NFV 523-WBT vRouter Quality of Service

NFV 523-WBT AT&T Vyatta 5600 vRouter Quality of Service

The training materials and other content provided herein for assistance in training on the Vyatta vRouter may have references to Brocade as the Vyatta vRouter was formerly a Brocade product prior to AT&T's acquisition of Vyatta. Brocade remains a separate company and is not affiliated to AT&T.

AT&T

Welcome to the AT&T vRouter Dynamic Multipoint VPN course.

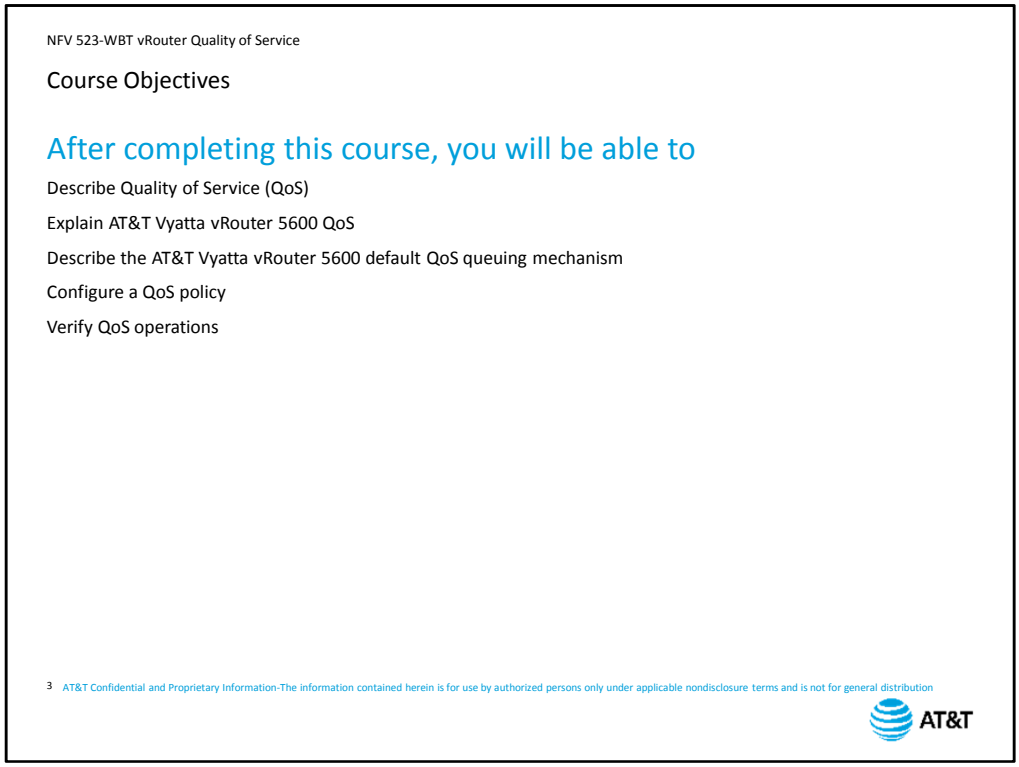
NFV 523-WBT vRouter Quality of Service

Legal Disclaimer

All or some of the products detailed in this presentation may still be under development and certain specifications may be subject to change. Nothing in this presentation shall be deemed to create a warranty of any kind.

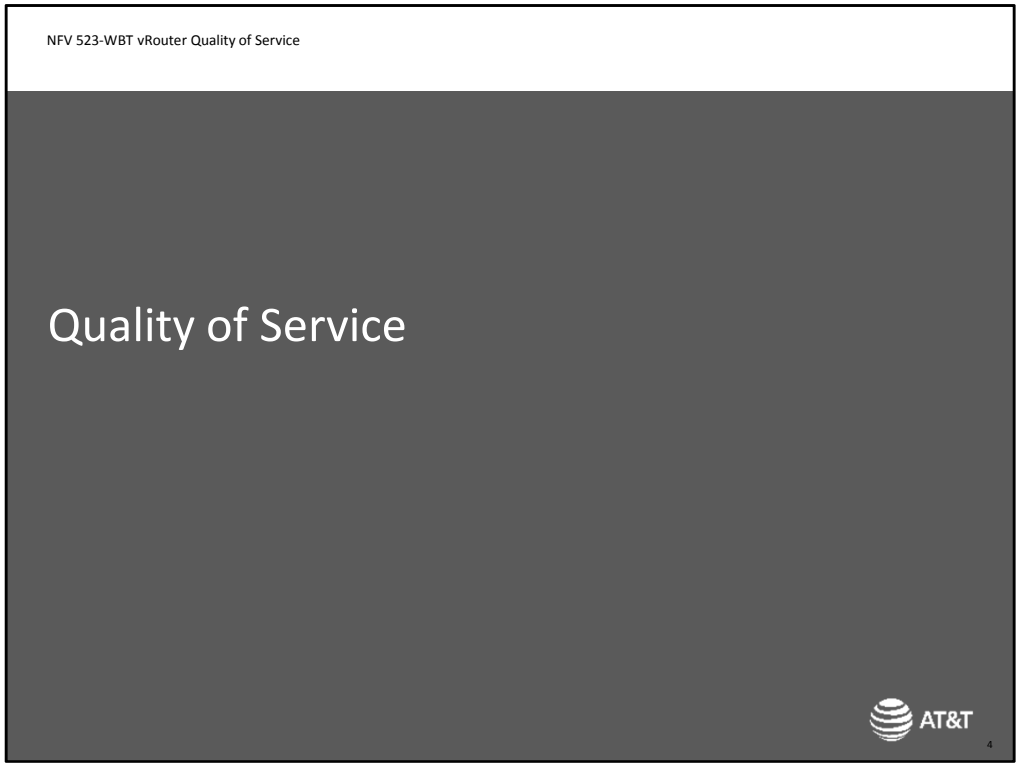
AT&T

Before we begin the course, please take a moment to read our legal disclaimer.



After completing this course, you will be able to:

- Describe Quality of Service (QoS)
- Explain AT&T Vyatta vRouter 5600 QoS
- Describe the AT&T Vyatta vRouter 5600 default QoS queuing mechanism
- Configure a QoS policy
- Verify QoS operations



We'll begin with a discussion of the Quality of Service features and options available on the 5600 vRouter.

NFV 523-WBT vRouter Quality of Service

Quality of Service (QoS)

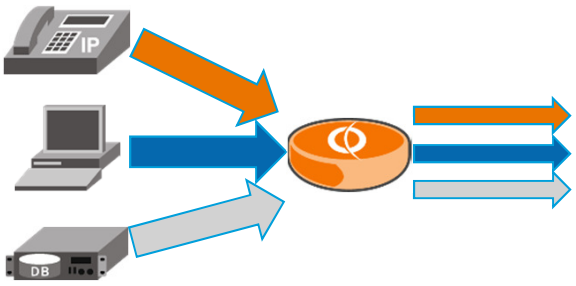
QoS provides guarantees to services:

