



Object Groups for ACLs

The Object Groups for ACLs feature lets you classify users, devices, or protocols into groups and apply those groups to access control lists (ACLs) to create access control policies for those groups. This feature lets you use object groups instead of individual IP addresses, protocols, and ports, which are used in conventional ACLs. This feature allows multiple access control entries (ACEs), but now you can use each ACE to allow an entire group of users to access a group of servers or services or to deny them from doing so.

In large networks, the number of ACLs can be large (hundreds of lines) and difficult to configure and manage, especially if the ACLs frequently change. Object group-based ACLs are smaller, more readable, and easier to configure and manage than conventional ACLs, simplifying static and dynamic ACL deployments for large user access environments on Cisco IOS routers.

Cisco IOS Firewall benefits from object groups, because they simplify policy creation (for example, group A has access to group A services).

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see [Bug Search Tool](#) and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Restrictions for Object Groups for ACLs

- You can use object groups only in extended named and numbered ACLs.
- Object group-based ACLs support only IPv4 addresses.
- Object group-based ACLs support only Layer 3 interfaces (such as routed interfaces and VLAN interfaces). Object group-based ACLs do not support Layer 2 features such as VLAN ACLs (VACLs) or port ACLs (PACLs).
- Object group-based ACLs are not supported with IPsec.
- The highest number of object group-based ACEs supported in an ACL is 2048.

Information About Object Groups for ACLs

You can configure conventional ACEs and ACEs that refer to object groups in the same ACL.

You can use object group-based ACLs with quality of service (QoS) match criteria, Cisco IOS Firewall, Dynamic Host Configuration Protocol (DHCP), and any other features that use extended ACLs. In addition, you can use object group-based ACLs with multicast traffic.

When there are many inbound and outbound packets, using object group-based ACLs increases performance when compared to conventional ACLs. Also, in large configurations, this feature reduces the storage needed in NVRAM, because using object groups in ACEs means that you do not need to define an individual ACE for every address and protocol pairing.

Object Groups

An object group can contain a single object (such as a single IP address, network, or subnet) or multiple objects (such as a combination of multiple IP addresses, networks, or subnets).

A typical access control entry (ACE) allows a group of users to have access only to a specific group of servers. In an object group-based access control list (ACL), you can create a single ACE that uses an object group name instead of creating many ACEs (which requires each ACE to have a different IP address). A similar object group (such as a protocol port group) can be extended to provide access only to a set of applications for a user group. ACEs can have object groups for the source only, destination only, none, or both.

You can use object groups to separate the ownership of the components of an ACE. For example, each department in an organization controls its group membership, and the administrator owns the ACE itself to control which departments can contact one another.

You can use object groups in features that use Cisco Policy Language (CPL) class maps.

This feature supports two types of object groups for grouping ACL parameters: network object groups and service object groups. Use these object groups to group IP addresses, protocols, protocol services (ports), and Internet Control Message Protocol (ICMP) types.

Objects Allowed in Network Object Groups

A network object group is a group of any of the following objects:

- Host IP addresses
- Network address of group members
- Nested object groups

Objects Allowed in Service Object Groups

A service object group is a group of any of the following objects:

- Source and destination protocol ports (such as Telnet or Simple Network Management Protocol [SNMP])
- Internet Control Message Protocol (ICMP) types (such as echo, echo-reply, or host-unreachable)
- Top-level protocols (such as Encapsulating Security Payload [ESP], TCP, or UDP)
- Other service object groups

ACLs Based on Object Groups

All features that use or reference conventional access control lists (ACLs) are compatible with object-group-based ACLs, and the feature interactions for conventional ACLs are the same with object-group-based ACLs. This feature extends the conventional ACLs to support object-group-based ACLs and also adds new keywords and the source and destination addresses and ports.

You can add, delete, or change objects in an object group membership list dynamically (without deleting and redefining the object group). Also, you can add, delete, or change objects in an object group membership list without redefining the ACL access control entry (ACE) that uses the object group. You can add objects to groups, delete them from groups, and then ensure that changes are correctly functioning within the object-group-based ACL without reapplying the ACL to the interface.

You can configure an object-group-based ACL multiple times with a source group only, a destination group only, or both source and destination groups.

You cannot delete an object group that is used within an ACL or a class-based policy language (CPL) policy.

