ISP-friendly P2P live streaming

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ABSTRACT

Current peer-to-peer systems are network-agnostic, often generating large volumes of unnecessary inter-ISP traffic. Although recent work has shown the benefits of ISP-awareness on bulk transfer applications, no studies have focused on optimizing P2P live streaming systems. These are harder to design, as data must be diffused to all receivers within short delays.

We have designed a novel scheme for ISP-friendly mesh-based live streaming. Each peer maintains two distinct sets of overlay neighbors, used respectively for local and global stream propagation. A dynamic unchoke mechanism minimizes inter-ISP traffic in normal operation, enabling it promptly when local diffusion is impaired, e.g., when fast local sources become suddenly unavailable. Our scheme is independent of the chunk scheduling algorithm, and thus can be applied to a wide range of existing systems.

We have integrated our ISP-friendly scheme to our P2P live streaming prototype, and evaluated its performance through emulation and Planetlab experiments. Our results show that our scheme adapts quickly to churn and network partitions, and achieves up to a ten-fold reduction in transit traffic.

1. DEMO DESCRIPTION

This demo shows a live execution of the prototype used in the experimental evaluation of our ICDCS'09 paper [1].

In the demo we run our ISP-friendly live streaming prototype in an emulated environment. We emulate a simple two-ISP topology using the setup shown in Figure 1. The notebook ISP1 and ISP2 emulate two different ISPs which exchange traffic through a core router, emulated by a third notebook CORE. We execute several instances of our P2P client on notebooks ISP1 and ISP2, thus emulating an overlay that spans both ISPs, as shown in Figure 2.

We create two concurrent overlays. We run our old ISP-agnostic clients on one, and our new ISP-friendly clients on the other. Each overlay contains a seeder client. We seed a live video feed from a webcam to the first overlay, and a movie trailer to the second one.

The screens of notebooks ISP1 and ISP2 show the video outputs of four P2P clients. Notebook CORE shows two figures updated in real time:

- The connections established between clients of overlays A and B (i.e., the overlay graph).
- The total local-ISP and cross-ISP traffic generated by overlays A and B as a function of time.

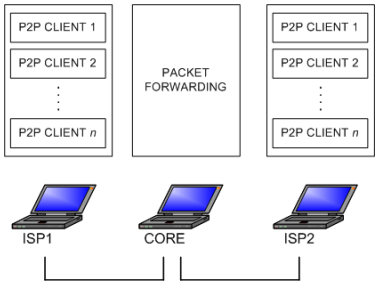

Figure 1: Demo hardware setup.

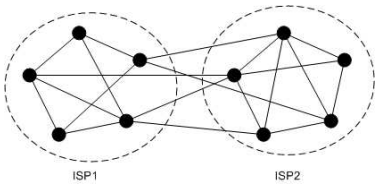

Figure 2: Example overlay spanning both ISPs.

We limit the uplink capacity of each client to 3 Mbps. We do not limit the download capacity of clients or the bandwidth between ISPs.

During the demo, the viewer can observe the following:

- **Overlay initial and final state**. The ISP-friendly overlay starts with a near-random configuration (clients initially accept any incoming connections to ensure good connectivity with low start-up time), but is gradually rewired to match the underlying topology. The ISP-agnostic overlay remains in a random configuration.
- **Total local and cross-ISP traffic**. The ISP-friendly overlay generates little cross-ISP traffic once it has converged to its stable configuration. Conversely, the ISP-agnostic overlay generates a comparable amount of cross-ISP and local-ISP.

2. REFERENCES

[1] F. Picconi and L. Massoulie. ISP-friend or foe? Making P2P live streaming ISP-aware. In *29th Intl Conference on Distributed Computing Systems* (ICDCS'09), Montreal, Quebec, Canada.