Reduces latency by limiting buffering

Controls bandwidth to contracted service levels

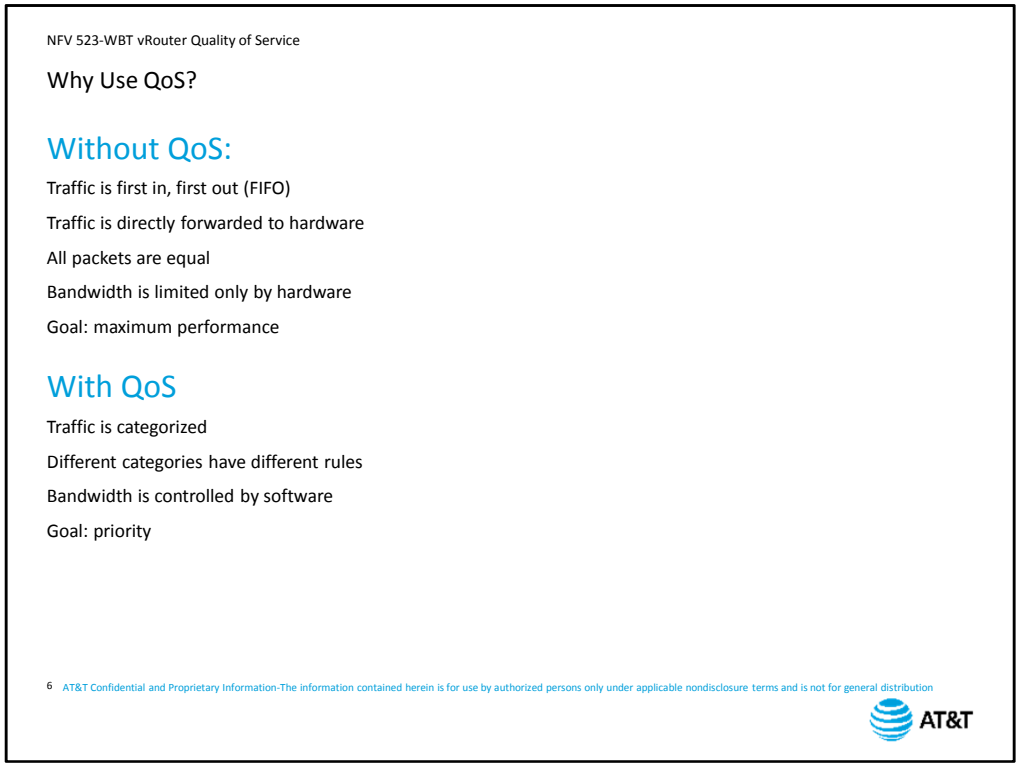
Prioritizes traffic based on application

Limits certain traffic to help with Denial Of Service

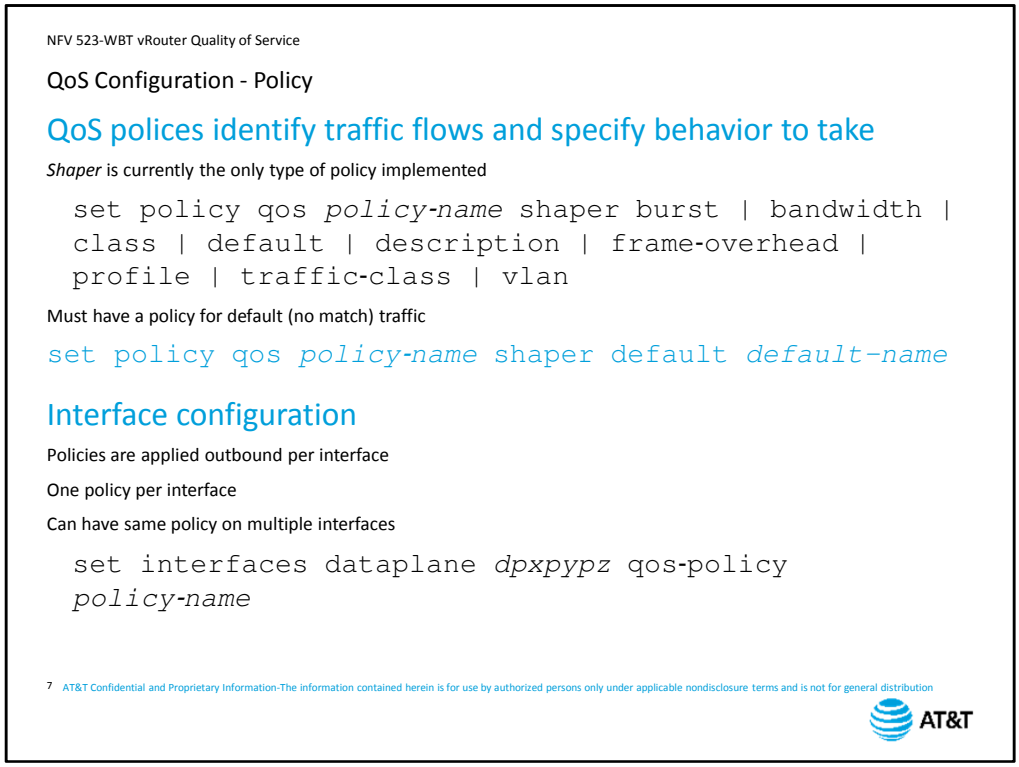


AT&T

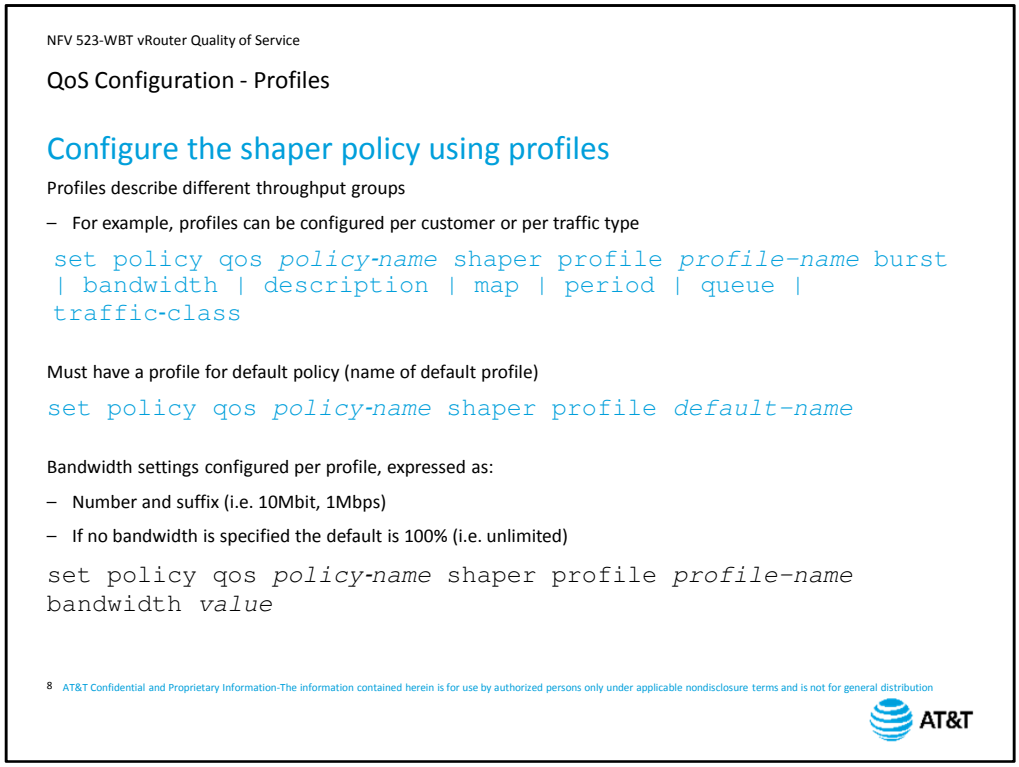
Quality of Service (or QoS) allows you to determine how you want the vRouter to handle data when you have more traffic than a link can support. QoS features are typically implemented to protect time-critical data such as voice over IP or streaming media transmissions, which cannot tolerate lost data or transmission delay.
QoS is also used to provided guarantees to services by reducing latency by limiting buffering, controlling bandwidth to contracted service levels, prioritizing traffic based on application, and limiting certain traffic to help with Denial Of Service.



