

Perspectives on Congestion Management

Richard Woundy
Comcast Cable

ISP Motivations for Congestion Management

ISP must be responsive to dissimilar customer application demands

- Customer care call volume is an obvious indicator of customer dissatisfaction, as well as its own support cost
- Mix of popular customer applications tends to vary according to demographics, e.g., higher P2P usage in college environments
- Interactive applications (VoIP, web, streaming video, online gaming) tend to have much stronger diurnal consumption patterns than bulk file distribution (P2P)

ISP must balance multiple external concerns

- Internet community, government regulators, different traffic sources & sinks, sustainable business models, etc.

Network capacity increases are not instantaneous

- DOCSIS bandwidth augmentation usually requires fiber node splits and CMTS port allocations; it sometimes requires new fiber runs, additional CMTS blades and chassis, and occasionally the allocation of additional RF spectrum
- Additional access network capacity can be consumed quickly

Comcast Congestion Management

Concepts behind Comcast congestion management

- Goal: consistent performance of Internet applications even with heavy traffic, e.g., from P2P file sharing
- Both “protocol agnostic” and “application agnostic”
- Acts on *current* network conditions and *recent* user traffic
- Compatible with Internet standards and supportive of Internet innovation

Congestion management details

- Use two different Quality of Service (QoS) levels for best effort traffic over DOCSIS network
 - Priority Best Effort (PBE), which is the default QoS
 - Best Effort (BE)
- Customer traffic in congestion-managed state is forwarded with a lower priority (BE)
- Upstream and downstream DOCSIS networks are managed separately
- Only impact the traffic of users marked with BE QoS when congestion actually occurs

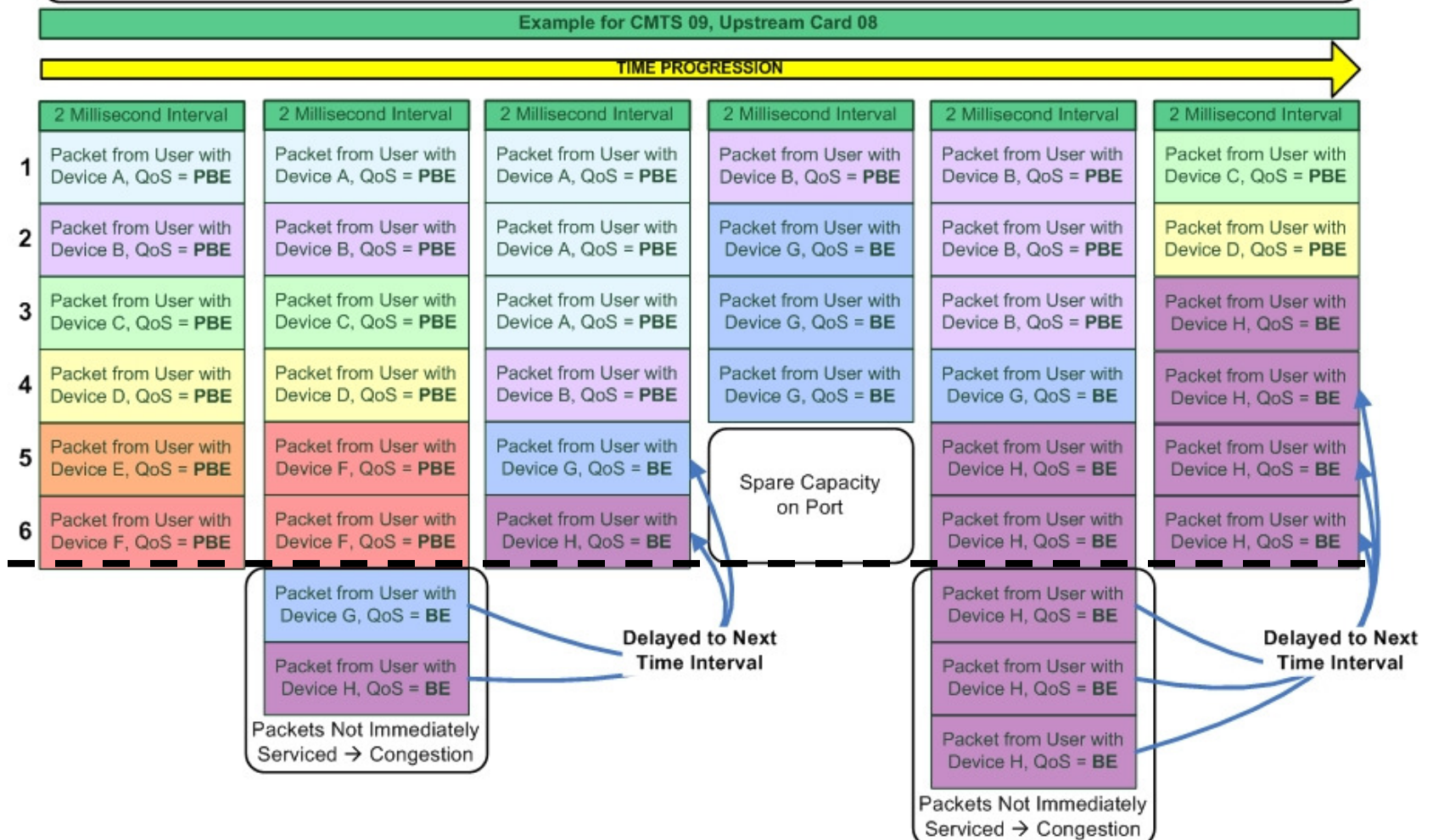
Very few customers (< 1%) impacted by congestion management



Traffic Impact Using Congestion Management

The CMTS scheduler treats PBE and BE traffic according to priority during congestion. BE traffic marking is determined by recent user traffic volumes.

Example of CMTS Packet Scheduler Behavior for an Upstream Port, During Near-Congestion and Congestion



This is a greatly simplified example, for illustrative purposes. In this example, we assume there are a total of 6 mini-slots (6.25 microseconds ea.) available on a given upstream port.

Summary

The Comcast congestion management solution is effective, is application-neutral, and supports future Internet innovation.

Comcast is collaborating with the IETF on new protocols as part of future solutions for end-to-end congestion management, e.g. Conex, Alto, and Ledbat.