Performance of video chat applications under congestion

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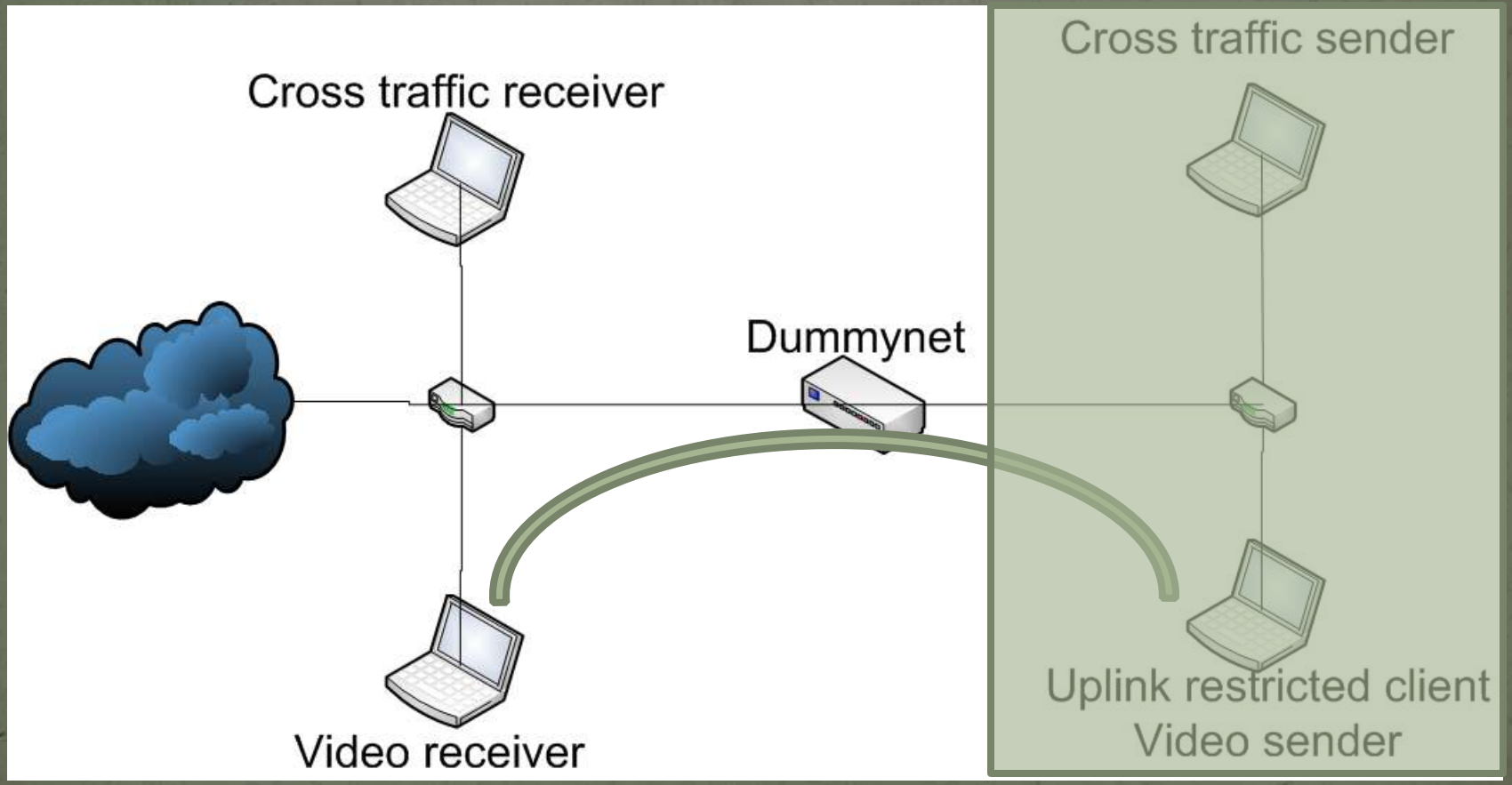
Introduction

- Performance of video chat applications under congestion
  - Residential area networks (DSL and cable)
    - Limited uplink speeds (around 1Mbit/s)
    - Big queues in the cable/DSL modem(600ms to 6sec)
    - Shared more than one user/application
- Investigate applications' behavior under congestion
  - Whether they are increasing the overall congestion
  - Or trying to maintain a fair share of bandwidth among flows

Experimental setup



Video chat clients

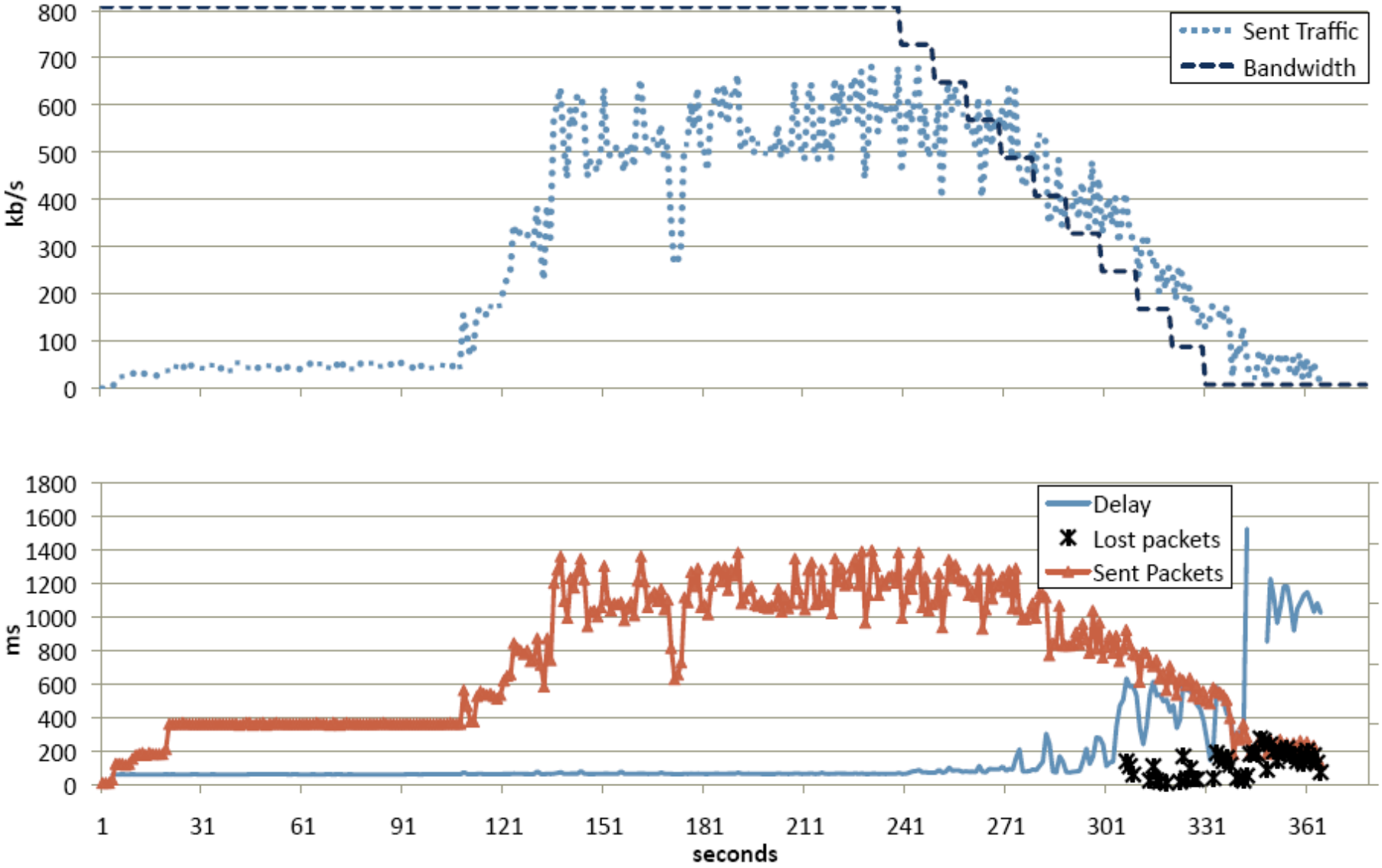
- Skype
- Windows Live Messenger
- X-Lite free softphone
- Eyebeam