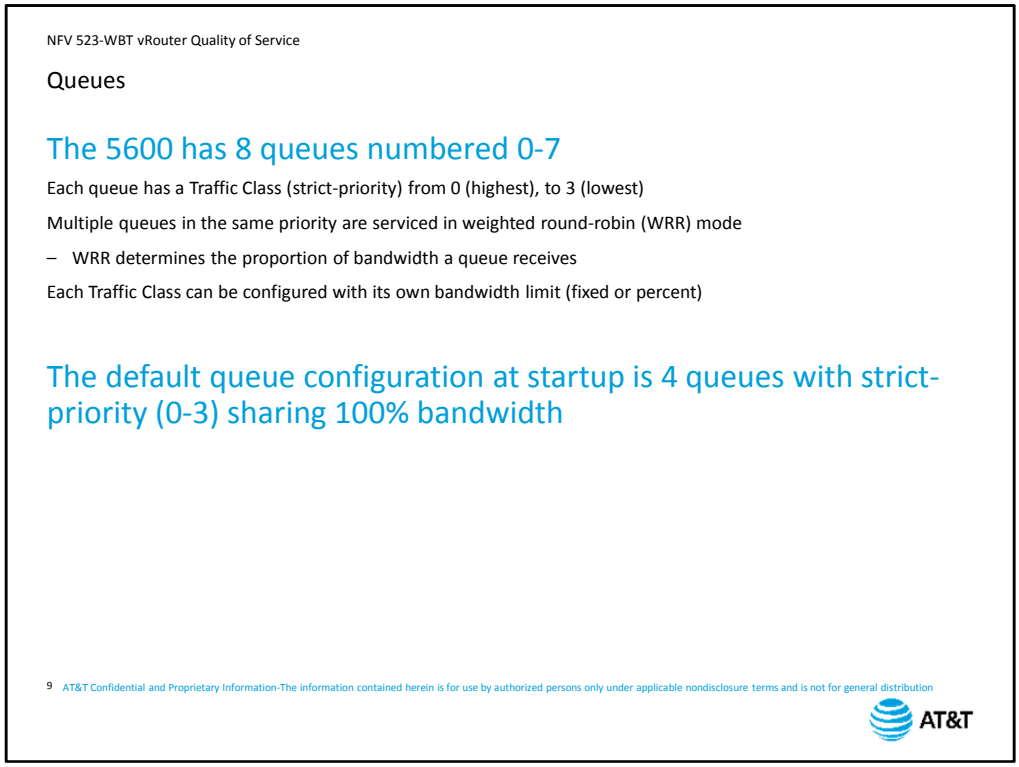
Let's take a look at how traffic is handled without QoS. Traffic is handled on a first in, first out basis. Traffic is directly forwarded to hardware and bandwidth is limited only by the hardware in the path. Without QoS all packets are treated equally. The goal in this scenario is maximum performance.
With QoS implemented, the traffic is categorized and these different categories have different rules assigned. With QoS, bandwidth is controlled by software. In this scenario the goal is to provide priority including dedicated bandwidth, controlled latency and jitter, and improved loss characteristics.



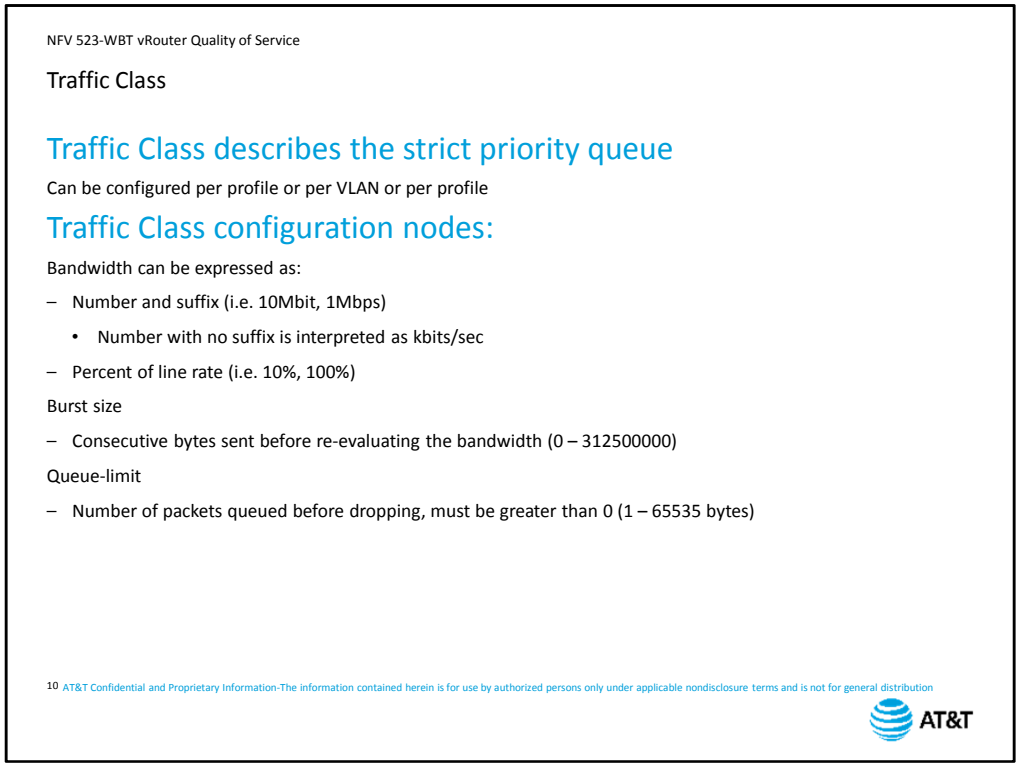
In the Vyatta vRouter 5600, QoS is configured in policies. Policies identify different traffic flows and the specific behavior to take on the traffic. Currently the only type of policy available for configuration is called shaper. QoS is currently only supported on data plane interfaces, not virtual or tunnel interfaces.
You must configure a default policy for any traffic that does not match the traffic specified in the shaper policy. If you do not configure a default policy, you will be given an error when you commit the QoS policy.
Once policies are configured they are applied outbound on a per interface basis. Though you can only have one policy per interface, you can assign the same policy to multiple interfaces.



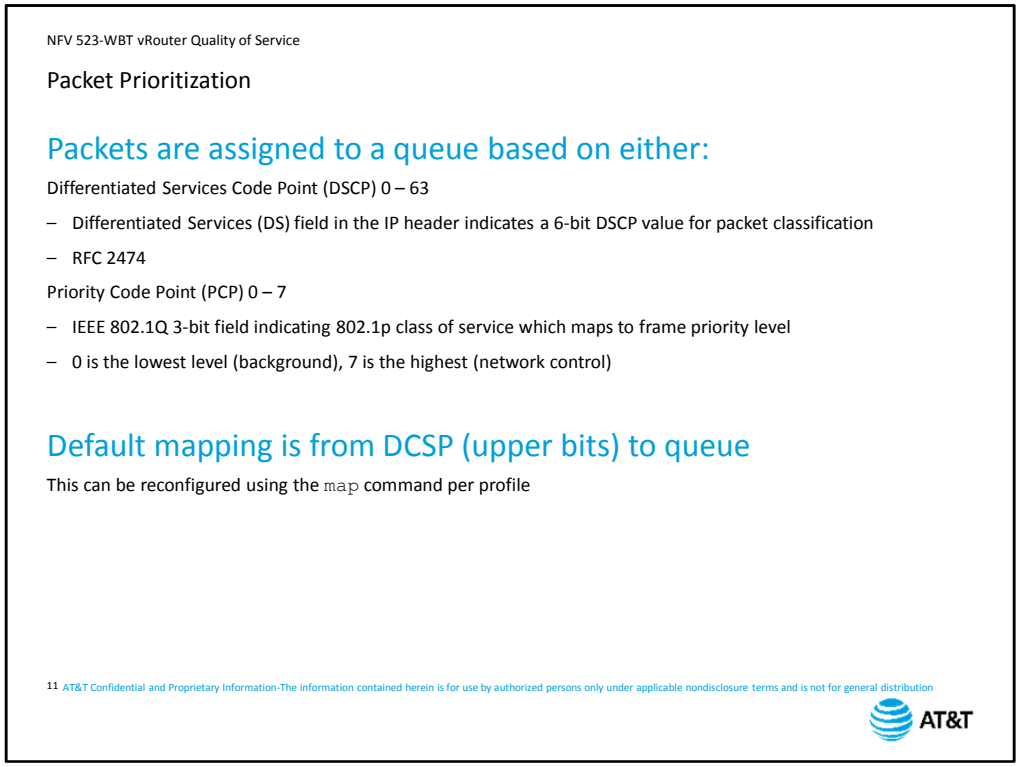
As a best practice you should configure the policy to use profiles to describe different throughput groups. For example, profiles can be configured per customer or per type of traffic. For example, you can configure profiles for premium traffic like VOIP, normal traffic, or guest traffic.
You must configure a profile for default traffic using the name of the default shaper created on the previous slide.
Configure bandwidth, burst, map, period, queue, and traffic-class settings under the profiles, for example, set the bandwidth per profile. If no bandwidth is specified, the default bandwidth is unlimited or 100%.



