Real-time parallel TCP streaming

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Parallel download protocols have gained widespread use to overcome performance limitations in the modern Internet. In peer-to-peer networks, protocols such as BitTorrent or KaZaa establish parallel TCP connections to replicated servers to improve the download performance for a single client by aggregating the resources of multiple servers and network connections. Content Distribution Networks (CDNs), such as Akamai, download individual embedded objects in a Web page from different servers to improve end-to-end latency.

We have developed TCP-PARIS and TCP-ROME, two transport-layer protocols that establish n parallel connections to distributed servers and download TCP segments in parallel. The ability to coordinate the download of individual segments can significantly improve the download time. We implemented the protocols in the Linux kernel.

The objective of this thesis is twofold. First, TCP-ROME shall be evaluated in a local testbed and in the Internet to show the advantages of parallel downloads and to assess the tradeoffs in the design of TCP-ROME.

Second, TCP-ROME shall be extended for real-time parallel download. Commercial sites offering video on demand are florishing all over the world. In addition, home-made videos visible from MySpace, Yahoo or YouTube are flooding the Internet. Current downloads use TCP as their underlying protocol to pass through firewalls. Unfortunately, to protect against packet loss, significant client-side buffering is needed that increases the initial startup delay. TCP-ROME has the potential to alleviate many drawbacks of single-flow downloads as it aggregates the throughput of multiple connections and can compensate packet loss. In this part, it must be assessed which parts and how TCP-ROME must be extended to support real-time streaming. The benefit must be evaluated in the testbed and in the Internet.