How to Configure Object Groups for ACLs

To configure object groups for ACLs, you first create one or more object groups. These can be any combination of network object groups (groups that contain objects such as, host addresses and network addresses) or service object groups (which use operators such as **lt**, **eq**, **gt**, **neq**, and **range** with port numbers). Then, you create access control entries (ACEs) that apply a policy (such as **permit** or **deny**) to those object groups.

Creating a Network Object Group

A network object group that contains a single object (such as a single IP address, a hostname, another network object group, or a subnet) or nested objects (multiple network object groups can be defined in single network object group), is with a network object-group-based ACL to create access control policies for the objects.

Perform this task to create a network object group.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **object-group network** *object-group-name*
4. **description** *description-text*
5. **host** *{host-address | host-name}*
6. *network-address {/nn | network-mask}*
7. **group-object** *nested-object-group-name*
8. Repeat the steps until you have specified objects on which you want to base your object group.
9. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	object-group network <i>object-group-name</i> Example: Device(config)# object-group network my-network-object-group	Defines the object group name and enters network object-group configuration mode.
Step 4	description <i>description-text</i> Example: Device(config-network-group)# description test engineers	(Optional) Specifies a description of the object group. <ul style="list-style-type: none"> • You can use up to 200 characters.
Step 5	host <i>{host-address host-name}</i> Example: Device(config-network-group)# host 209.165.200.237	(Optional) Specifies the IP address or name of a host. <ul style="list-style-type: none"> • If you specify a host address, you must use an IPv4 address.
Step 6	<i>network-address {/nn network-mask}</i>	(Optional) Specifies a subnet object.

	Command or Action	Purpose
	<p>Example:</p> <pre>Device(config-network-group)# 209.165.200.241 255.255.255.224</pre>	<ul style="list-style-type: none"> You must specify an IPv4 address for the network address. The default network mask is 255.255.255.255.
Step 7	<p>group-object <i>nested-object-group-name</i></p> <p>Example:</p> <pre>Device(config-network-group)# group-object my-nested-object-group</pre>	<p>(Optional) Specifies a nested (child) object group to be included in the current (parent) object group.</p> <ul style="list-style-type: none"> The type of child object group must match that of the parent (for example, if you are creating a network object group, you must specify another network object group as the child). You can use duplicated objects in an object group only via nesting of group objects. For example, if object 1 is in both group A and group B, you can define a group C that includes both A and B. However, you cannot include a group object that causes the group hierarchy to become circular (for example, you cannot include group A in group B and then also include group B in group A). You can use an unlimited number of levels of nested object groups (however, a maximum of two levels is recommended).
Step 8	Repeat the steps until you have specified objects on which you want to base your object group.	—
Step 9	<p>end</p> <p>Example:</p> <pre>Device(config-network-group)# end</pre>	Exits network object-group configuration mode and returns to privileged EXEC mode.

Creating a Service Object Group

Use a service object group to specify TCP and/or UDP ports or port ranges. When the service object group is associated with an access control list (ACL), this service object-group-based ACL can control access to ports.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **object-group service** *object-group-name*
4. **description** *description-text*
5. *protocol*
6. **{tcp | udp | tcp-udp}** [**source** **{[eq] | lt | gt}** *port1* | **range** *port1 port2*] [**{[eq] | lt | gt}** *port1* | **range** *port1 port2*]
7. **icmp** *icmp-type*
8. **group-object** *nested-object-group-name*
9. Repeat the steps to specify the objects on which you want to base your object group.
10. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	object-group service <i>object-group-name</i> Example: Device(config)# object-group service my-service-object-group	Defines an object group name and enters service object-group configuration mode.
Step 4	description <i>description-text</i> Example: Device(config-service-group)# description test engineers	(Optional) Specifies a description of the object group. • You can use up to 200 characters.
Step 5	<i>protocol</i> Example: Device(config-service-group)# ahp	(Optional) Specifies an IP protocol number or name.