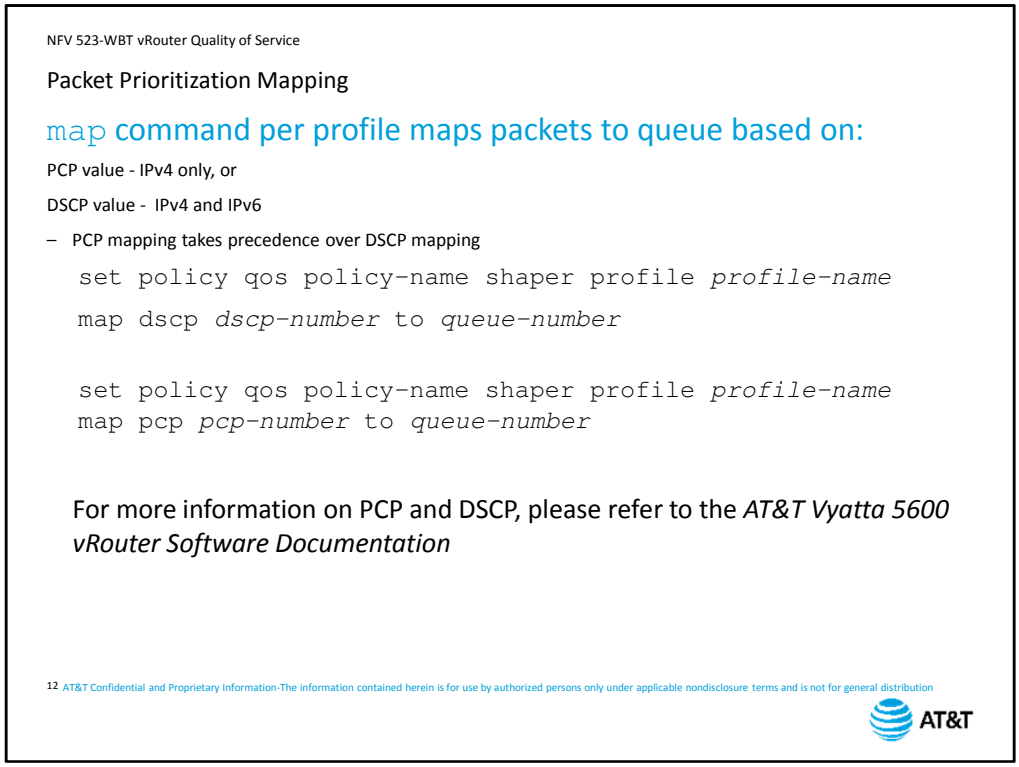
The Vyatta vRouter 5600 has 8 queues numbered zero through seven. Each queue has a strict-priority (or Traffic Class), priority 0 is the highest, and priority 3 is the lowest. If multiple queues have the same priority, they operate in weighted round-robin (WRR) mode. WWR mode determines the proportion of bandwidth a queue receives (1 to 100%). Each priority can be configured with its own fixed or percent of bandwidth limit. We will discuss the configuration of the bandwidth limit on the next slide.
The default queue configuration on the 5600 is very basic, the vRouter initializes with 4 queues with strict-priority sharing 100% bandwidth.



Again, the traffic class describes the strict priority of the queue. This can be configured per VLAN or per profile. Each traffic class can be configured with a specific bandwidth, burst size and queue limit.
Configure a specific bandwidth using a number and suffix like 1Mbps. If no suffix is configured, the number is in Kilobits (kbit) per second.
The burst size is the consecutive bytes sent before re-evaluating the bandwidth. Burst size is configured as 0 through 312,500,000 bytes.
You can also configure a queue-limit. The queue-limit is the number of packets queued before dropping, the value must be greater than 0 bytes. The value can be configured as 1 to 65535 bytes.

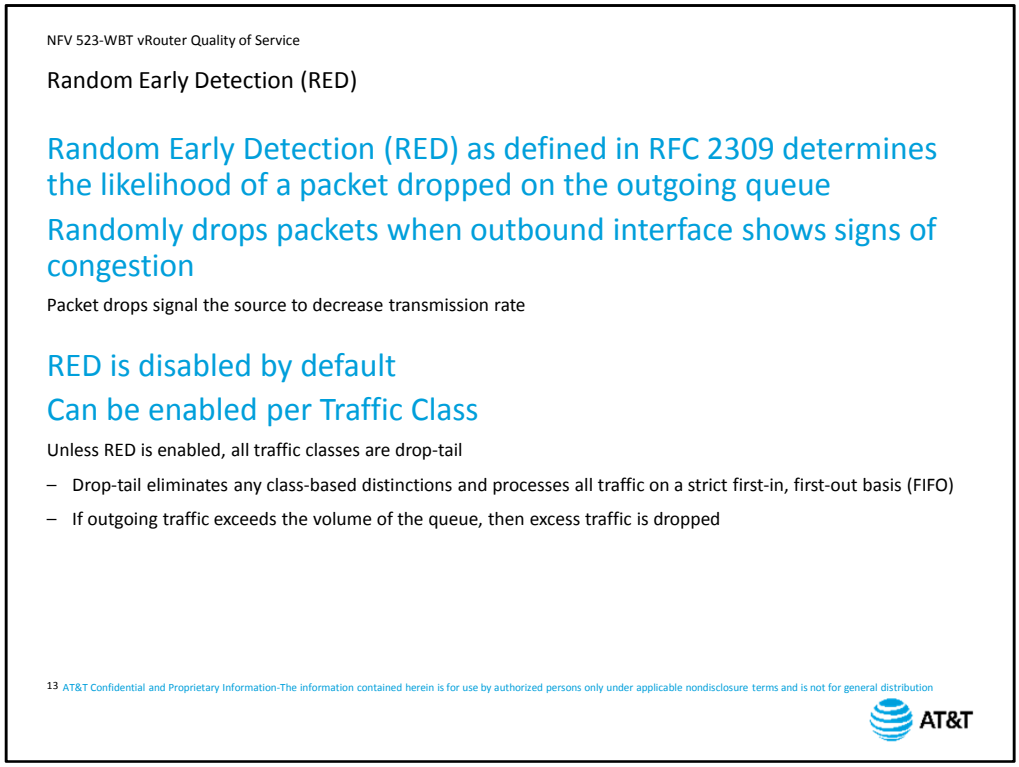


QoS mapping is based on priority for IPv4 or IPv6 traffic. Packets are mapped to queues based on either Differentiated Services Code Point (or DSCP) for IPv4 or IPv6 traffic, or IEEE 802.3 VLAN Priority Code Point (PCP) for tagged IPv4 traffic.
The default mapping is from DSCP to queue but this can be reconfigured per profile using the `map` command. We will discuss using the `map` command on the next slide.
For more information please review RFC 2474 for DSCP values, or the IEEE 802.1Q standard for PCP values.

