Quantifying Skype User Satisfaction

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Skype

- 882 million registered accounts
- About 200 million active users (January 2012)
- Record simultaneous online users at one time:
  - 34 million (February 27, 2012)
Quantifying User Satisfaction

• User Satisfaction Index (USI)
  • Call duration
  • QoS measures
  • Parameters are easy to access and compute
  • User satisfaction can be accessed online

• Assumption: the more smoothly users interact, the more satisfied they will be
  • Responsiveness
  • Response delay
  • Talk burst length
  • Bit rate
  • Delay jitter
  • Packet loss
  • Network latency
Gathering Skype Traffic

Figure 1: The network setup for VoIP session collection
Filtering Skype Traffic

- Detect HTTP requests sent to ui.skype.com
- Inspect port numbers of outgoing traffic
- Extract VoIP sessions
- Probe packets are sent to measure round-trip times

462 usable VoIP sessions
Results

- Call duration varies with different levels of bit rate
  - Skype can adjust by starting off with a low bit rate then increasing it gradually
  - May also be caused by network conditions
- Call duration varies with different levels of jitter
  - Higher the jitter, the shorter the call duration
- Call duration varies with different levels of round-trip times
  - The shorter the round-trip time, the longer the call duration.
Cox Model

- Treat the factors as risk factors (variables that can cause failures)
- Divide each factor samples into parts
  - Take samples from each part, namely the minimum, average, and the maximum of a duration
- Choose one of the measures to describe the user’s perceived experience during a call
Results
Relative Impact

- RTT: (0% - 4%)
- Jitter: (34% - 73%)
- Bit Rate: (26% - 64%)

Cumulative normalized risk vs. Session index
User Satisfaction Index (USI)

\[
USI = -\beta^t Z \\
= 2.15 \times \log(\text{bit rate}) - 1.55 \times \log(\text{jitter}) \\
- 0.36 \times \text{RTT},
\]

**Figure 9:** Predicted vs. actual median duration of session groups sorted by their User Satisfaction Indexes.
Quantifying the Interactivity and Smoothness of a Conversation

- Three voice interactivity measures:
  - Responsiveness
  - Response Delay
  - Talk Burst Length
- Conversations detected using packet size
- Wavelet denoising
  - Localizes higher frequency components
- Determine the presence of speech bursts
Results

(a) Responsiveness vs. USI

(b) Average response delay vs. USI

(c) Average talk burst length vs. USI
Conclusion

-call durations and user interaction significantly represents Skype user satisfaction

-USI can be implemented to allow adaptation for optimal user satisfaction in real time