Experiments

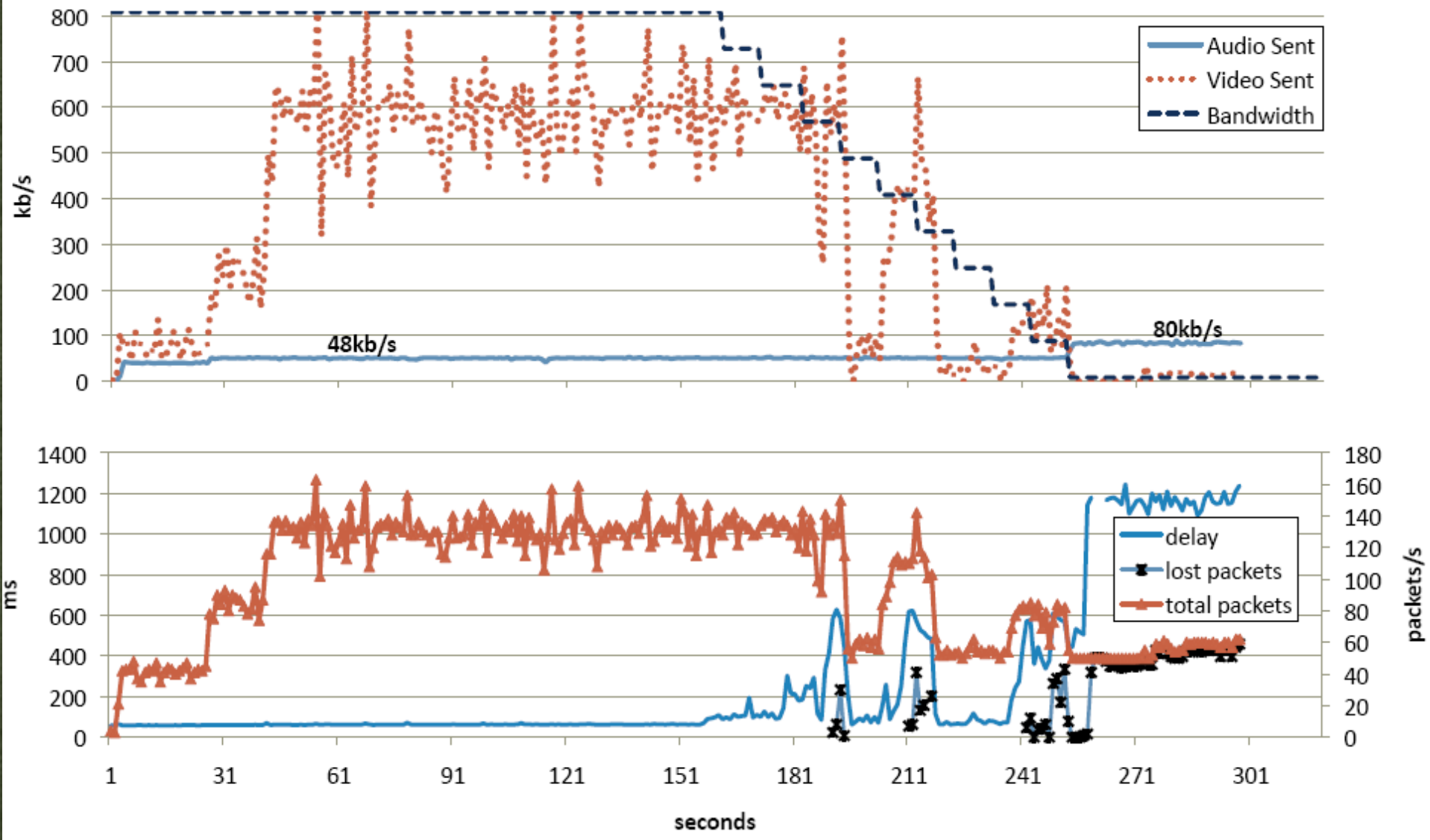
- Step functions
  - 10 steps [1kbit/s-1024kbit/s] [10 sec in each step]
  - 2 steps [1kbits-1024kbit/s] [10 sec in each step]
- Cross traffic
  - File transfer to mediafire
  - Bittorrent

