



Configuring NBAR Using the MQC

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After you enable Protocol Discovery, you can configure Network-Based Application Recognition (NBAR) using the functionality of the Modular Quality of Service (QoS) Command-Line Interface (CLI) (MQC). The MQC uses traffic classes and traffic policies (policy maps) to apply QoS features to classes of traffic and applications recognized by NBAR.

This module contains concepts and tasks for configuring NBAR using the MQC.

Finding Feature Information in This Module

Your Cisco IOS software release may not support all of the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the “[Feature Information for Configuring NBAR Using the MQC](#)” section on [page 13](#).

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Americas Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

Prerequisites for Configuring NBAR Using the MQC

- Before configuring NBAR using the MQC, read the information in the [“Classifying Network Traffic Using NBAR”](#) module.
- As applicable, enable Protocol Discovery and use it to obtain statistics about the protocols and applications that are used in your network. You will need this information when using the MQC.



Note

This prerequisite assumes that you do not already have this information about the protocols and applications in use in your network.

Information About Configuring NBAR Using the MQC

Before configuring NBAR using the MQC, you should understand the following concepts:

- [NBAR and the MQC Functionality, page 2](#)
- [NBAR and the match protocol Commands, page 3](#)

NBAR and the MQC Functionality

To configure NBAR using the MQC, you must define a traffic class, configure a traffic policy (policy map), and then attach that traffic policy to the appropriate interface. These three tasks can be accomplished by using the MQC. The MQC is a command-line interface that allows you to define traffic classes, create and configure traffic policies (policy maps), and then attach these traffic policies to interfaces.

In the MQC, the **class-map** command is used to define a traffic class (which is then associated with a traffic policy). The purpose of a traffic class is to classify traffic.

Using the MQC to configure NBAR consists of the following:

- Defining a traffic class with the **class-map** command.
- Creating a traffic policy by associating the traffic class with one or more QoS features (using the **policy-map** command).
- Attaching the traffic policy to the interface with the **service-policy** command.

A traffic class contains three major elements: a name, one or more **match** commands, and, if more than one **match** command exists in the traffic class, an instruction on how to evaluate these **match** commands (that is, **match-all** or **match-any**). The traffic class is named in the **class-map** command line; for example, if you enter the **class-map cisco** command while configuring the traffic class in the CLI, the traffic class would be named “cisco.”

The **match** commands are used to specify various criteria for classifying packets. Packets are checked to determine whether they match the criteria specified in the **match** commands. If a packet matches the specified criteria, that packet is considered a member of the class and is forwarded according to the QoS specifications set in the traffic policy. Packets that fail to meet any of the matching criteria are classified as members of the default traffic class.



Note

For NBAR, the **match protocol** commands are used to specify the match criteria, as described in the [“NBAR and the match protocol Commands”](#) section on page 3.

NBAR and the match protocol Commands

NBAR recognizes specific network protocols and network applications that are used in your network. Once a protocol or application is recognized by NBAR, you can use the MQC to group the packets associated with those protocols or applications into classes. These classes are grouped on the basis of whether the packets conform to certain criteria.

For NBAR, the criterion is whether the packet matches a specific protocol or application known to NBAR. Using the MQC, network traffic with one network protocol (citrix, for example) can be placed into one traffic class, while traffic that matches a different network protocol (gnutella, for example) can be placed into another traffic class. Later, the network traffic within each class can be given the appropriate QoS treatment by using a traffic policy (policy map).

You specify the criteria used to classify traffic by using a **match protocol** command. [Table 1](#) lists some of the available **match protocol** commands and the corresponding protocol or traffic type recognized and supported by NBAR.



Note

For a more complete list of the protocol types supported by NBAR, see the “[Classifying Network Traffic Using NBAR](#)” module.

Table 1 *match protocol Commands and Corresponding Protocol or Traffic Type*

match protocol Command¹	Protocol Type
match protocol (NBAR)	Protocol type supported by NBAR
match protocol citrix	Citrix protocol
match protocol fasttrack	FastTrack peer-to-peer traffic
match protocol gnutella	Gnutella peer-to-peer traffic
match protocol http	Hypertext Transfer Protocol
match protocol rtp	Real-Time Transport Protocol traffic

1. Cisco IOS **match protocol** commands can vary by release. For more information, see the command documentation for the Cisco IOS release that you are using.