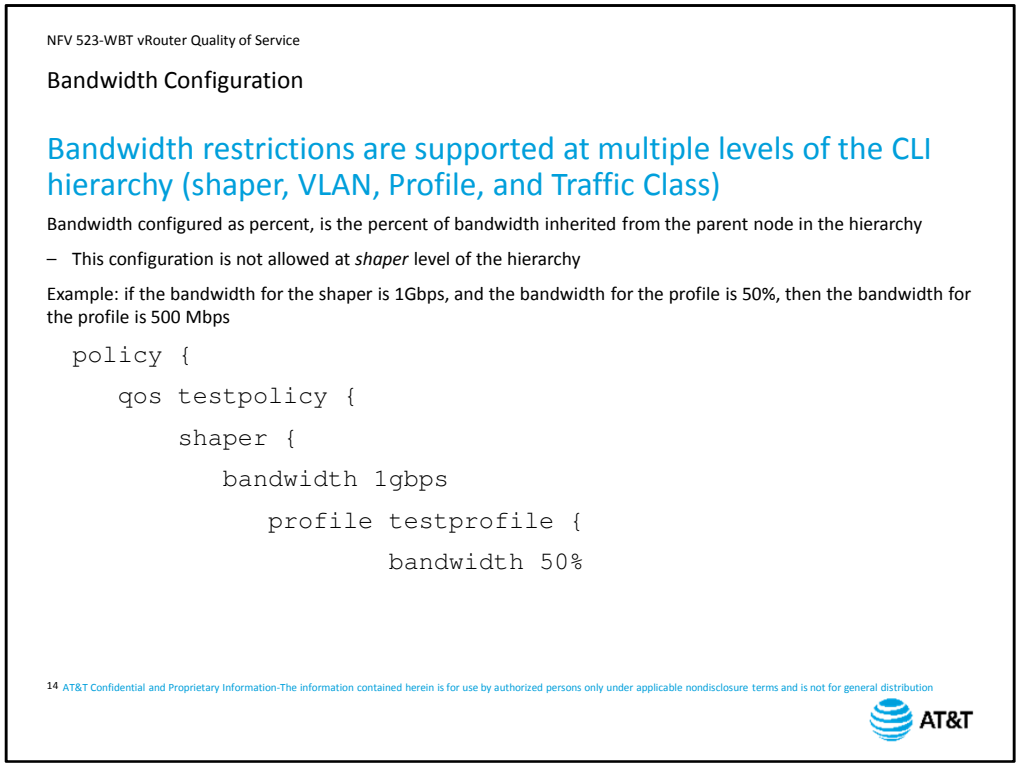


To change the default mapping behavior you can use the `map` command per QoS profile. Use the `map dscp` command to change the association of a specific DSCP number to a specific queue. Likewise, use the `map pcp` command to change the association of a specific PCP value to a particular queue.

For more information on PCP and DSCP, please refer to the *AT&T Vyatta 5600 vRouter Software Documentation* on www.AT&T.com.



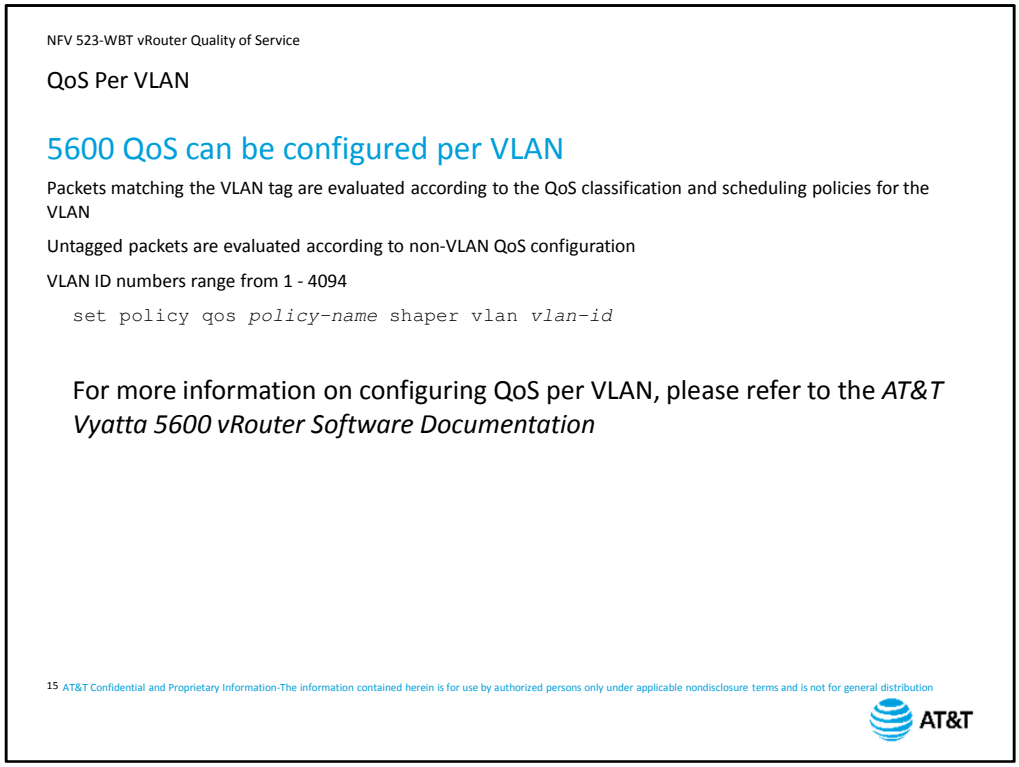
Random Early Detection, or RED, determines the likelihood of a packet to be dropped on an outgoing queue. RED will randomly drop packets when the outbound interface shows signs of congestion. These packet drops will then signal the source to decrease transmission rate.
RED is disabled by default on the vRouter 5600, but it can be enabled per Traffic Class.
When RED is disabled, all traffic classes are drop-tail. Drop-tail eliminates any class-based distinctions and processes all traffic on a strict first-in, first-out basis. If outgoing traffic exceeds the volume of the queue, then excess traffic is dropped.
RED is defined in RFC 2309.



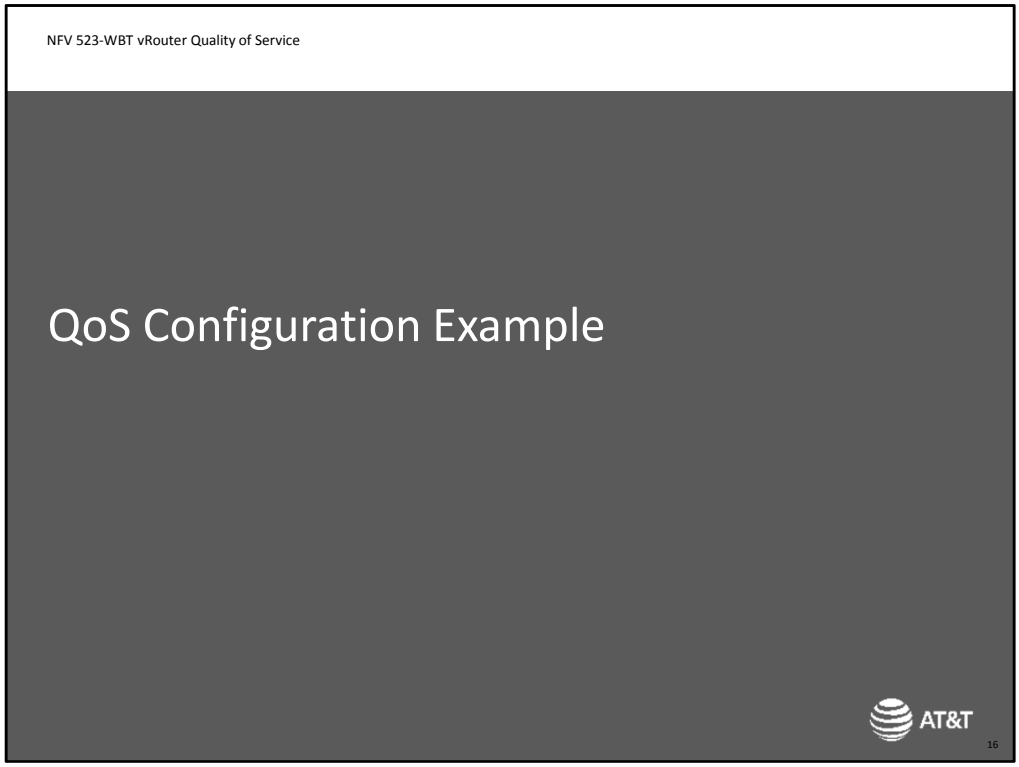
As with many QoS configurations, bandwidth restrictions are supported at multiple levels of the CLI hierarchy. They can be applied at the shaper, VLAN, profile, and Traffic Class level. If bandwidth is configured as a percentage, this will be the percent of bandwidth inherited from the parent node in the hierarchy. For example, if the bandwidth for the shaper policy is 1Gbps, and the bandwidth for the profile under the policy is 50%, the bandwidth for the profile is 50% of 1Gbps, or 500 Mbps.

```
policy {
   qos testpolicy {
      shaper {
         bandwidth 1gbps
            profile testprofile {
               bandwidth 50%
```