	Command or Action	Purpose
Step 6	<pre>{tcp udp tcp-udp} [source {[eq] lt gt} port1 range port1 port2}] [{[eq] lt gt} port1 range port1 port2]</pre> <p>Example:</p> <pre>Device(config-service-group)# tcp-udp range 2000 2005</pre>	(Optional) Specifies TCP, UDP, or both.
Step 7	<pre>icmp icmp-type</pre> <p>Example:</p> <pre>Device(config-service-group)# icmp conversion-error</pre>	(Optional) Specifies the decimal number or name of an Internet Control Message Protocol (ICMP) type.
Step 8	<pre>group-object nested-object-group-name</pre> <p>Example:</p> <pre>Device(config-service-group)# group-object my-nested-object-group</pre>	<p>(Optional) Specifies a nested (child) object group to be included in the current (parent) object group.</p> <ul style="list-style-type: none"> • The type of child object group must match that of the parent (for example, if you are creating a network object group, you must specify another network object group as the child). • You can use duplicated objects in an object group only via nesting of group objects. For example, if object 1 is in both group A and group B, you can define a group C that includes both A and B. However, you cannot include a group object that causes the group hierarchy to become circular (for example, you cannot include group A in group B and then also include group B in group A). • You can use an unlimited number of levels of nested object groups (however, a maximum of two levels is recommended).
Step 9	Repeat the steps to specify the objects on which you want to base your object group.	—
Step 10	<pre>end</pre> <p>Example:</p> <pre>Device(config-service-group)# end</pre>	Exits service object-group configuration mode and returns to privileged EXEC mode.

Creating an Object-Group-Based ACL

When creating an object-group-based access control list (ACL), configure an ACL that references one or more object groups. As with conventional ACLs, you can associate the same access policy with one or more interfaces.

You can define multiple access control entries (ACEs) that reference object groups within the same object-group-based ACL. You can also reuse a specific object group in multiple ACEs.

Perform this task to create an object-group-based ACL.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip access-list extended** *access-list-name*
4. **remark** *remark*
5. **deny** *protocol source* [*source-wildcard*] *destination* [*destination-wildcard*] [**option** *option-name*] [**precedence** *precedence*] [**tos** *tos*] [**established**] [**log** | **log-input**] [**time-range** *time-range-name*] [**fragments**]
6. **remark** *remark*
7. **permit** *protocol source* [*source-wildcard*] *destination* [*destination-wildcard*] [**option** *option-name*] [**precedence** *precedence*] [**tos** *tos*] [**established**] [**log** | **log-input**] [**time-range** *time-range-name*] [**fragments**]
8. Repeat the steps to specify the fields and values on which you want to base your access list.
9. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	ip access-list extended <i>access-list-name</i> Example: Device(config)# ip access-list extended nomarketing	Defines an extended IP access list using a name and enters extended access-list configuration mode.
Step 4	remark <i>remark</i> Example: Device(config-ext-nacl)# remark protect server by denying access from the Marketing network	(Optional) Adds a comment about the configured access list entry. <ul style="list-style-type: none"> • A remark can precede or follow an access list entry. • In this example, the remark reminds the network administrator that the subsequent entry denies the Marketing network access to the interface.

	Command or Action	Purpose
Step 5	<p>deny <i>protocol source</i> [<i>source-wildcard</i>] <i>destination</i> [<i>destination-wildcard</i>] [option <i>option-name</i>] [precedence <i>precedence</i>] [tos <i>tos</i>] [established] [log log-input] [time-range <i>time-range-name</i>] [fragments]</p> <p>Example:</p> <pre>Device(config-ext-nacl)# deny ip 209.165.200.244 255.255.255.224 host 209.165.200.245 log</pre>	<p>(Optional) Denies any packet that matches all conditions specified in the statement.</p> <ul style="list-style-type: none"> Optionally use the object-group <i>service-object-group-name</i> keyword and argument as a substitute for the <i>protocol.</i> argument Optionally use the object-group <i>source-network-object-group-name</i> keyword and argument as a substitute for the <i>source source-wildcard.</i> arguments Optionally use the object-group <i>destination-network-object-group-name</i> keyword and argument as a substitute for the <i>destination destination-wildcard.</i> arguments If the <i>source-wildcard</i> or <i>destination-wildcard</i> is omitted, a wildcard mask of 0.0.0.0 is assumed, which matches all bits of the source or destination address, respectively. Optionally use the any keyword as a substitute for the <i>source source-wildcard</i> or <i>destination destination-wildcard</i> to specify the address and wildcard of 0.0.0.0 255.255.255.255. Optionally use the host <i>source</i> keyword and argument to indicate a source and source wildcard of <i>source</i> 0.0.0.0 or the host <i>destination</i> keyword and argument to indicate a destination and destination wildcard of <i>destination</i> 0.0.0.0. In this example, packets from all sources are denied access to the destination network 209.165.200.244. Logging messages about packets permitted or denied by the access list are sent to the facility configured by the logging facility command (for example, console, terminal, or syslog). That is, any packet that matches the access list will cause an informational logging message about the packet to be sent to the configured facility. The level of messages logged to the console is controlled by the logging console command.
Step 6	<p>remark <i>remark</i></p> <p>Example:</p> <pre>Device(config-ext-nacl)# remark allow TCP from any source to any destination</pre>	<p>(Optional) Adds a comment about the configured access list entry.</p> <ul style="list-style-type: none"> A remark can precede or follow an access list entry.
Step 7	<p>permit <i>protocol source</i> [<i>source-wildcard</i>] <i>destination</i> [<i>destination-wildcard</i>] [option <i>option-name</i>] [precedence <i>precedence</i>] [tos <i>tos</i>] [established] [log log-input] [time-range <i>time-range-name</i>] [fragments]</p>	<p>Permits any packet that matches all conditions specified in the statement.</p> <ul style="list-style-type: none"> Every access list needs at least one permit statement. Optionally use the object-group <i>service-object-group-name</i> keyword and argument as a substitute for the <i>protocol.</i> Optionally use the object-group <i>source-network-object-group-name</i> keyword and argument as a substitute for the <i>source source-wildcard.</i>