Experiment 1. Step 10sec10kbit

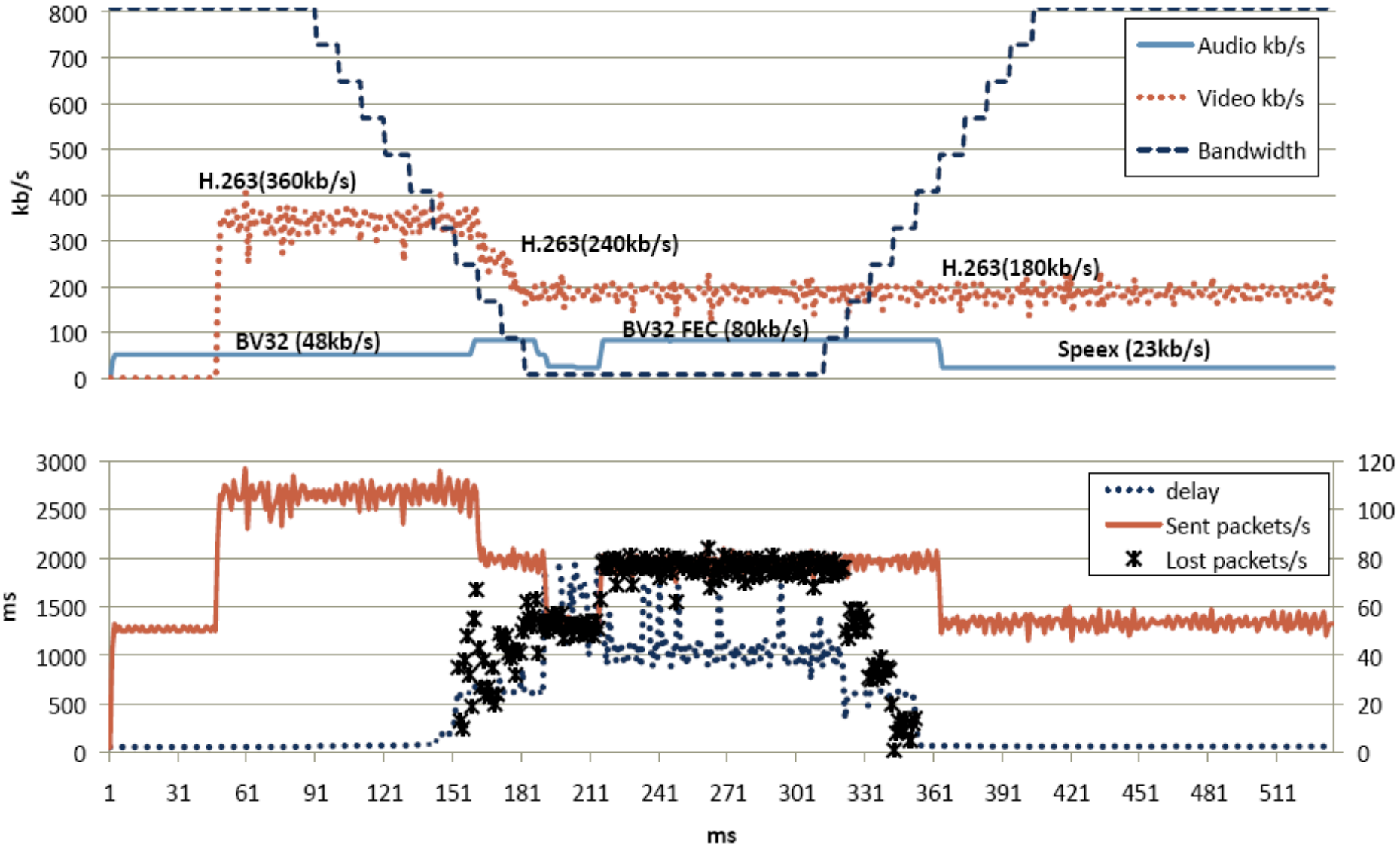
Experiment 1. Step 10sec100kbit Skype



Experiment 1. Step 10sec100kbit Live

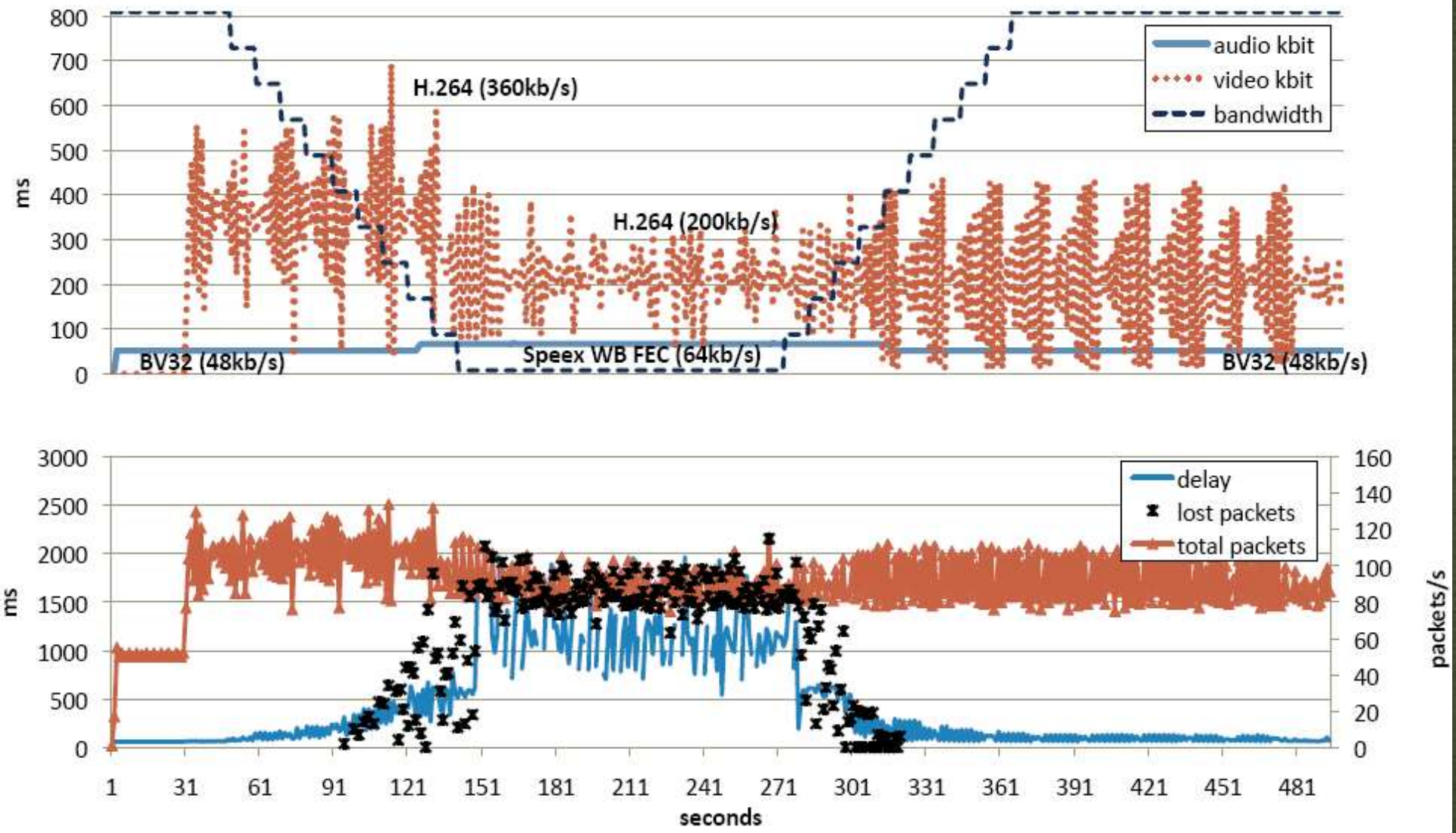


Experiment 1. Step 10sec100kbit X-Lite



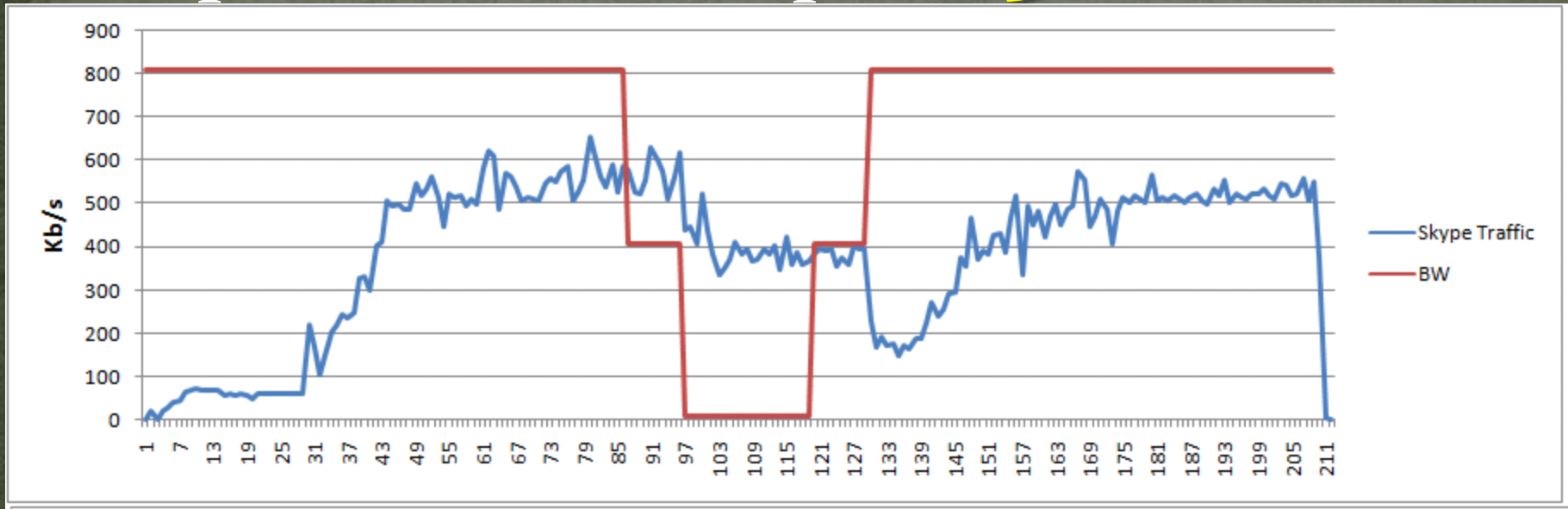
