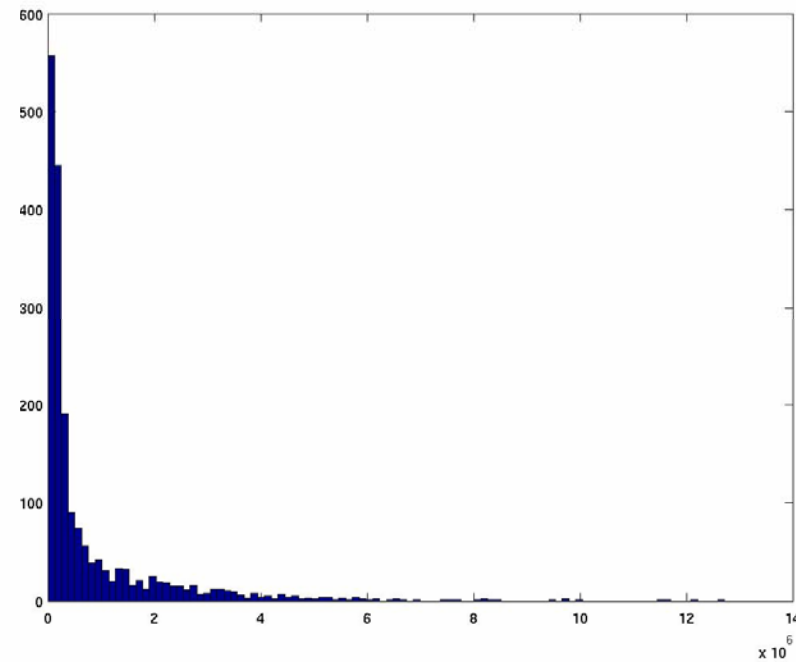 - distribution and durations of calls
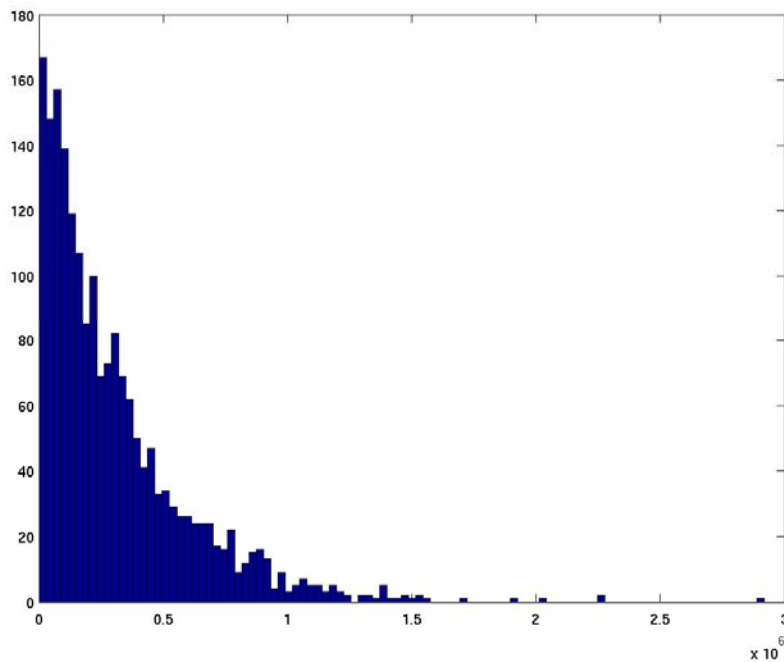
Preliminary results (1)
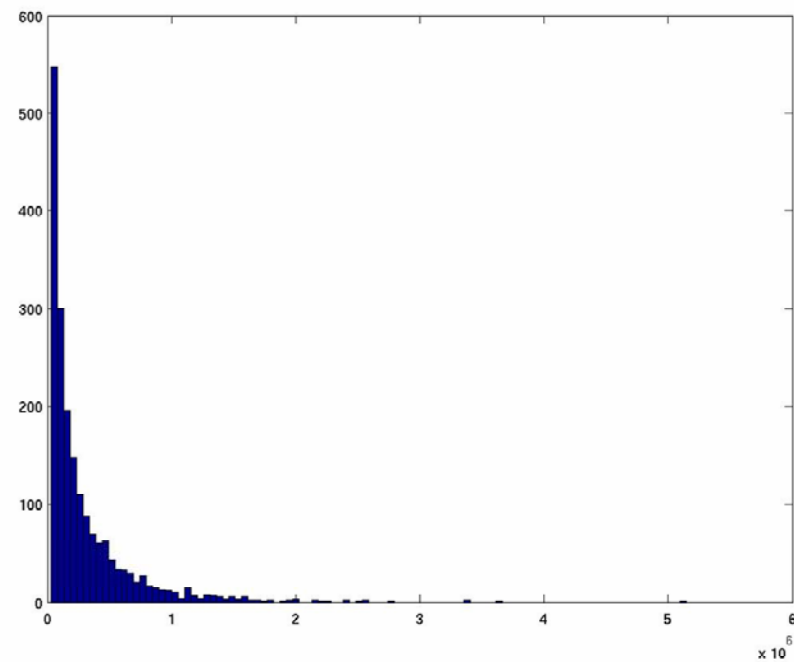

Exponential distribution
of on-periods duration

Distribution of on-periods
duration in trace file

Preliminary results (2)

Exponential distribution
of off-periods duration

Distribution of off-periods
duration in trace file

Discussions and future work

- Exponential distribution does not model all characteristic VoIP traffic

- Future work:

  - Session Initiation Protocol (SIP) implementation and comparison to H.323

  - Examination of admission policies and performance

  - Try different distributions for modeling VoIP traffic

References

- [1] VoIP over Frame Relay with Quality of Service (Fragmentation, Traffic Shaping, LLQ / IP RTP Priority) http://www.cisco.com/en/US/tech/tk652/tk698/technologies_configuration_example09186a0080094af9.shtml

- [2] www.logikom.net/traces

- [3] Voice over IP for the Cisco AS5300 http://www.cisco.com/en/US/products/sw/losswrel/ps1830/products_feature_guide_chapter09186a008008808d.htm

- [4] NetFlow services solutions Guide

- http://www.cisco.com/univerod/oc/td/doc/cisintwk/intsolns/netflsol/nfwhite.htm#xtocid7l

- [5] http://www.tcpdump.org/

- [6] Network Research Group (NRG) at Lawrence Berkeley National Laboratory (LBNL) in Berkeley http://ee.lbl.gov/

- [7] H.323 Protocol International Telecommunication Union

- [8] J. Bellamy, Digital Telephony, 3rd Ed. NY:NY, John Wiley & Sons, 2000

Questions?