	Command or Action	Purpose
	<p>Example:</p> <pre>Device(config-ext-nacl)# permit tcp any any</pre>	<ul style="list-style-type: none"> Optionally use the object-group <i>destination-network-object-group-name</i> keyword and argument as a substitute for the <i>destination destination-wildcard</i>. If <i>source-wildcard</i> or <i>destination-wildcard</i> is omitted, a wildcard mask of 0.0.0.0 is assumed, which matches on all bits of the source or destination address, respectively. Optionally use the any keyword as a substitute for the <i>source source-wildcard</i> or <i>destination destination-wildcard</i> to specify the address and wildcard of 0.0.0.0 255.255.255.255. In this example, TCP packets are allowed from any source to any destination. Use the log-input keyword to include input interface, source MAC address, or virtual circuit in the logging output.
Step 8	Repeat the steps to specify the fields and values on which you want to base your access list.	Remember that all sources not specifically permitted are denied by an implicit deny statement at the end of the access list.
Step 9	<p>end</p> <p>Example:</p> <pre>Device(config-ext-nacl)# end</pre>	Exits extended access-list configuration mode and returns to privileged EXEC mode.

Applying an Object Group-Based ACL to an Interface

Use the **ip access-group** command to apply an object group-based ACL to an interface. An object group-based access control list (ACL) can be used to control traffic on the interface it is applied to.

Perform this task to apply an object group-based ACL to an interface.

SUMMARY STEPS

- enable**
- configure terminal**
- interface** *type number*
- ip access-group** {*access-list-name* | *access-list-number*} {**in** | **out**}
- end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	interface <i>type number</i> Example: Device(config)# interface vlan 100	Specifies the interface and enters interface configuration mode.
Step 4	ip access-group { <i>access-list-name</i> <i>access-list-number</i> } { in out } Example: Device(config-if)# ip access-group my-ogacl-policy in	Applies the ACL to the interface and specifies whether to filter inbound or outbound packets.
Step 5	end Example: Device(config-if)# end	Exits interface configuration mode and returns to privileged EXEC mode.

Verifying Object Groups for ACLs

SUMMARY STEPS

1. **enable**
2. **show object-group** [*object-group-name*]
3. **show ip access-list** [*access-list-name*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	show object-group [<i>object-group-name</i>] Example: Device# show object-group my-object-group	Displays the configuration in the named or numbered object group (or in all object groups if no name is entered).
Step 3	show ip access-list [<i>access-list-name</i>] Example: Device# show ip access-list my-ogacl-policy	Displays the contents of the named or numbered access list or object group-based ACL (or for all access lists and object group-based ACLs if no name is entered).