Experiment 1. Step 10sec100kbit

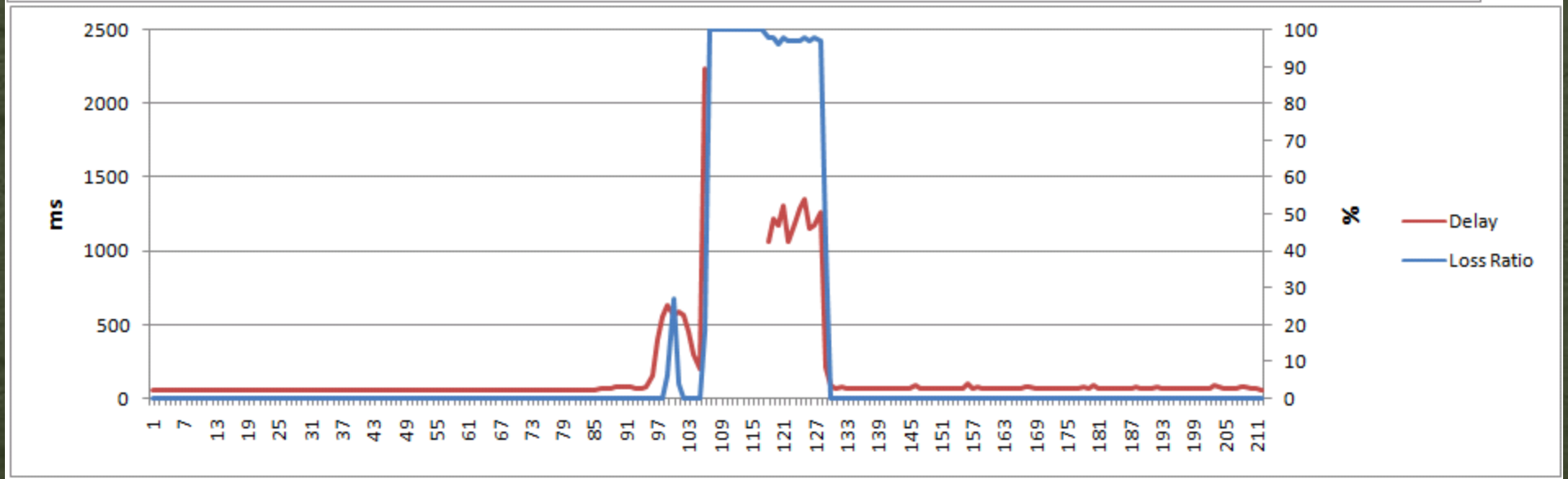
Eyebeam



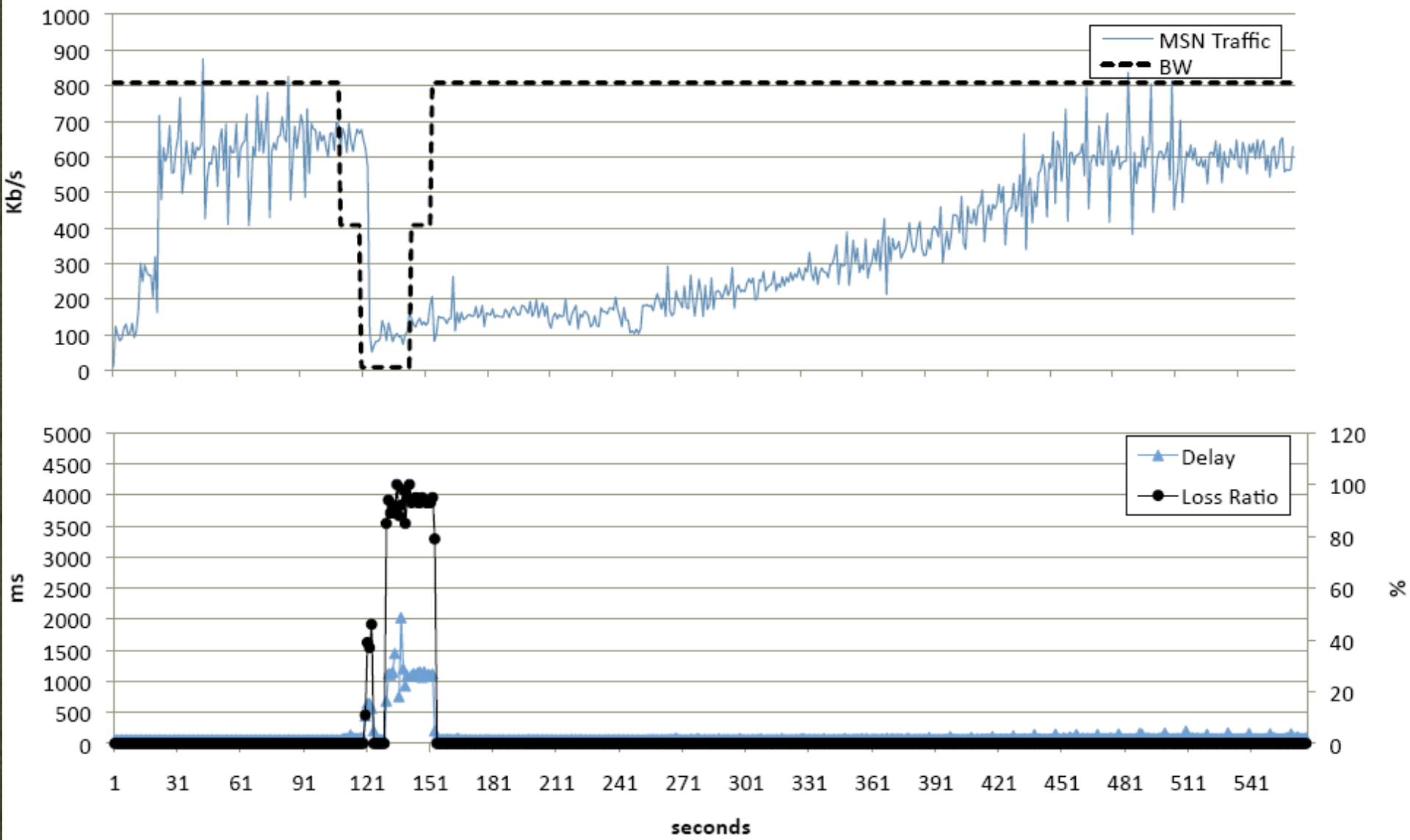
Experiment 2. Step 10sec500kbit

Experiment 2. Step 10sec500kbit Skype

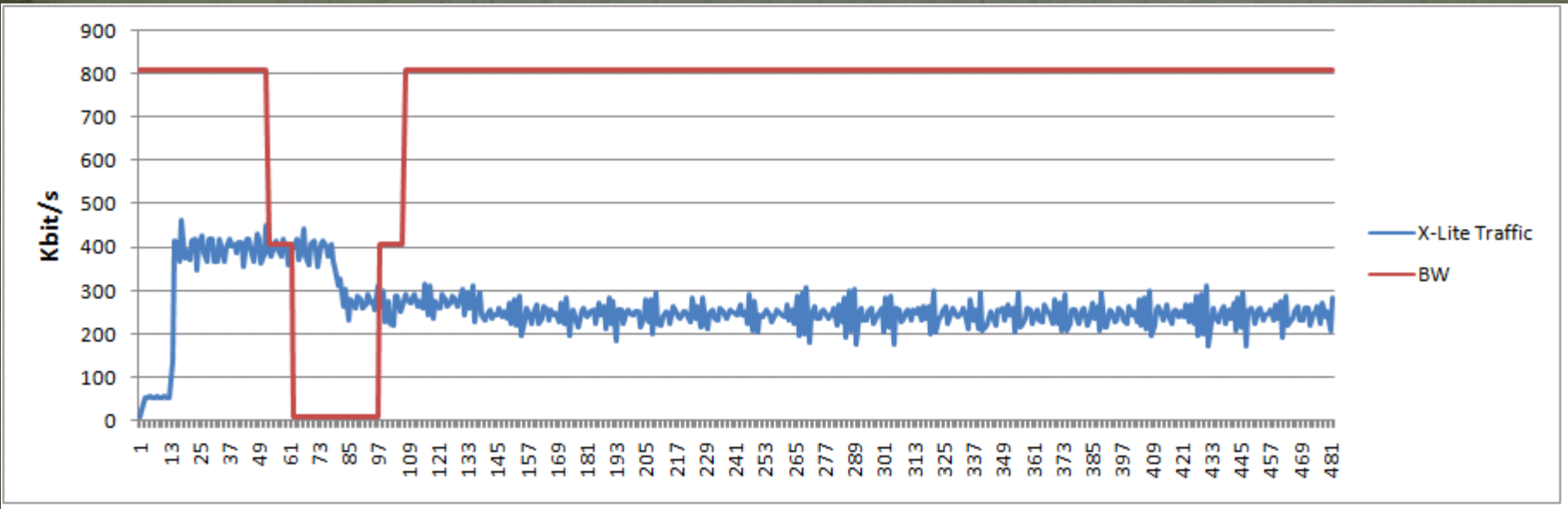


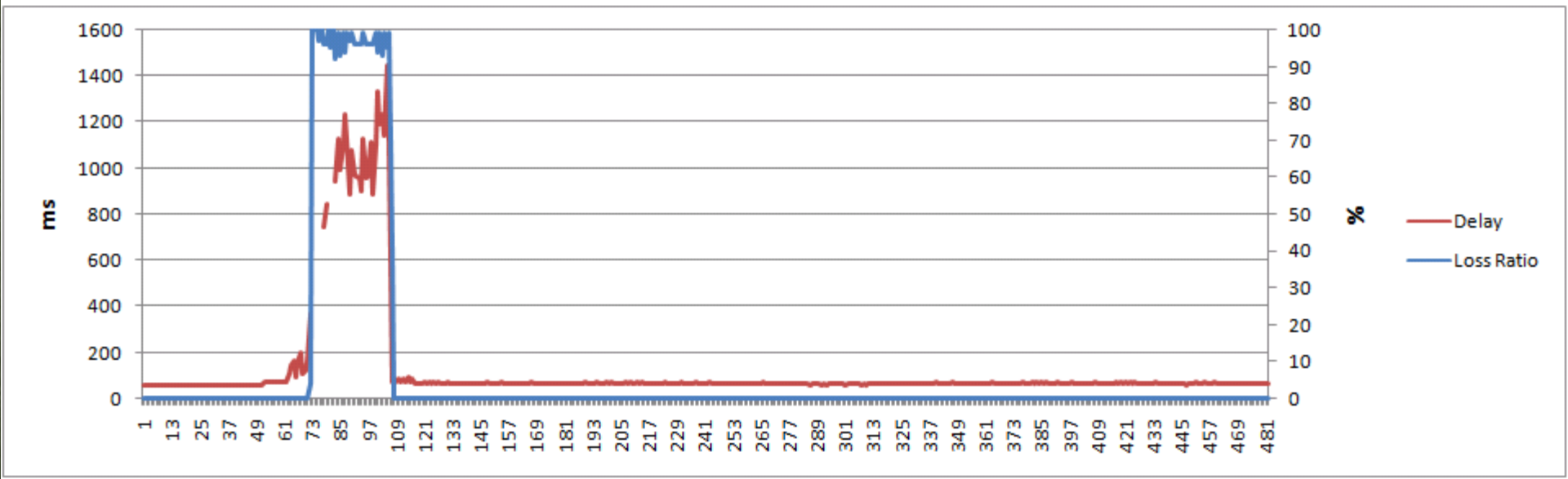