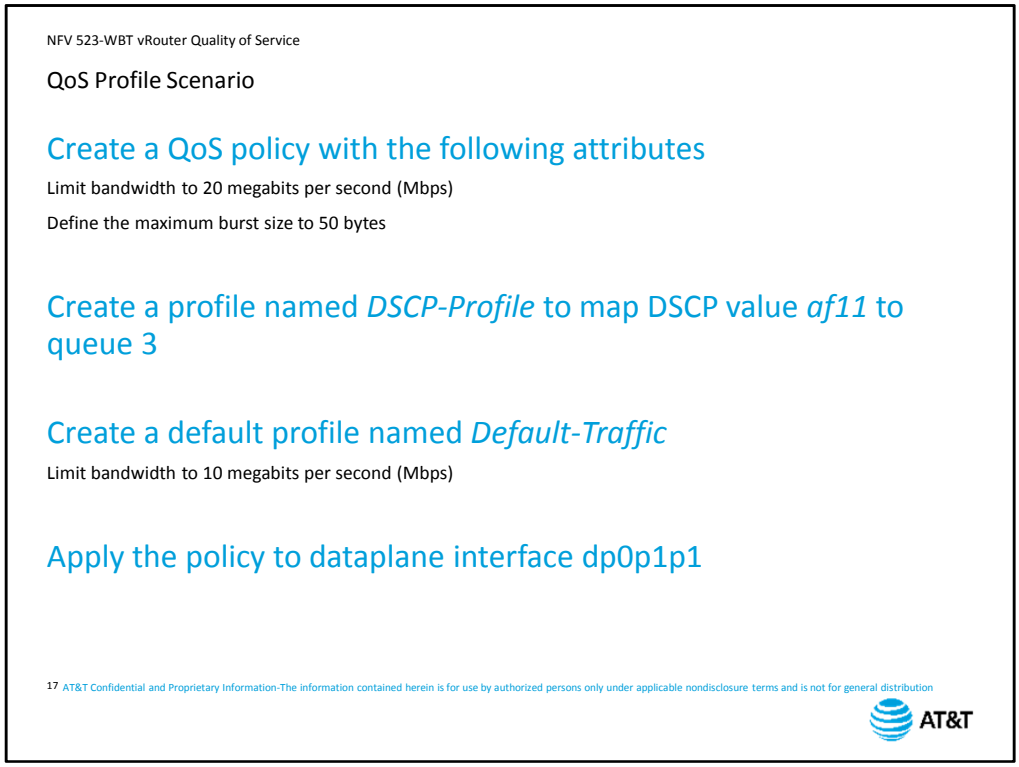
This does not pertain to the bandwidth configuration at the *shaper* level of hierarchy as it is the top of the hierarchy.



We have been focusing on configuring QoS at the shaper profile level, but QoS can also be configured per VLAN. When configured per VLAN, packets matching the VLAN tag are evaluated according to the QoS classification and scheduling policies for the VLAN. Untagged packets are evaluated according to non-VLAN QoS configuration. Valid VLAN ID numbers range from 1 to 4094.
Use the `set policy qos policy-name shaper vlan vlan-id` command to configure QoS per VLAN.
For more information on configuring QoS per VLAN and other QoS options, please refer to the *AT&T Vyatta 5600 vRouter Software Documentation* on www.AT&T.com.

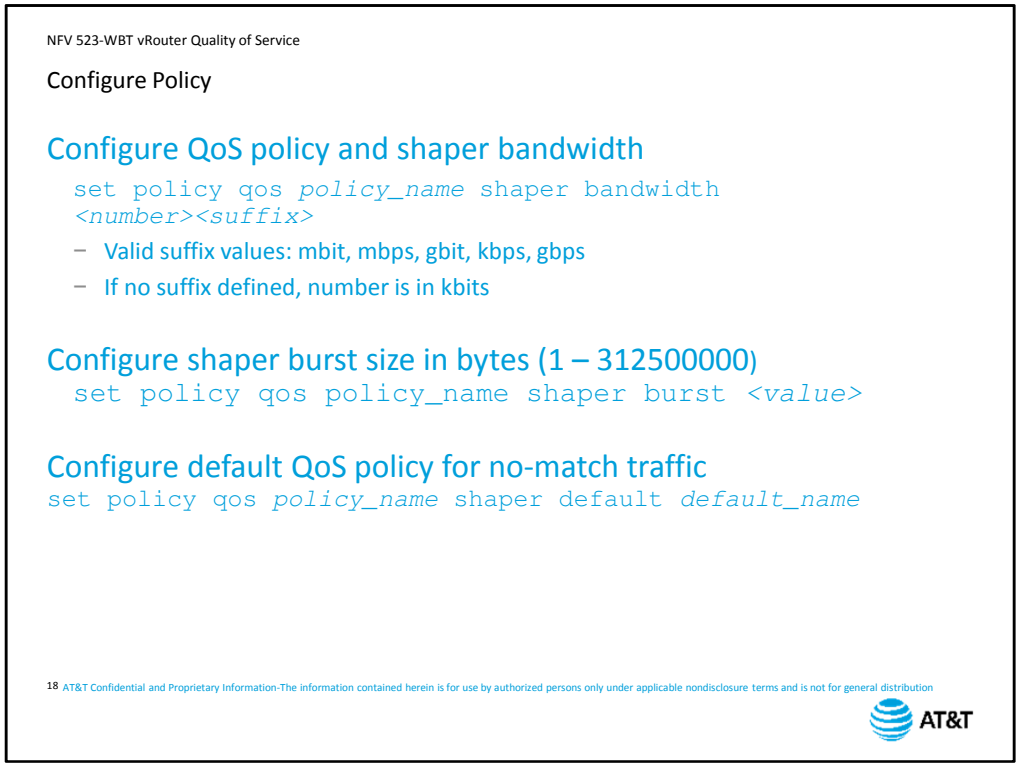


Let’s put the information we just went over into a configuration example.



In our example we will create a QoS policy with the following attributes:

- Limit bandwidth to 20 megabits per second (Mbps).
- Define the maximum burst size to 50 bytes.
- Create a profile named *DSCP-Profile* to map DSCP value *af11* to queue 3.
- Create a default profile named *Default-Traffic.*
- Apply the policy to data plane interface *dp0p1p1*.



Here we look at the commands used to configure the QoS policy. Each command uses the `set` command.

First configure the bandwidth at the shaper level of the hierarchy. Remember, if no suffix is defined, value is in kbits.

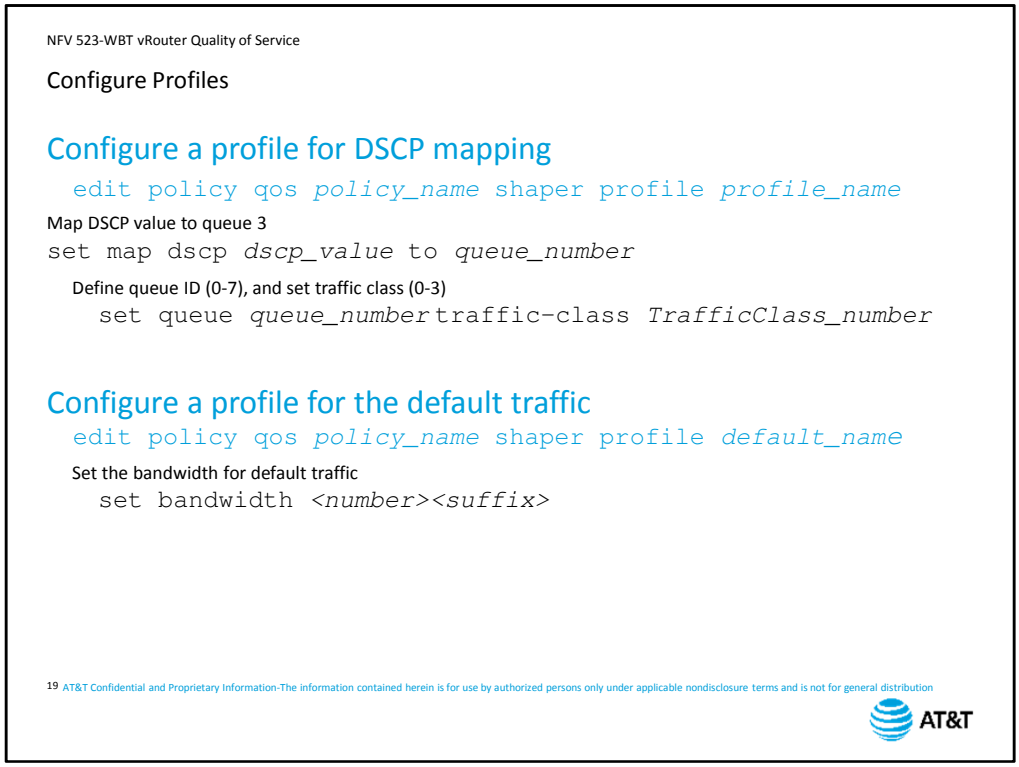
`set policy qos policy_name shaper bandwidth <number><suffix>`