Configuration Examples for Object Groups for ACLs

Example: Creating a Network Object Group

The following example shows how to create a network object group named my-network-object-group, which contains two hosts and a subnet as objects:

```
Device> enable
Device# configure terminal
Device(config)# object-group network my-network-object-group
Device(config-network-group)# description test engineers
Device(config-network-group)# host 209.165.200.237
Device(config-network-group)# host 209.165.200.238

Device(config-network-group)# 209.165.200.241 255.255.255.224
Device(config-network-group)# end
```

The following example shows how to create a network object group named my-company-network, which contains two hosts, a subnet, and an existing object group (child) named my-nested-object-group as objects:

```
Device> enable
Device# configure terminal
Device(config)# object-group network my-company-network
Device(config-network-group)# host host1
Device(config-network-group)# host 209.165.200.242
Device(config-network-group)# 209.165.200.225 255.255.255.224
Device(config-network-group)# group-object my-nested-object-group
Device(config-network-group)# end
```

Example: Creating a Service Object Group

The following example shows how to create a service object group named `my-service-object-group`, which contains several ICMP, TCP, UDP, and TCP-UDP protocols and an existing object group named `my-nested-object-group` as objects:

```
Device> enable
Device# configure terminal
Device(config)# object-group service my-service-object-group
Device(config-service-group)# icmp echo
Device(config-service-group)# tcp smtp
Device(config-service-group)# tcp telnet
Device(config-service-group)# tcp source range 1 65535 telnet
Device(config-service-group)# tcp source 2000 ftp
Device(config-service-group)# udp domain
Device(config-service-group)# tcp-udp range 2000 2005
Device(config-service-group)# group-object my-nested-object-group
Device(config-service-group)# end
```

Example: Creating an Object Group-Based ACL

The following example shows how to create an object-group-based ACL that permits packets from the users in `my-network-object-group` if the protocol ports match the ports specified in `my-service-object-group`:

```
Device> enable
Device# configure terminal
Device(config)# ip access-list extended my-ogacl-policy
Device(config-ext-nacl)# permit object-group my-service-object-group object-group
my-network-object-group any
Device(config-ext-nacl)# deny tcp any any
Device(config-ext-nacl)# end
```

Example Applying an Object Group-Based ACL to an Interface

The following example shows how to apply an object group-based ACL to an interface. In this example, an object group-based ACL named `my-ogacl-policy` is applied to VLAN interface 100:

```
Device> enable
Device# configure terminal
Device(config)# interface vlan 100
Device(config-if)# ip access-group my-ogacl-policy in
Device(config-if)# end
```

Example: Verifying Object Groups for ACLs

The following example shows how to display all object groups:

```
Device# show object-group

Network object group auth-proxy-acl-deny-dest
  host 209.165.200.235
Service object group auth-proxy-acl-deny-services
  tcp eq www
```

```

tcp eq 443
Network object group auth-proxy-acl-permit-dest
209.165.200.226 255.255.255.224
209.165.200.227 255.255.255.224
209.165.200.228 255.255.255.224
209.165.200.229 255.255.255.224
209.165.200.246 255.255.255.224
209.165.200.230 255.255.255.224
209.165.200.231 255.255.255.224
209.165.200.232 255.255.255.224
209.165.200.233 255.255.255.224
209.165.200.234 255.255.255.224
Service object group auth-proxy-acl-permit-services
tcp eq www
tcp eq 443

```

The following example shows how to display information about specific object-group-based ACLs:

```

Device# show ip access-list my-ogacl-policy

Extended IP access list my-ogacl-policy
10 permit object-group eng_service any any

```

Additional References for Object Groups for ACLs

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Command List, All Releases
Security commands	<ul style="list-style-type: none"> • Cisco IOS Security Command Reference: Commands A to C • Cisco IOS Security Command Reference: Commands D to L • Cisco IOS Security Command Reference: Commands M to R • Cisco IOS Security Command Reference: Commands S to Z
ACL configuration guide	<i>Security Configuration Guide: Access Control Lists</i>

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for Object Groups for ACLs

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to . An account on Cisco.com is not required.

Table 1: Feature Information for Object Groups for ACLs

Feature Name	Releases	Feature Information
Object Groups for ACLs	12.4(20)T	<p>The Object Groups for ACLs feature lets you classify users, devices, or protocols into groups and apply them to access control lists (ACLs) to create access control policies for those groups. This feature lets you use object groups instead of individual IP addresses, protocols, and ports, which are used in conventional ACLs. This feature allows multiple access control entries (ACEs), but now you can use each ACE to allow an entire group of users to access a group of servers or services or to deny them from doing so.</p> <p>The following commands were introduced or modified: deny, ip access-group, ip access-list, object-group network, object-group service, permit, show ip access-list, show object-group.</p>