Experiment 2. Step 10sec500kbit Live



Experiment 2. Step 10sec 500kbit X-Lite





Experiment 2. Step 10sec500kbit

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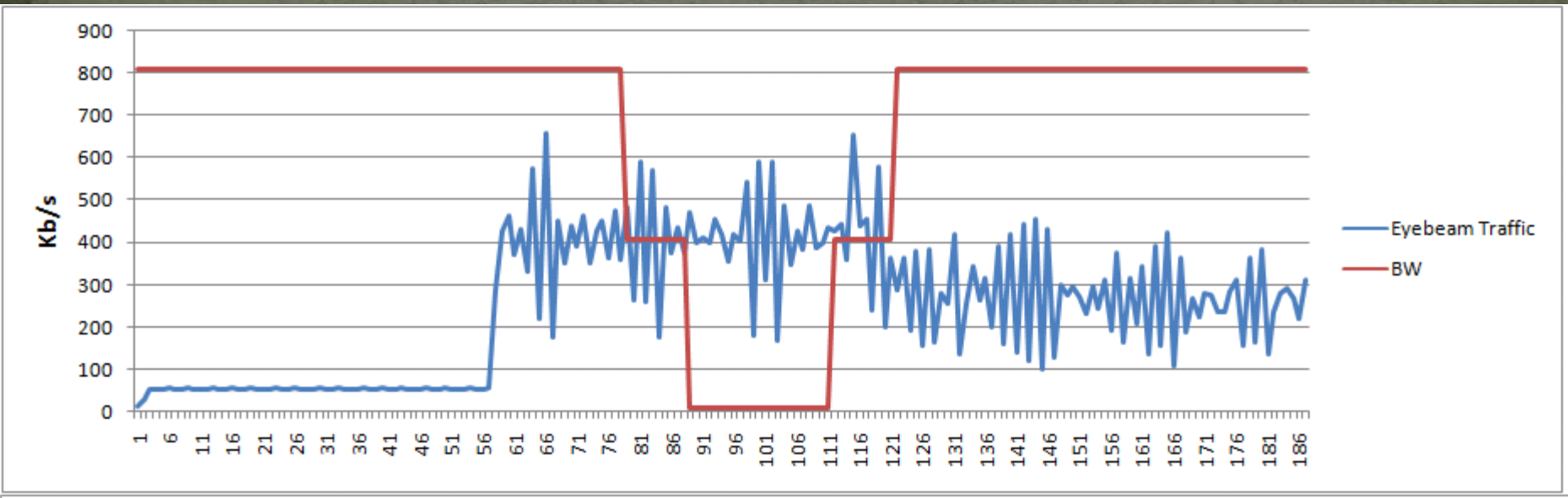
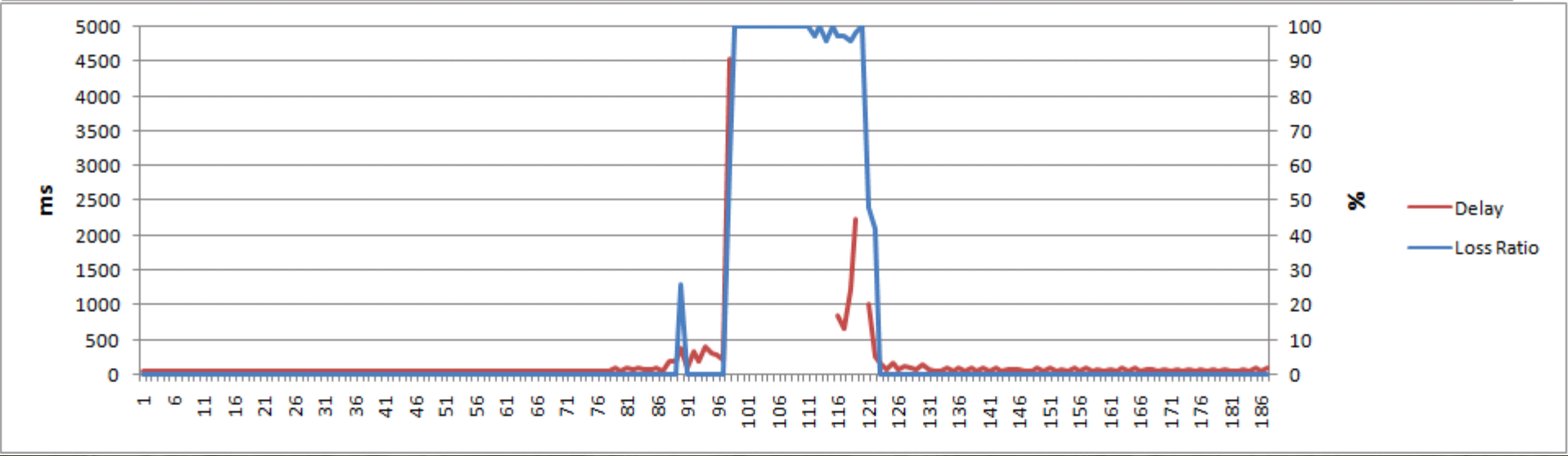
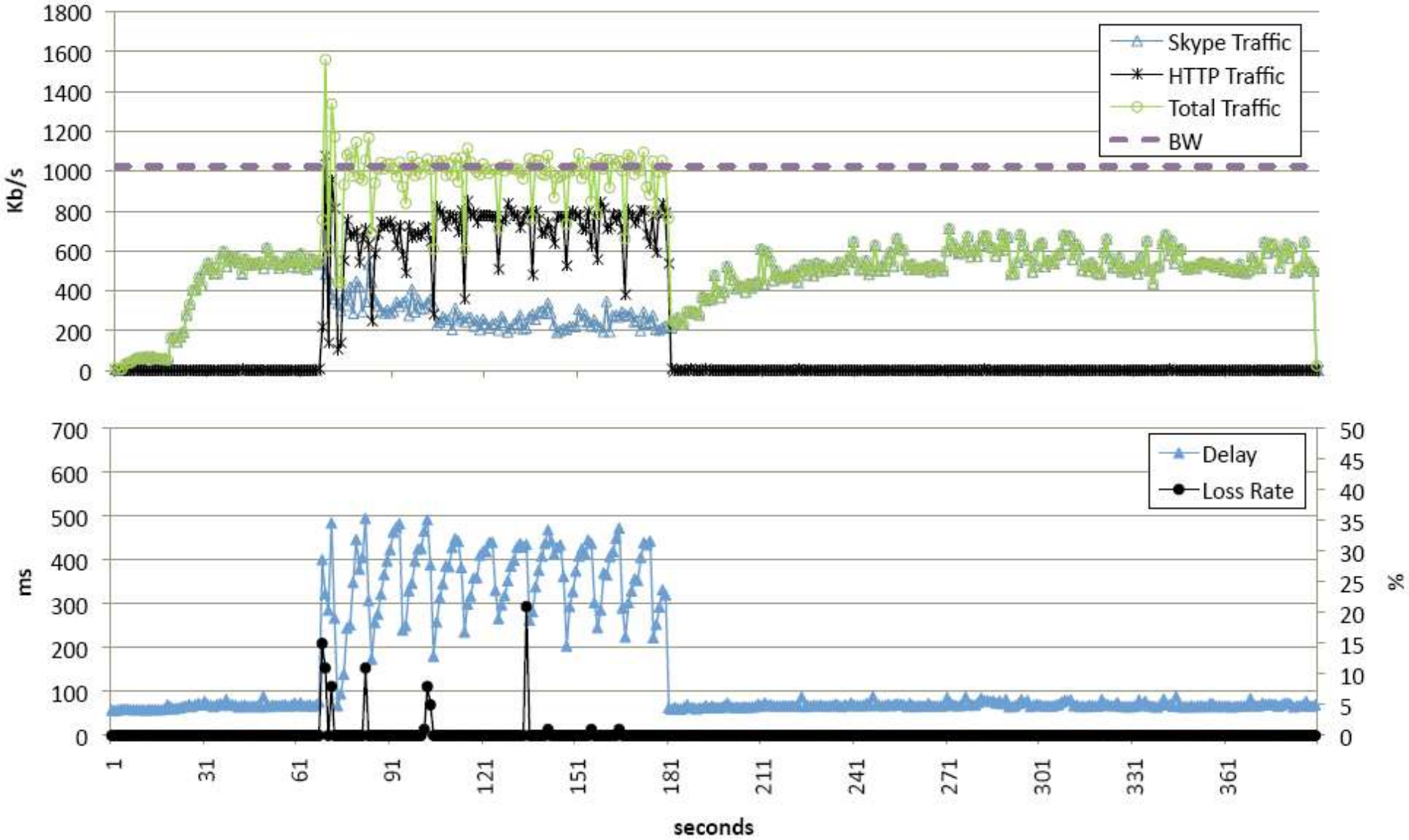




