

HOST EQUALIZATION

FINDING A BALANCED AND FAIR APPROACH

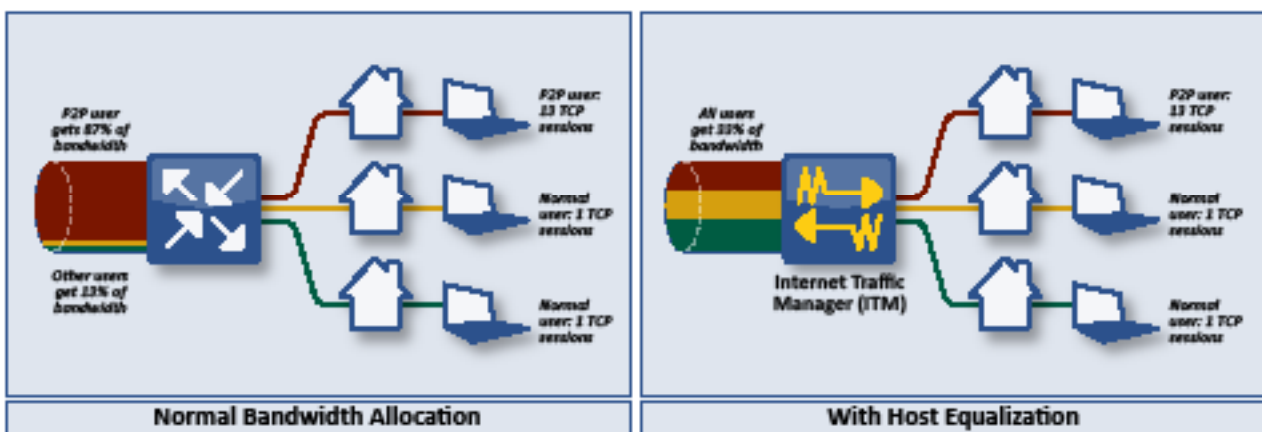
An inherent characteristic of IP networks is that they tend to allocate bandwidth as equally as possible among all flows. This was a natural architectural characteristic of the Internet at its onset and served as an equitable mechanism to easily and automatically allocate bandwidth. Unfortunately, aggressive multi-flow applications, peer-to-peer (P2P) being the best known example, have taken advantage of this architectural characteristic by opening up large numbers of flows. A large file transfer, for example, could be divided into ten segments and sent over ten parallel TCP connections. The receiving computer reassembles the segments into a single file and the overall file transfer will complete much more quickly than if the single file had been sent over a single TCP connection. While cleverly exploiting the inherent design of TCP, these applications obtain greater throughput by utilizing more than their fair share of the bandwidth at the expense of other users on the network.

Attempting to correct this imbalance by blocking misbehaving applications—as DPI devices do—is not the right answer. In addition to regulatory concerns about such activity, users themselves are uncomfortable with the idea that service providers are inspecting their traffic and making traffic policing decisions based on its content.

HOST EQUALIZATION YIELDS NON-INTRUSIVE FAIRNESS

A better approach is simply to task the network with ensuring that all hosts (users or applications) of a have access to the same amount of bandwidth irrespective of how many TCP or UDP flows are initiated.

This approach, referred to as host equalization, is an extremely powerful function of the Anagran FR-1000 Internet traffic manager (ITM). As can be seen in the figure above, available bandwidth is allocated much more fairly and done so independent of the application used (e.g., BitTorrent or Pando), ensuring that all users have fair access to their share of bandwidth.



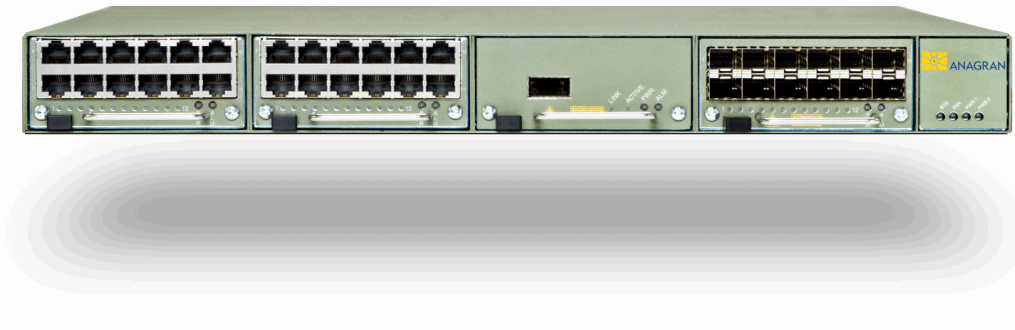
BENEFITS

Three critical benefits are realized when deploying Anagran ITMs: 1) significant improvement in the users' quality of their Internet experience, 2) material improvement in network capacity utilization, lowering both Service Provider's CAPEX and OPEX, and 3) increased revenue generation opportunities through the delivery of tiered services.

Anagran products:

- Manage individual TCP flows so as to eliminate inherent inefficiencies. In practical terms, this means applying greater intelligence to inevitable packet discards in order to ensure that all flows of a similar class are treated fairly and the TCP slow starts and stalls are completely eliminated. This yields a fairer and more deterministic network experience for all users.
- Reduce the ability of certain applications (e.g., peer-to-peer) to "game the system" by employing multiple flows per session. This reduces aggregate bandwidth requirements and also contributes to fairness between users.
- Allocate bandwidth in such a way the "bulk" applications such as file transfers yield bandwidth to quality sensitive applications such as VOIP and streaming video and "fill the valleys" when these applications are relatively idle. This also reduces overall bandwidth requirements while radically improving performance for quality sensitive applications.

Anagran's Internet traffic manager, the FR-1000, represents a new class of equipment deployable in wireline, cable, and wireless broadband networks without modifying the underlying topology of these networks. Designed to snap into current architectures, the FR-1000 produces significant OPEX savings through a reduction in backhaul bandwidth requirements and improvement in the Internet experience for all users.



www.anagran.com
Anagran, Inc., 580 North Pastoria Ave., Sunnyvale, CA 94085, USA, +1.408.701.0880.

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