How to Configure NBAR Using the MQC

This section contains the following tasks:

- [Configuring a Traffic Class, page 4](#) (required)
- [Configuring a Traffic Policy, page 5](#) (required)
- [Attaching a Traffic Policy to an Interface or Subinterface, page 6](#) (required)
- [Verifying the NBAR Traffic Classes, Traffic Policies, and Protocol-to-Port Mappings, page 8](#) (optional)

Configuring a Traffic Class

Traffic classes can be used to organize packets into groups based on a user-specified criteria. For example, traffic classes can be configured to match packets on the basis of the protocol type or application recognized by NBAR. In this task, the traffic class is configured to match on the basis of the Citrix protocol type.



Note

The **match protocol citrix** command is shown in Step 4. The **match protocol citrix** command is just an example of one of the **match protocol** commands that can be used. For a complete list of **match protocol** commands, see the command documentation for the Cisco IOS release that you are using.

To configure a traffic class, perform the following steps.

Restrictions

Typically, a single traffic class contains one or more **match** commands that can be used to organize packets into groups on the basis of a protocol type or application. You can create as many traffic classes as needed. However, for Cisco IOS Release 12.2(18)ZY, the following restrictions apply:

- A single traffic class can be configured to match a maximum of 8 protocols or applications.
- Multiple traffic classes can be configured to match a cumulative maximum of 95 protocols or applications.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **class-map** [**match-all** | **match-any**] *class-map-name*
4. **match protocol citrix**
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none">• Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	class-map [match-all match-any] <i>class-map-name</i> Example: Router(config)# class-map cmap1	Creates a class map to be used for matching packets to a specified class and enters class-map configuration mode. <ul style="list-style-type: none">• Enter the name of the class map.

	Command or Action	Purpose
Step 4	match protocol citrix Example: Router(config-cmap)# match protocol citrix	Configures NBAR to match Citrix traffic. Note The match protocol citrix command is just an example of one of the match protocol commands that can be used. For a complete list of match protocol commands, see the command documentation for the Cisco IOS release that you are using. Note For Cisco IOS Release 12.2(18)ZY, a maximum of 8 match protocol commands can be configured in a single traffic class.
Step 5	end Example: Router(config-cmap)# end	(Optional) Returns to privileged EXEC mode.

Configuring a Traffic Policy

Traffic that matches a user-specified criterion can be organized into a specific class that can, in turn, receive specific user-defined QoS treatment when that class is included in a policy map.

To configure a traffic policy, perform the following steps.



Note

The **bandwidth** command is shown in Step 5. The **bandwidth** command configures the QoS feature class-based weighted fair queuing (CBWFQ). CBWFQ is just an example of a QoS feature that can be configured. Use the appropriate command for the QoS feature that you want to use.

As of Cisco IOS Release 12.2(18)ZY, CBWFQ is not supported on the Catalyst 6500 series switch that is equipped with a Supervisor 32/programmable intelligent services accelerator (PISA).

Restrictions

For Cisco IOS Release 12.2(18)ZY, an existing traffic policy (policy map) cannot be modified if the traffic policy is already attached to the interface. To remove the policy map from the interface, use the **no** form of the **service-policy** command.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **policy-map** *policy-map-name*
4. **class** { *class-name* | **class-default** }
5. **bandwidth** { *bandwidth-kbps* | **remaining percent** *percentage* | **percent** *percentage* }
6. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	policy-map <i>policy-map-name</i> Example: Router(config)# policy-map policy1	Creates or modifies a policy map that can be attached to one or more interfaces and enters policy-map configuration mode. <ul style="list-style-type: none"> Enter the name of the policy map.
Step 4	class { <i>class-name</i> class-default } Example: Router(config-pmap)# class class1	Specifies the name of the class whose policy you want to create or change and enters policy-map class configuration mode. <ul style="list-style-type: none"> Enter the specific class name or enter the class-default keyword.
Step 5	bandwidth { <i>bandwidth-kbps</i> remaining percent <i>percentage</i> percent <i>percentage</i> } Example: Router(config-pmap-c)# bandwidth percent 50	(Optional) Specifies or modifies the bandwidth allocated for a class belonging to a policy map. <ul style="list-style-type: none"> Enter the amount of bandwidth as a number of kbps, a relative percentage of bandwidth, or an absolute amount of bandwidth. <p>Note The bandwidth command configures the QoS feature class-based weighted fair queuing (CBWFQ). CBWFQ is just an example of a QoS feature that can be configured. Use the appropriate command for the QoS feature that you want to use.</p> <p>Note As of Cisco IOS Release 12.2(18)ZY, CBWFQ is not supported on the Catalyst 6500 series switch that is equipped with a Supervisor 32/PISA.</p>
Step 6	end Example: Router(config-pmap-c)# end	(Optional) Returns to privileged EXEC mode.