Next, configure the shaper burst size in bytes (1 – 312500000)

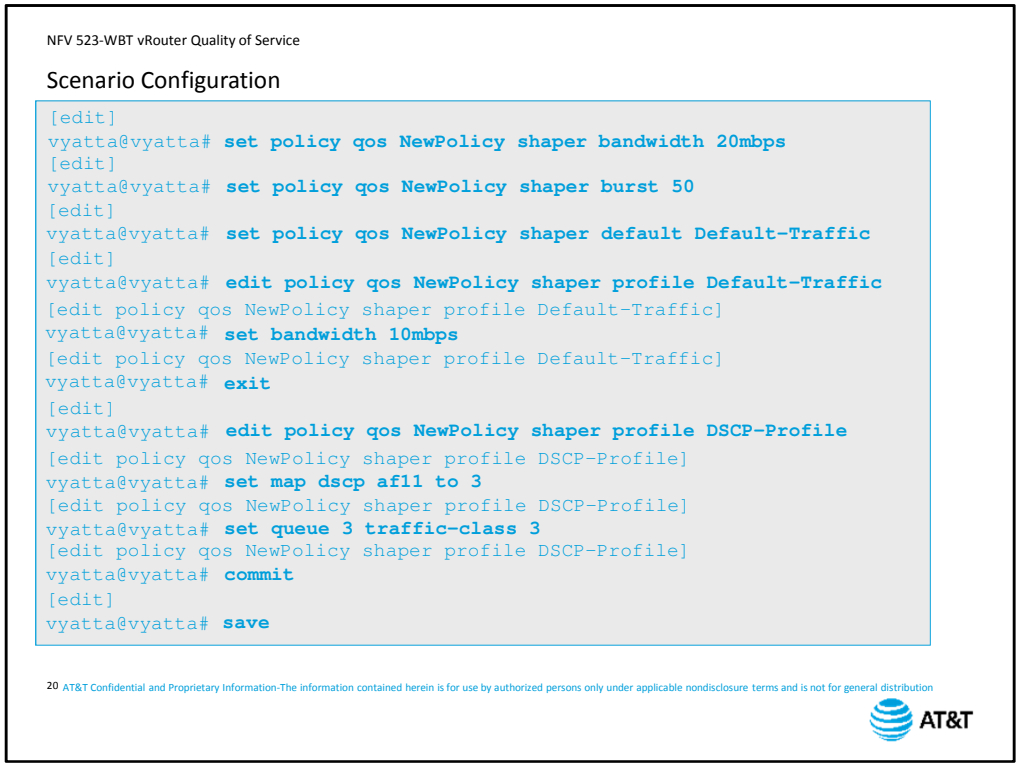
`set policy qos policy_name shaper burst <number>`

Then, configure the default QoS policy for no-match traffic.

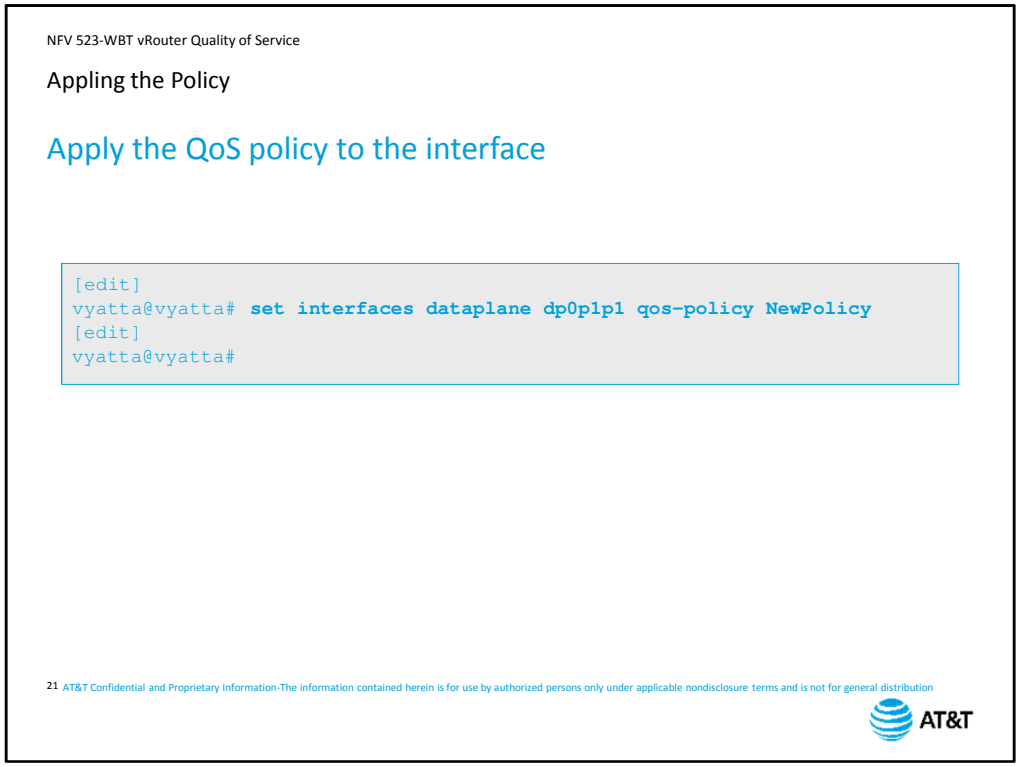
`set policy qos policy_name shaper default default_name`



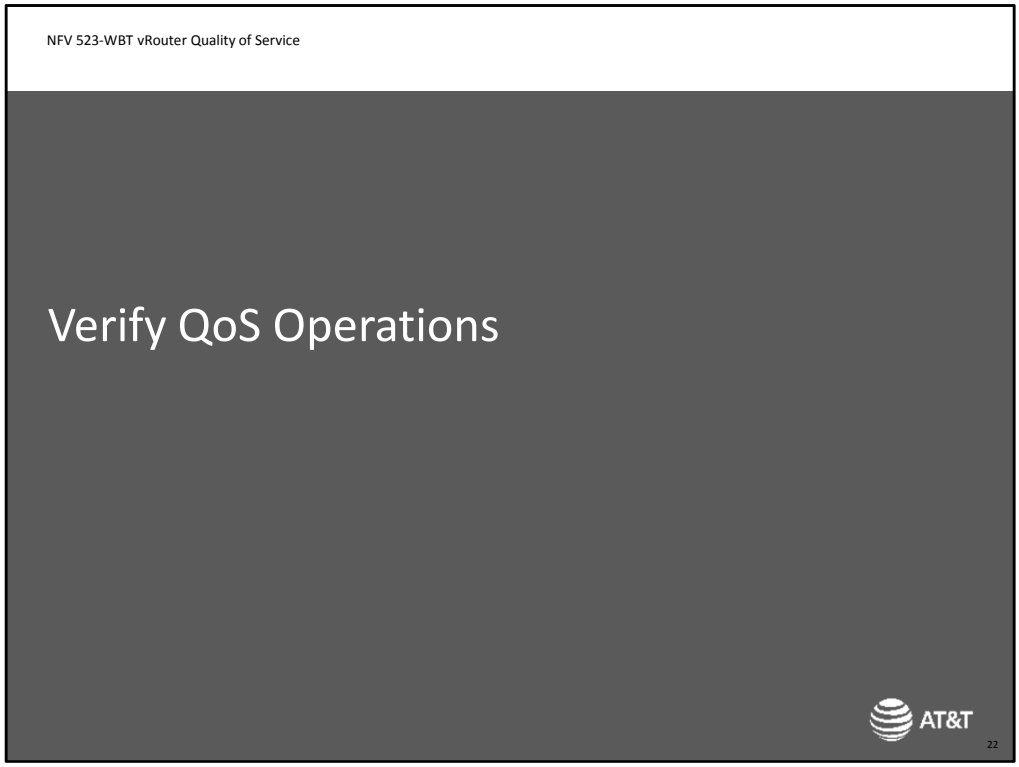
Here we show the commands to configure the profile for DSCP mapping. Note that we start with the `edit` command as all subsequent commands are set under the specified profile.
We define the mapping of the DSCP value to the queue, define the queue ID with a value of 0 through 7, and the Traffic Class with a value of 0 through 3.
We then configure a profile for the default traffic referencing the name of the default shaper configured on the previous slide, and set bandwidth for this profile.



