**Weighted random early detection**

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**Weighted random early detection** (**WRED**) is a queueing discipline for a [network scheduler](https://en.wikipedia.org/wiki/Network_scheduler) suited for [congestion avoidance](https://en.wikipedia.org/wiki/Network_congestion_avoidance).[[1]](https://en.wikipedia.org/wiki/Weighted_random_early_detection#cite_note-1) It is an extension to [random early detection](https://en.wikipedia.org/wiki/Random_early_detection) (RED) where a single queue may have several different sets of queue thresholds. Each threshold set is associated to a particular [traffic class](https://en.wikipedia.org/wiki/Traffic_shaping#Traffic_classification).

For example, a queue may have lower thresholds for lower priority packet. A queue buildup will cause the lower priority packets to be dropped, hence protecting the higher priority [packets](https://en.wikipedia.org/wiki/Network_packet) in the same queue. In this way [quality of service](https://en.wikipedia.org/wiki/Quality_of_service) prioritization is made possible for important packets from a pool of packets using the same buffer.[[2]](https://en.wikipedia.org/wiki/Weighted_random_early_detection#cite_note-2)

It is more likely that standard traffic will be dropped instead of higher prioritized traffic.



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**Restrictions**

On Cisco switches WRED is restricted to

* [TCP/IP](https://en.wikipedia.org/wiki/TCP/IP) traffic. Only this kind of traffic indicates congestion to the sender to enable a reduction of the transmission rate.

Non-IP traffic will be dropped more often than TCP/IP traffic because it is treated with the lowest possible precedence.

**Functional Description**

WRED proceeds in this order when a packet arrives:

* Calculation of the average queue size.
* The arriving packet is queued immediately if the average queue size is below the minimum queue threshold.
* Depending on the packet drop probability the packet is either dropped or queued if the average queue size is between the minimum and maximum queue threshold.
* The packet is automatically dropped if the average queue size is greater than the maximum threshold.

**Calculation of average queue size**

The average queue size depends on the previous average as well as the current size of the queue. The calculation formula is given below:

a v g = o ∗ ( 1 − 2 − n ) + c ∗ ( 2 − n ) {\displaystyle avg=o\*(1-2^{-n})+c\*(2^{-n})\,\!}

where n {\displaystyle n} is the user-configurable exponential weight factor, o {\displaystyle o} is the old average and c {\displaystyle c} is the current queue size. The previous average is more important for high values of n {\displaystyle n} . Peaks and lows in queue size are smoothed by a high value. For low values of n {\displaystyle n} , the average queue size is close to the current queue size.

**References**

 [*"Congestion Avoidance Overview"*](http://www.cisco.com/en/US/docs/ios/12_2/qos/configuration/guide/qcfconav_ps1835_TSD_Products_Configuration_Guide_Chapter.html)*. Cisco. Retrieved 2012-05-10.*

 [*"Class-Based Weighted Fair Queueing and Weighted Random Early Detection"*](https://www.cisco.com/en/US/docs/ios/12_0t/12_0t5/feature/guide/cbwfq.html)*. Cisco. Retrieved 2020-05-07.*