Attaching a Traffic Policy to an Interface or Subinterface

After a policy map is created, the next step is to attach the traffic policy (sometimes called a policy map) to an interface or subinterface. Traffic policies can be attached to either the input or output direction of the interface or subinterface.

**Note**

Depending on the needs of your network, you may need to attach the traffic policy to an ATM PVC, a Frame Relay data-link connection identifier (DLCI), or other type of interface.

To attach a traffic policy (policy map) to an interface, perform the following steps.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number* [*name-tag*]
4. **pvc** [*name*] *vpi/vci* [*ilmi* | *qsaal* | *smds* | **l2transport**]
5. **exit**
6. **service-policy** {**input** | **output**} *policy-map-name*
7. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	interface <i>type number</i> [<i>name-tag</i>] Example: Router(config)# interface ethernet 2/4	Configures an interface type and enters interface configuration mode. <ul style="list-style-type: none"> • Enter the interface type and the interface number.
Step 4	pvc [<i>name</i>] <i>vpi/vci</i> [<i>ilmi</i> <i>qsaal</i> <i>smds</i> l2transport] Example: Router(config-if)# pvc cisco 0/16	(Optional) Creates or assigns a name to an ATM permanent virtual circuit (PVC), specifies the encapsulation type on an ATM PVC, and enters ATM virtual circuit configuration mode. <ul style="list-style-type: none"> • Enter the PVC name, the ATM network virtual path identifier, and the network virtual channel identifier. <p>Note This step is required only if you are attaching the policy map to an ATM PVC. If you are not attaching the policy map to an ATM PVC, advance to Step 6.</p>
Step 5	exit Example: Router(config-atm-vc)# exit	(Optional) Returns to interface configuration mode. <p>Note This step is required only if you are attaching the policy map to an ATM PVC and you completed Step 4. If you are not attaching the policy map to an ATM PVC, advance to Step 6.</p>

Command or Action	Purpose
<p>Step 6</p> <pre>service-policy {input output} policy-map-name</pre> <p>Example: Router(config-if)# service-policy input policy1</p>	<p>Attaches a policy map (traffic policy) to an input or output interface.</p> <ul style="list-style-type: none"> Specify either the input or output keyword, and enter the policy map name. <p>Note Policy maps can be configured on ingress or egress routers. They can also be attached in the input or output direction of an interface. The direction (input or output) and the router (ingress or egress) to which the policy map should be attached vary according your network configuration. When using the service-policy command to attach the policy map to an interface, be sure to choose the router and the interface direction that are appropriate for your network configuration.</p> <p>Note After you use the service-policy command, you may see two messages similar to the following:</p> <pre>%PISA-6-NBAR_ENABLED: feature accelerated on input direction of: [interface name and type]</pre> <pre>%PISA-6-NBAR_ENABLED: feature accelerated on output direction of: [interface name and type]</pre> <p>While both of these messages appear, NBAR is enabled in the direction specified by the input or output keyword only.</p>
<p>Step 7</p> <pre>end</pre> <p>Example: Router(config-if)# end</p>	<p>(Optional) Returns to privileged EXEC mode.</p>

Verifying the NBAR Traffic Classes, Traffic Policies, and Protocol-to-Port Mappings

After you create the traffic classes and traffic policies (policy maps), you may want to verify that the end result is the one you intended. That is, you may want to verify whether your traffic is being classified correctly and whether it is receiving the QoS treatment as intended. You may also want to verify that the protocol-to-port mappings are correct.

To verify the NBAR traffic classes, traffic policies, and protocol-to-port mappings, perform the following steps.

SUMMARY STEPS

1. **enable**
2. **show class-map** [*class-map-name*]

3. **show policy-map** [*policy-map*]
4. **show policy-map interface** *type number*
5. **show ip nbar port-map** [*protocol-name*]
6. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	show class-map [<i>class-map-name</i>] Example: Router# show class-map	(Optional) Displays all class maps and their matching criteria. <ul style="list-style-type: none"> • (Optional) Enter the name of a specific class map.
Step 3	show policy-map [<i>policy-map</i>] Example: Router# show policy-map	(Optional) Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps. <ul style="list-style-type: none"> • (Optional) Enter the name of a specific policy map.
Step 4	show policy-map interface <i>type number</i> Example: Router# show policy-map interface Fastethernet 6/0	(Optional) Displays the packet and class statistics for all policy maps on the specified interface. <ul style="list-style-type: none"> • Enter the interface type and the interface number.
Step 5	show ip nbar port-map [<i>protocol-name</i>] Example: Router# show ip nbar port-map	(Optional) Displays the current protocol-to-port mappings in use by NBAR. <ul style="list-style-type: none"> • (Optional) Enter a specific protocol name.
Step 6	exit Example: Router# exit	(Optional) Exits privileged EXEC mode.