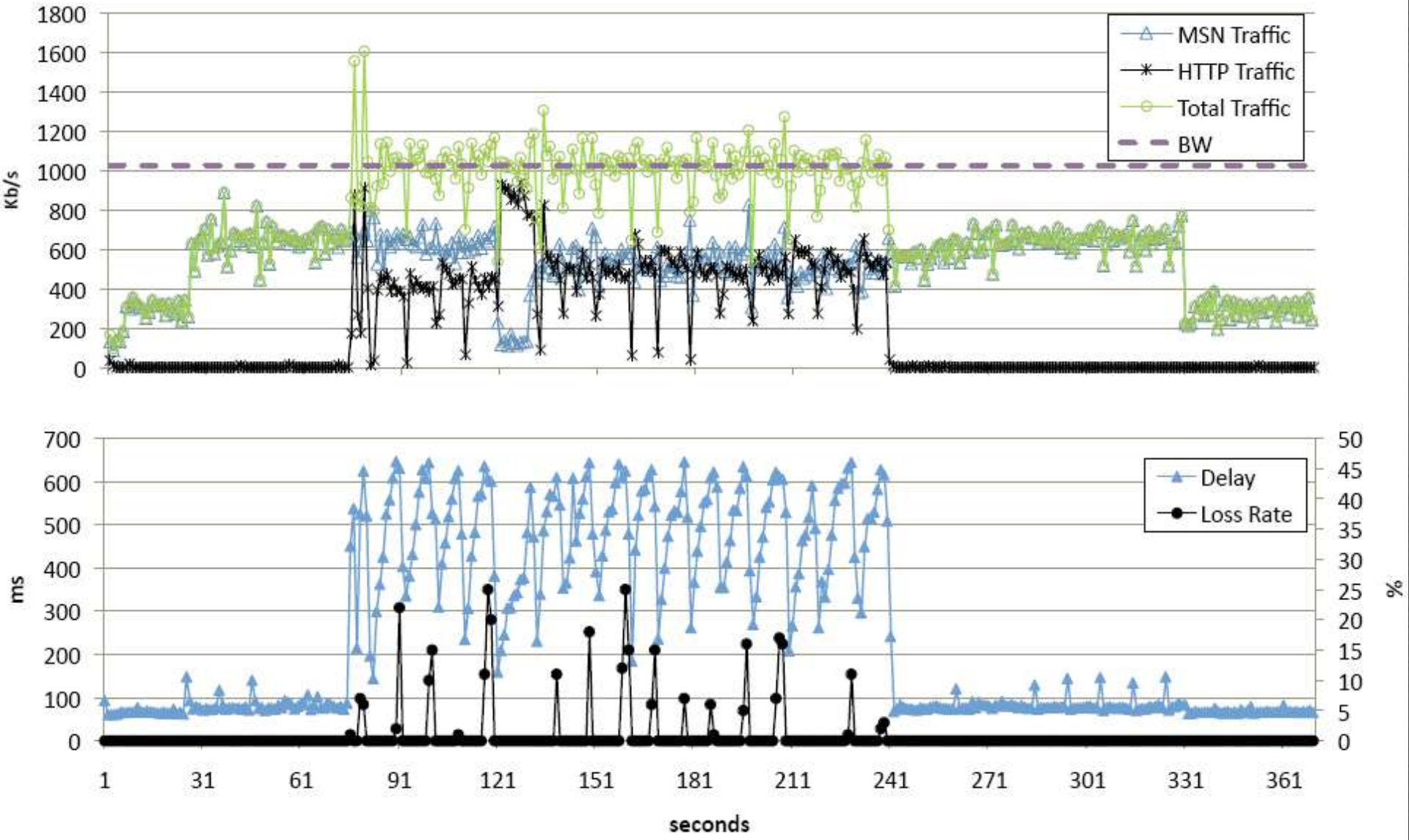
Experiment 3. File Transfer

- 9MB file to uploaded to mediafire
- If there is no cross traffic file upload fully utilizes the link