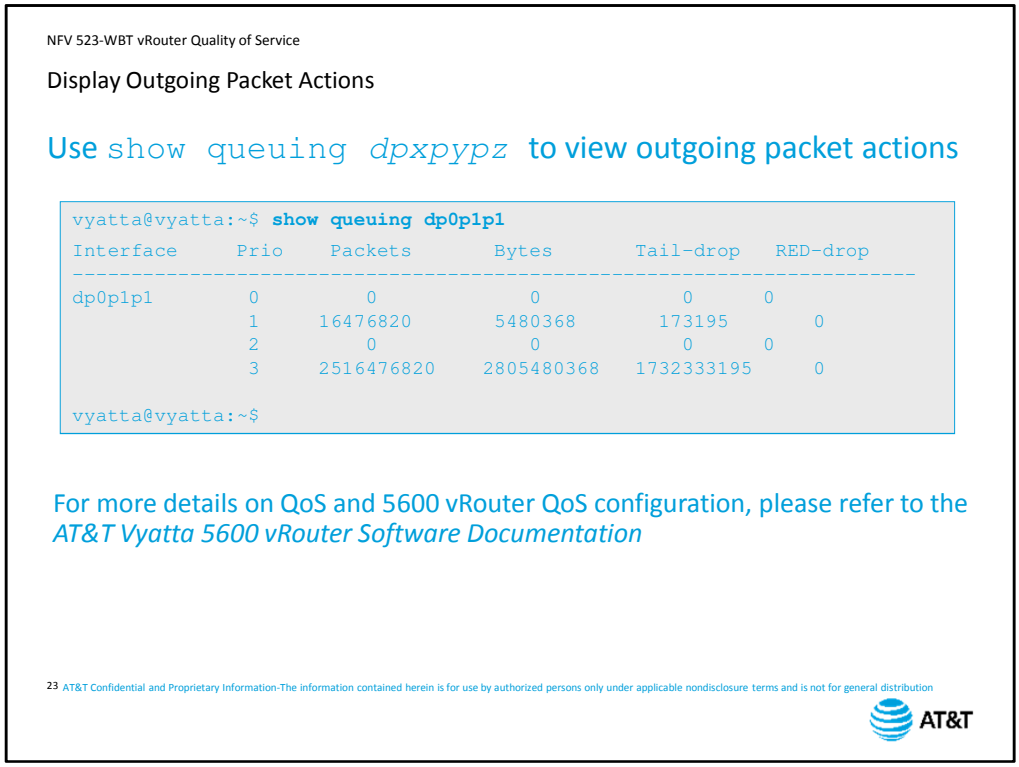
<click> We begin by creating a policy shaper called *NewPolicy*, and create the bandwidth and burst values.
<click> Next, we create the shaper for default traffic called *Default-Traffic*.
<click> Then, we use the `edit` command to create the default profile,
<click> and set the bandwidth to 10mbps.
<click> We exit the default profile,
<click> and create a new profile for DSCP mapping called *DSCP-Profile* using the `edit` command.
<click> Now, we map DSCP value af11 to queue 3, <click> and set the traffic class on queue 3 to 3,
<click> We are done with the QoS settings so we commit and save the configuration.



Now that all policy configurations are saved, we apply the QoS policy named *NewPolicy* to the desired interface, in this case data plane interface 1.

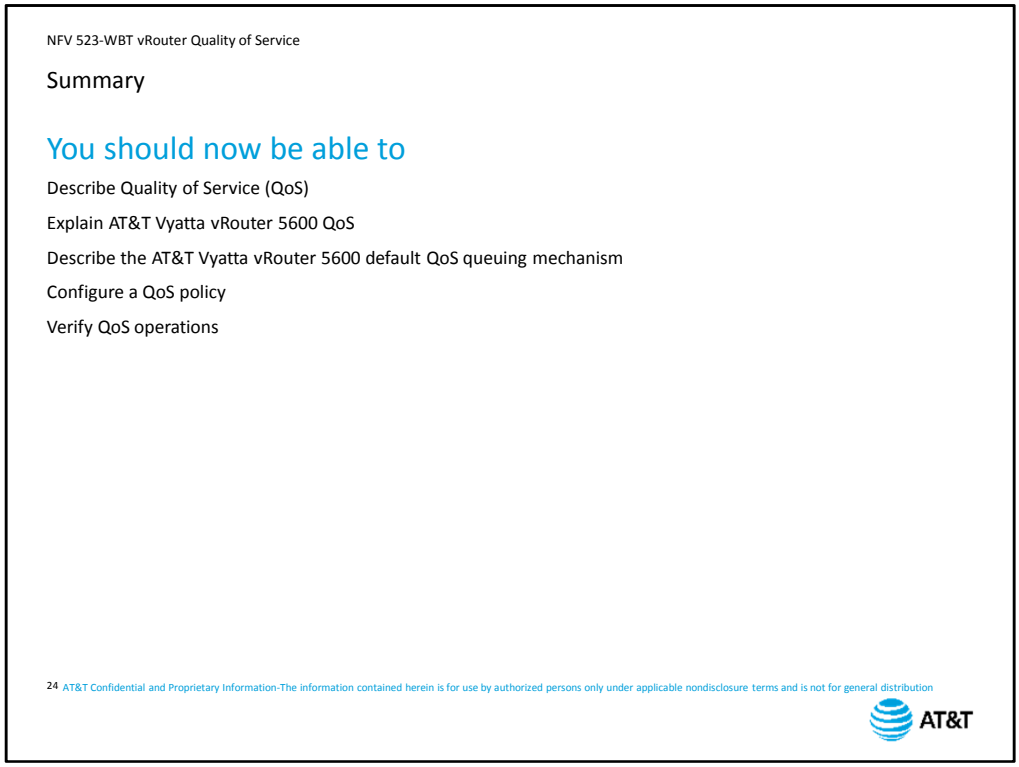


Now that we have added a QoS policy to the vRouter, we can verify the operations.



Use the `show queuing` command with the desired interface, in this case data plane interface 1. The output displays the interface, the Traffic Classes or priorities (0 through 3), and the number of packets that have been sent outbound on the interface and dropped. Also notice that RED has a value of zero, meaning it is disabled. Remember that RED is disabled by default.

This course only provides an overview of QoS on the 5600 vRouter, for more details please refer to the *AT&T Vyatta 5600 vRouter Software Documentation* on www.AT&T.com.



This concludes the AT&T Vyatta 5600 vRouter Quality of Service course.
You should now be able to:

- Describe Quality of Service (QoS)
- Explain AT&T Vyatta vRouter 5600 QoS
- Describe the AT&T Vyatta vRouter 5600 default QoS queuing mechanism
- Configure a QoS policy
- Verify QoS operations

We hope that this information has been useful, and that you will take additional AT&T University courses in the future.
Thank you.

NFV 523-WBT vRouter Quality of Service

End of Course – Quality of Service