Configuration Examples for Configuring NBAR Using the MQC

This section provides the following configuration examples:

- [Example: Configuring a Traffic Class, page 10](#)
- [Example: Configuring a Traffic Policy, page 10](#)
- [Example: Attaching a Traffic Policy to an Interface or Subinterface, page 10](#)
- [Example: Verifying the NBAR Protocol-to-Port Mappings, page 10](#)

Example: Configuring a Traffic Class

In the following example, a class called `cmap1` has been configured. All traffic that matches the `citrix` protocol will be placed in the `cmap1` class.

```
Router> enable
Router# configure terminal
Router(config)# class-map cmap1
Router(config-cmap)# match protocol citrix
Router(config-cmap)# end
```

Example: Configuring a Traffic Policy

In the following example, a traffic policy (policy map) called `policy1` has been configured. Policy1 contains a class called `class1`, within which CBWFQ has been enabled.

```
Router> enable
Router# configure terminal
Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# bandwidth percent 50
Router(config-pmap-c)# end
```



Note

In the above example, the `bandwidth` command is used to enable Class-Based Weighted Fair Queuing (CBWFQ). CBWFQ is only an example of one QoS feature that can be applied in a policy map. Use the appropriate command for the QoS feature that you want to use.

As of Cisco IOS Release 12.2(18)ZY, CBWFQ is not supported on the Catalyst 6500 series switch that is equipped with a Supervisor 32/PISA.

Example: Attaching a Traffic Policy to an Interface or Subinterface

In the following example, the traffic policy (policy map) called `policy1` has been attached to Ethernet interface `2/4` in the input direction of the interface.

```
Router> enable
Router# configure terminal
Router(config)# interface ethernet 2/4
Router(config-if)# service-policy input policy1
Router(config-if)# end
```

Example: Verifying the NBAR Protocol-to-Port Mappings

The following is sample output of the `show ip nbar port-map` command. This command displays the current protocol-to-port mappings in use by NBAR. Use the display to verify that these mappings are correct.

```
Router# show ip nbar port-map

port-map bgp      udp 179
port-map bgp      tcp 179
port-map cuseeme  udp 7648 7649
port-map cuseeme  tcp 7648 7649
```

```
port-map dhcp      udp 67 68
port-map dhcp      tcp 67 68
```

If the **ip nbar port-map** command has been used, the **show ip nbar port-map** command displays the ports assigned to the protocol.

If the **no ip nbar port-map** command has been used, the **show ip nbar port-map** command displays the default ports. To limit the display to a specific protocol, use the *protocol-name* argument of the **show ip nbar port-map** command.

Where to Go Next

To add application recognition modules (also known as Packet Description Language Modules or PDLMs) to your network, see the [“Adding Application Recognition Modules”](#) module.

To classify network traffic on the basis of a custom protocol, see the [“Creating a Custom Protocol”](#) module.

Additional References

The following sections provide references related to configuring NBAR using the MQC.

Related Documents

Related Topic	Document Title
QoS commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples	Cisco IOS Quality of Service Solutions Command Reference
QoS features and functionality on the Catalyst 6500 series switch	“Configuring PFC QoS” chapter of the <i>Catalyst Supervisor Engine 32 PISA Cisco IOS Software Configuration Guide</i> , Release 12.2ZY
MQC, traffic policies (policy maps), and traffic classes	“Applying QoS Features Using the MQC” module
CBWFQ	“Configuring Weighted Fair Queueing” module
Concepts and information about NBAR	“Classifying Network Traffic Using NBAR” module
Information about enabling Protocol Discovery	“Enabling Protocol Discovery” module
Information about adding application recognition modules (also known as PDLMs)	“Adding Application Recognition Modules” module
Creating a custom protocol	“Creating a Custom Protocol” module

Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	<p>http://www.cisco.com/techsupport</p>

Feature Information for Configuring NBAR Using the MQC

Table 2 lists the features in this module and provides links to specific configuration information. Only features that were introduced or modified in Cisco IOS Release 12.2(1) or a later release appear in the table.

For information on a feature in this technology that is not documented here, see the “[Classifying Network Traffic Using NBAR Features Roadmap](#)” module.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS and Catalyst OS software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.