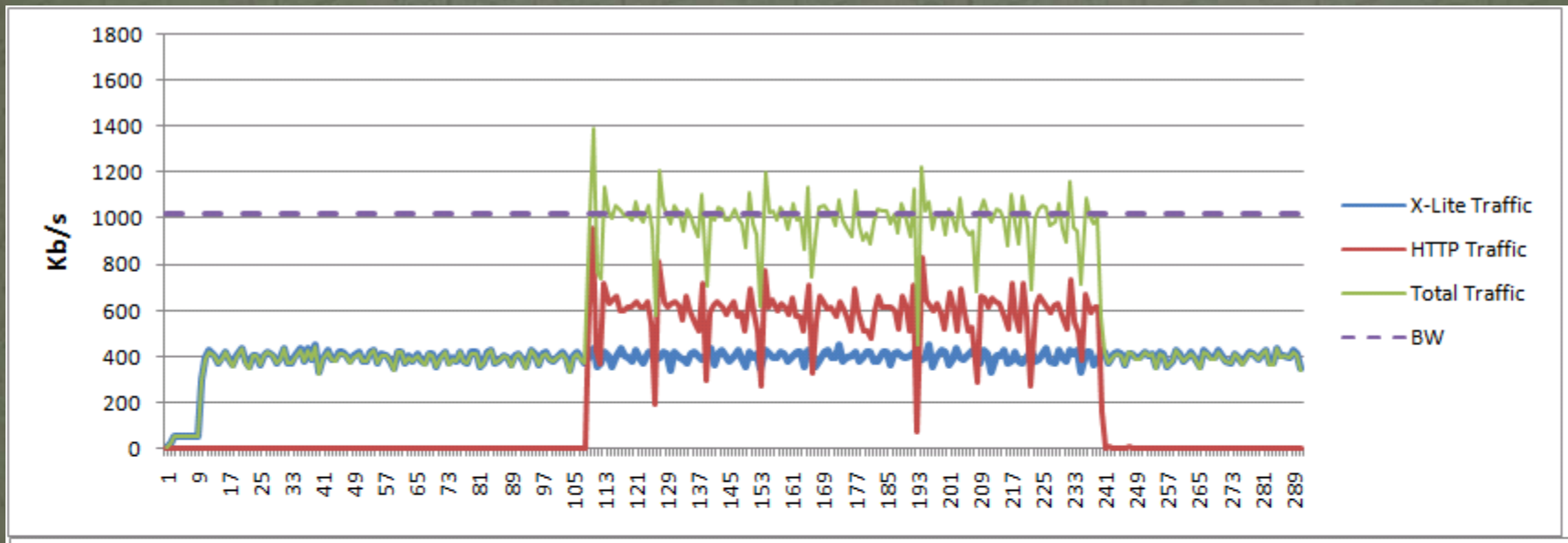
Experiment 3. File Transfer Skype

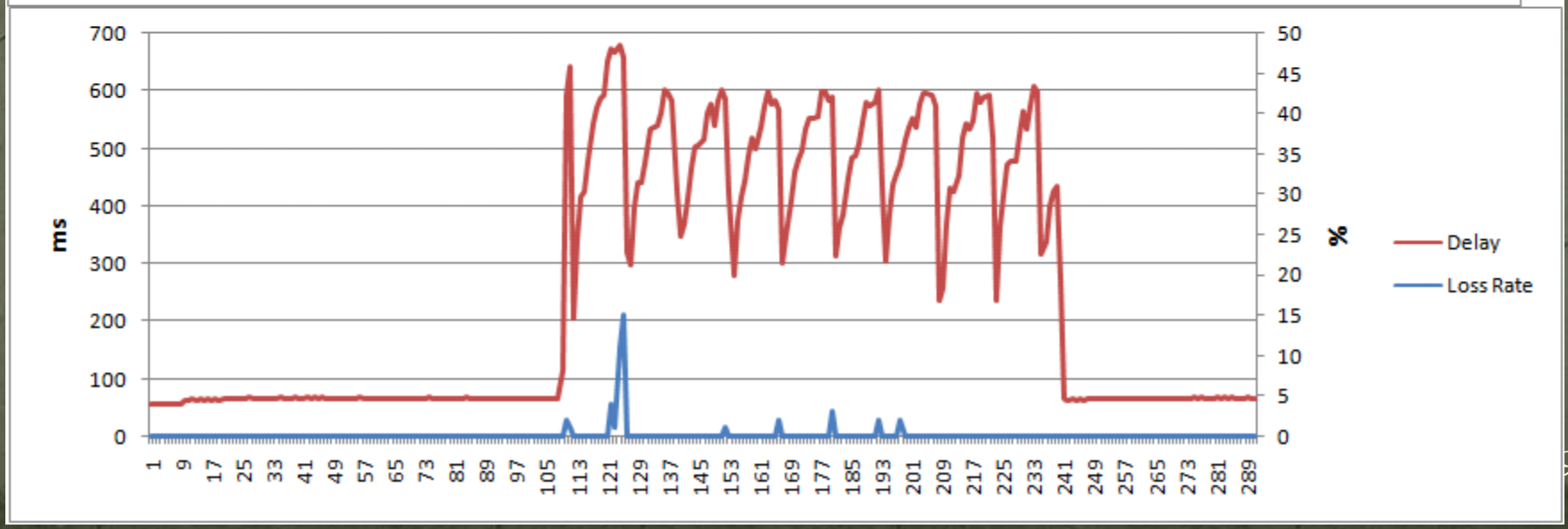


Experiment 3. File Transfer Live



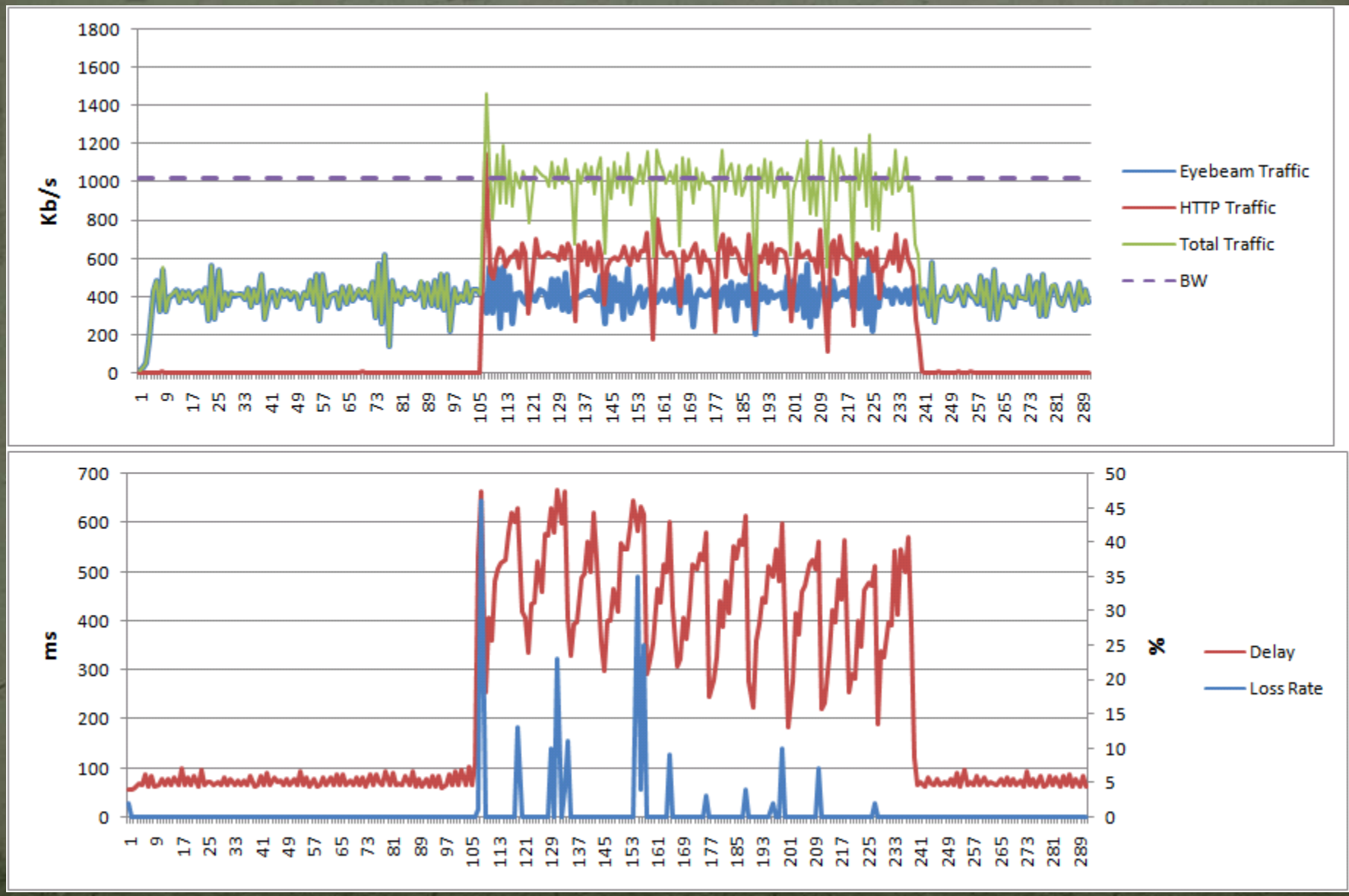
Experiment 3. File Transfer X-Lite





Experiment 3. File Transfer

Eyebeam

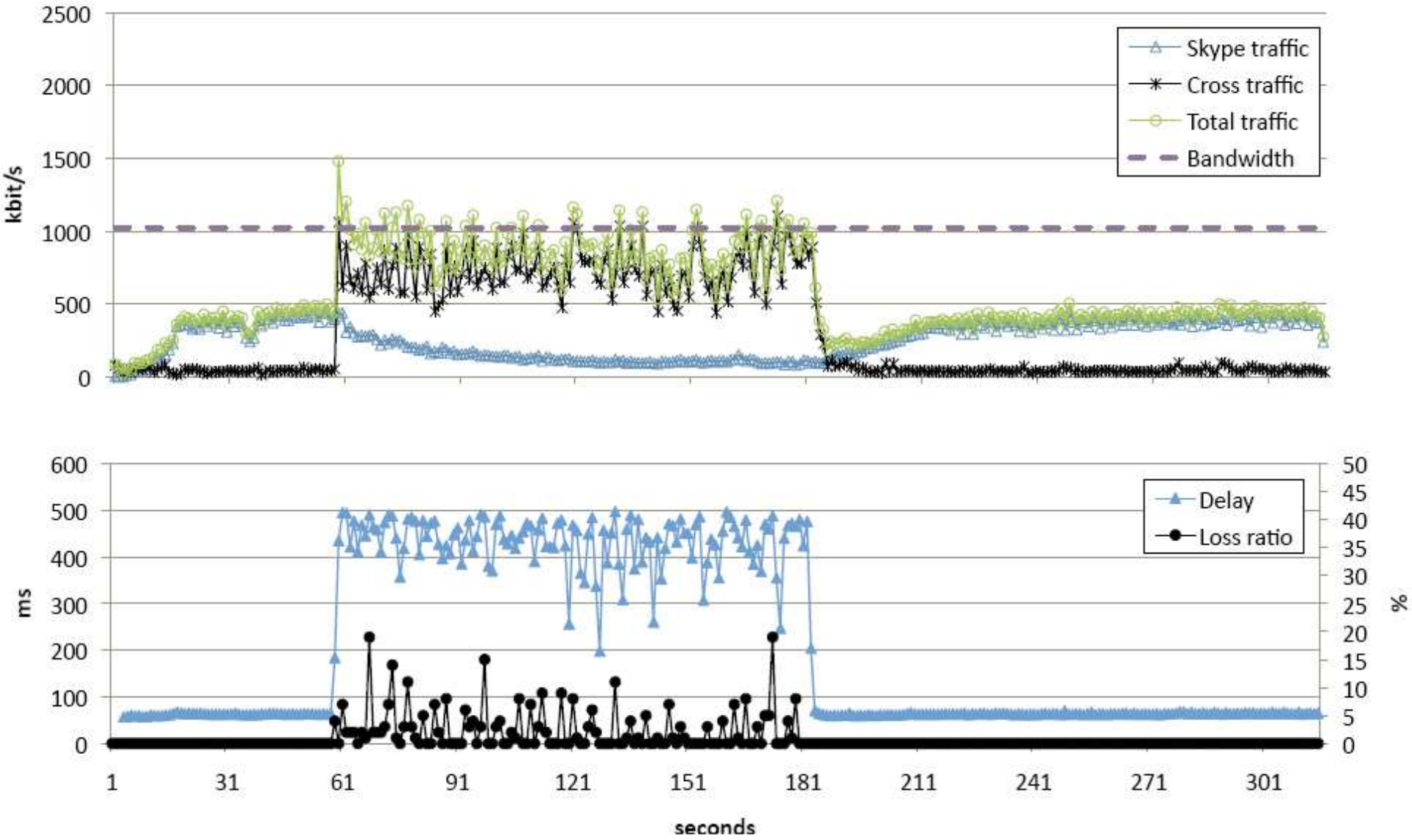


Experiment 4. Bittorrent

- Ubuntu 9.04 and Elephants Dream are shared
- If there is no cross traffic bittorrent fully utilizes the link

