Notes on the Class-Based Queueing Code

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Abstract

This is an informal note-in-progress on the CBQ code as it appears in rm_class.c. (That is, this is about the working code, not the code in the simulator ns.)

The current distribution of the CBQ code implements Ancestor-Only link-sharing; this is in the process of being updated to Top-Level Link-Sharing. Similarly, the current distribution of the CBQ code implements Packet Round Robin scheduling within a priority level; this is in the process of being updated to include the option of Weighted Round Robin scheduling.

1 The calculation of avgidle

The parameter *avgidle* is explained in [FJ95, F96]. From [FJ95], *avgidle* is calculated from *idle* as follows:

$$avg \leftarrow (1-w)avg + w * \mathit{diff},$$

for some weight w chosen as a negative power of two.

In the code in rm_class.c, in contrast, the following equation is used:

```
avgidle += (idle - avgidle) >> RM_FILTER_GAIN);
```

This equation from the code is equivalent to

```
avgidle += idle - avgidle/2^RM_FILTER_GAIN;
```

or

```
avgidle = (1 - 1/2^RM_FILTER_GAIN) avgidle + idle;
```

The key to reconciling these two equations is to note the following line from the comments in rm_class.c: "Also note that the 'idle' filter computation keeps an estimate scaled by `2^RM_FILTER_GAIN` so the passed value of maxidle must be scaled by this value." That is, in rm_class.c `idle` is unscaled, but the scaled parameter `avgidle` actually represents `AvgIdle * 2^RM_FILTER_GAIN`, for `AvgIdle` the true unscaled version.

Thus, the code translates to the following:

```
  AvgIdle * 2^RM_FILTER_GAIN =
    (1 - 1/2^RM_FILTER_GAIN) AvgIdle * 2^RM_FILTER_GAIN + idle;
```

or equivalently,

```
  AvgIdle =
    (1 - 1/2^RM_FILTER_GAIN) AvgIdle + (1/2^RM_FILTER_GAIN) idle;
```

This gives the correct equation.

References

[F96] Floyd, S., Notes on Class-Based Queueing: Setting Parameters, URL ftp://ftp.ee.lbl.gov/papers/params.ps.Z.

[FJ95] Floyd, S., and Jacobson, V., Link-sharing and Resource Management Models for Packet Networks. IEEE/ACM Transactions on Networking, Vol. 3 No. 4, pp. 365-386, August 1995. URL ftp://ftp.ee.lbl.gov/papers/link.ps.Z.

[F95] Floyd, S., WWW page for CBQ, URL http://www-nrg.ee.lbl.gov/floyd/cbq.

[MF95] McCanne, S., and Floyd, S., NS (Network Simulator). 1995. Available via http://www-nrg.ee.lbl.gov/ns.