Note

Table 2 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 2 Feature Information for Configuring NBAR Using the MQC

Feature Name	Releases	Feature Information
QoS: DirectConnect PDLM	12.4(4)T	<p>Provides support for the DirectConnect protocol and Packet Description Language Module (PDLM). The DirectConnect protocol can now be recognized when using the MQC to classify traffic.</p> <p>The following sections provide information about the QoS: DirectConnect PDLM feature:</p> <ul style="list-style-type: none"> • Information About Configuring NBAR Using the MQC, page 2 • How to Configure NBAR Using the MQC, page 3
QoS: Skype Classification	12.4(4)T	<p>Provides support for the Skype protocol. The Skype protocol can now be recognized when using the MQC to classify traffic.</p> <p>Note Cisco currently supports Skype Version 1 only.</p> <p>The following sections provide information about the QoS: Skype Classification feature:</p> <ul style="list-style-type: none"> • Information About Configuring NBAR Using the MQC, page 2 • How to Configure NBAR Using the MQC, page 3

Table 2 Feature Information for Configuring NBAR Using the MQC (continued)

Feature Name	Releases	Feature Information
NBAR—BitTorrent PDLM	12.4(2)T	<p>Provides support for the BitTorrent PDLM and protocol. The BitTorrent protocol can now be recognized when using the MQC to classify traffic.</p> <p>The following sections provide information about the NBAR—BitTorrent PDLM feature:</p> <ul style="list-style-type: none"> • Information About Configuring NBAR Using the MQC, page 2 • How to Configure NBAR Using the MQC, page 3
NBAR—Citrix ICA Published Applications	12.4(2)T	<p>Enables NBAR to classify traffic on the basis of the Citrix Independent Computing Architecture (ICA) published application name and tag number.</p> <p>The following sections provide information about the NBAR—Citrix ICA Published Applications feature:</p> <ul style="list-style-type: none"> • Information About Configuring NBAR Using the MQC, page 2 • How to Configure NBAR Using the MQC, page 3
NBAR—Multiple Matches Per Port	12.4(2)T	<p>Provides the ability for NBAR to distinguish between values of an attribute within the traffic stream of a particular application on a TCP or UDP port.</p> <p>The following sections provide information about the NBAR—Multiple Matches Per Port feature:</p> <ul style="list-style-type: none"> • Information About Configuring NBAR Using the MQC, page 2 • How to Configure NBAR Using the MQC, page 3
NBAR Extended Inspection for HTTP Traffic	12.3(4)T	<p>Allows NBAR to scan TCP ports that are not well known and identify HTTP traffic that traverses these ports.</p> <p>The following sections provide information about the NBAR Extended Inspection for HTTP Traffic feature:</p> <ul style="list-style-type: none"> • Information About Configuring NBAR Using the MQC, page 2 • How to Configure NBAR Using the MQC, page 3
NBAR Real-Time Transport Protocol Payload Classification	12.2(15)T	<p>Enables stateful identification of real-time audio and video traffic.</p> <p>The following section provides information about the NBAR Real-Time Transport Protocol Payload Classification feature:</p> <ul style="list-style-type: none"> • Information About Configuring NBAR Using the MQC, page 2 • How to Configure NBAR Using the MQC, page 3

Table 2 **Feature Information for Configuring NBAR Using the MQC (continued)**

Feature Name	Releases	Feature Information
NBAR—Network-Based Application Recognition	12.2(18)ZYA	<p>Integrates NBAR and Firewall Service Module (FWSM) functionality on the Catalyst 6500 series switch that is equipped with a Supervisor 32/programmable intelligent services accelerator (PISA). Additional protocols are now recognized by NBAR.</p> <p>The following sections provide information about the NBAR feature:</p> <ul style="list-style-type: none"> • Information About Configuring NBAR Using the MQC, page 2 • How to Configure NBAR Using the MQC, page 3 <p>The following command was modified: match protocol (NBAR).</p>
NBAR—Network-Based Application Recognition (Hardware Accelerated NBAR)	12.2(18)ZY	<p>Enables NBAR functionality on the Catalyst 6500 series switch that is equipped with a Supervisor 32/programmable intelligent services accelerator (PISA).</p> <p>The following section provides information about the NBAR—Network-Based Application Recognition (Hardware Accelerated NBAR) feature:</p> <ul style="list-style-type: none"> • Information About Configuring NBAR Using the MQC, page 2 • How to Configure NBAR Using the MQC, page 3

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