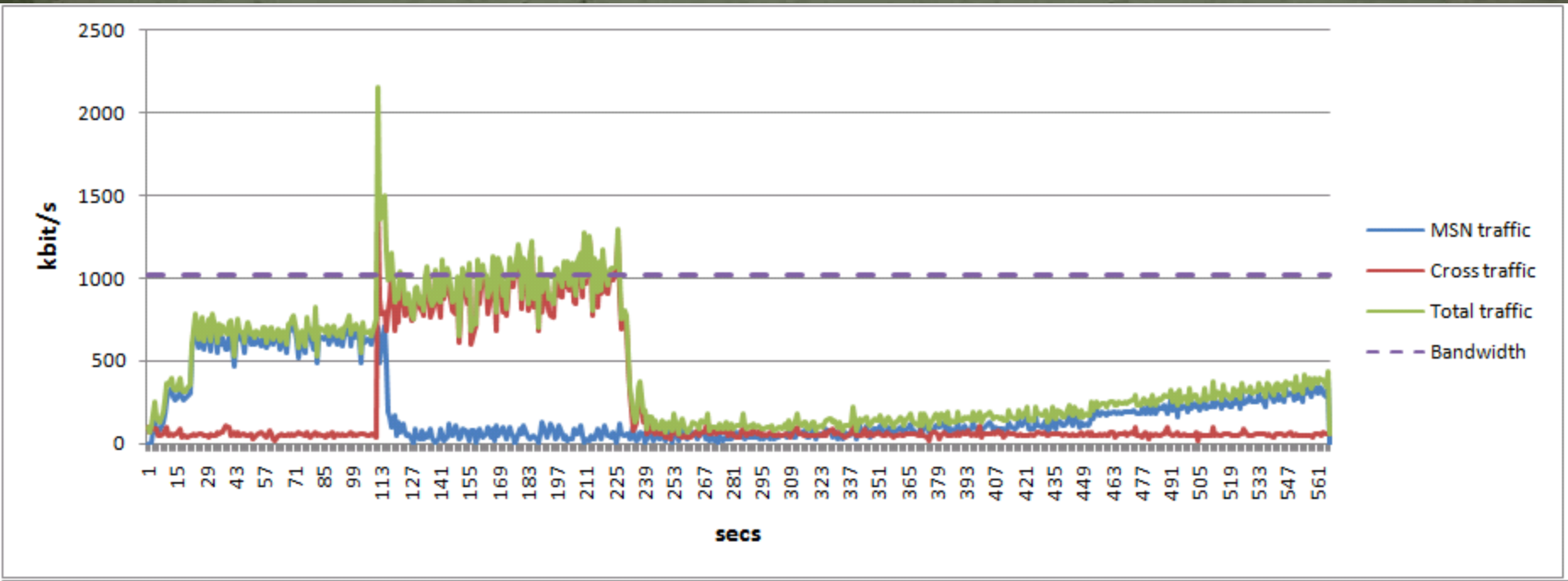
Experiment 4. Bittorrent

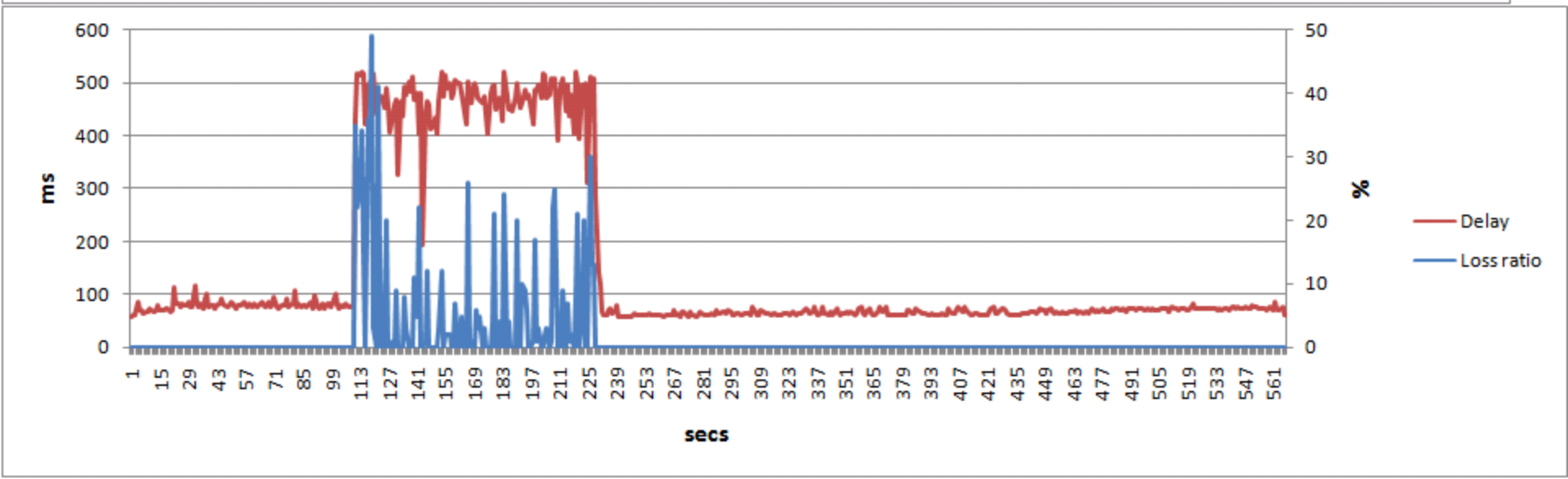
Skype



Experiment 4. Bittorrent

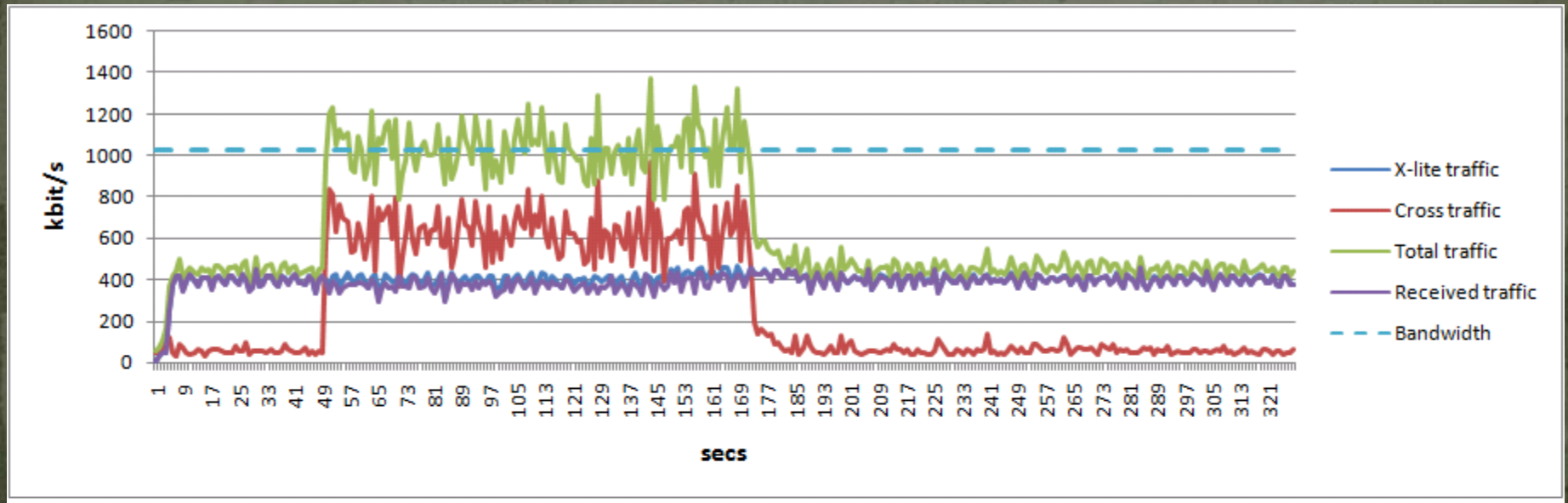
Live

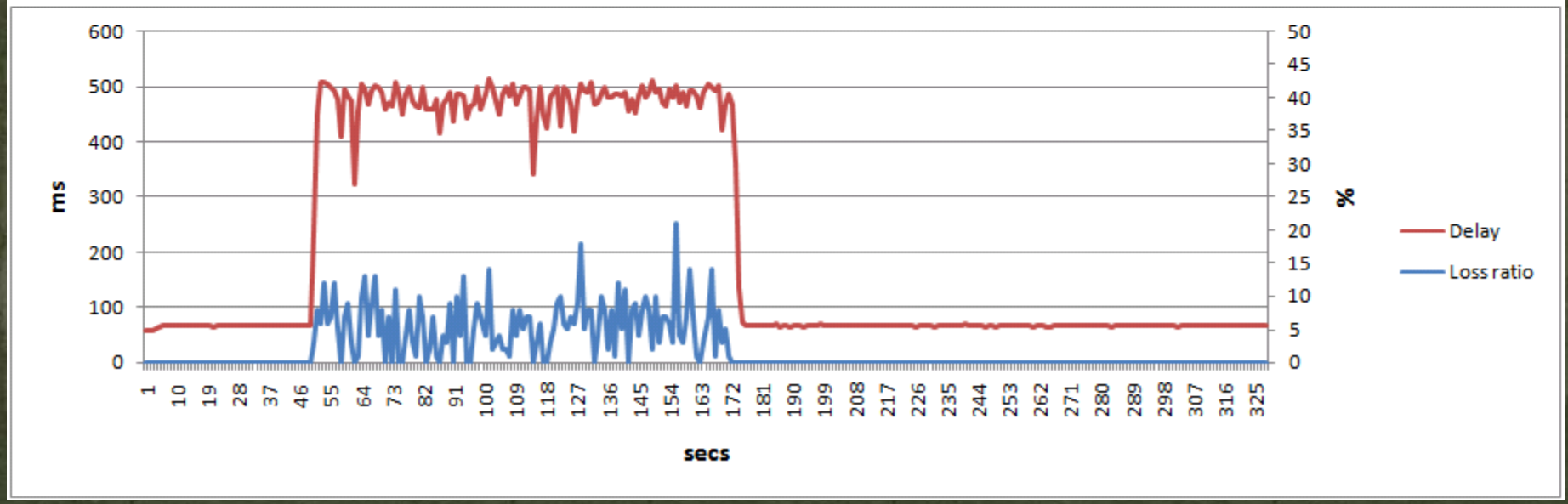




Experiment 4. Bittorrent

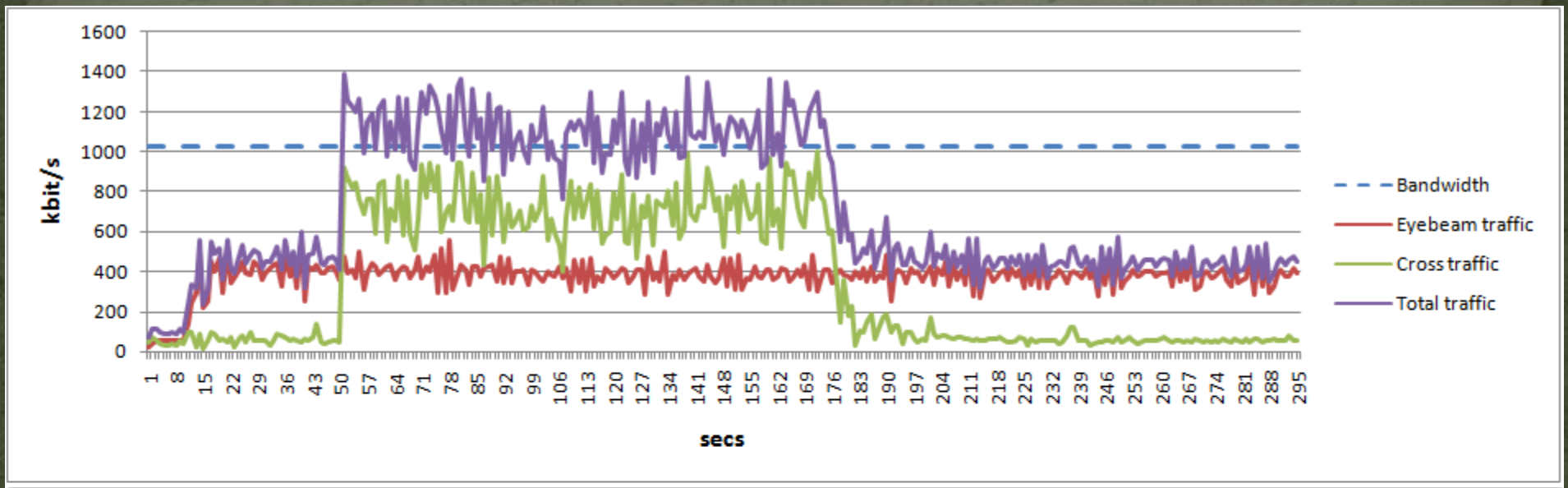
X-Lite

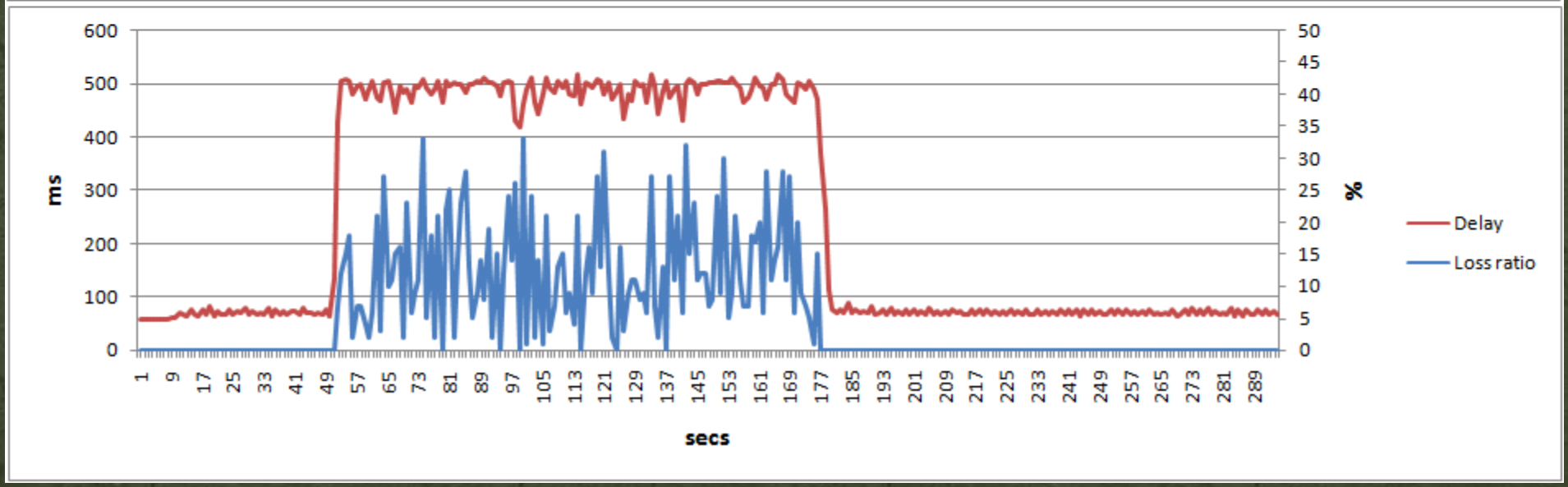




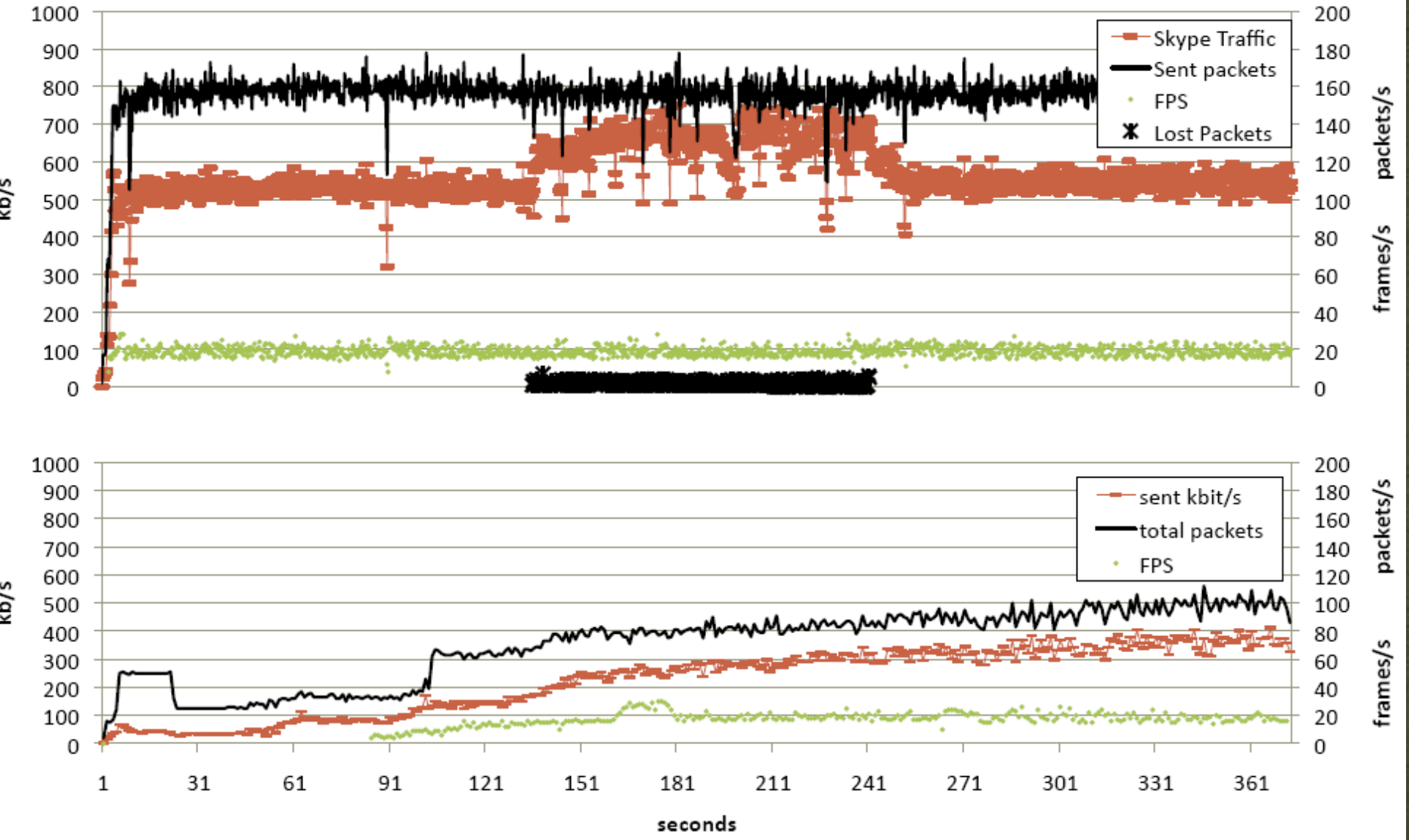
Experiment 4. Bittorrent

Eyebeam





Experiment 5. Random Loss



Conclusion

- We analyzed the behavior of Skype, Live Messenger, X-Lite and Eyebeam.
  - Skype behaved the best by adapting its codec parameters based not only on packet loss but also on RTT and jitter. This allowed Skype to closely follow the changes in bandwidth without causing any packet loss.
  - Eyebeam performed the worst with high fluctuations in the transmission speed of its video traffic and with poor adaptation to bandwidth fluctuations.
- Due to limited upstream bandwidth, video clients must have bandwidth adaptation mechanisms and must be able to differentiate between wireless losses and congestion losses.