

# Cisco

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# Basis

# Wichtige Befehle

Befehl	Beschreibung	Beispiel	Ergebniss
en	Enable Modus	SW>en	SW#
wr	Schreibe Konfiguration	SW#wr	-
show run	Anzeigen der Aktuellen Konfiguration	SW#show run	-
conf t	Konfigurations Modus	SW#conf t	SW( config) #
do show run	Anzeigen der Aktuellen Konfiguration im tieferen Modus	sw( config) #do show run	-
do wr	Schreibe Konfiguration im Konfigurations Modus	SW( config) #do wr	-
hostname	Hostname	SW( config) #hostname SW1	SW1( config) #
enabel	Enable Password	SW( config) #enabel secret Passwort	-
ctrl+z	Rückkehr in den Enable Modus	SW( config- if) #^Z	SW#
show run   inc ip address	Anzeigen aller IP-Adressen	SW#show run   inc ip address	
show ip int brief	Anzeigen aller IP-Adressen bei Router	SW#show ip int brief	-

# Interface

Interface	Bedeutung	Abkürzung
FastEthernet 0/1	erster Fastbit Anschluss ohne Modul	fa0/1
FastEthernet 0/0/1	erster Fastbit Anschluss mit Modul	fa0/0/1
GigabitEthernet 0/1	erster Gigabit Anschluss ohne Modul	gi0/1
GigabitEthernet 0/0/1	erster Gigabit Anschluss mit Modul	gi0/0/1
port-channel 1	erster LACP	-

## Konfiguration IP-Adressen eines Router

```
R1#conf t
R1(config)#interface GigabitEthernet 0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shutdown
```

## Konfiguration Port ausschalten bei einem Range

```
SW1#conf
SW1(config)#interface range GigabitEthernet 0/1-12
SW1(config-if)#shutdown
```

## Konfiguration LACP

```
SW1#conf
SW1(config)#interface range FastEthernet 0/1-2
SW1(config-if)#channel-groupe 1 mode activ
SW1(config-if)#interface port-channel 1
SW1(config-if)#switchport mod trunk
```

# Konfiguration Portsecurity

```
SW1#conf
SW1(config)#interface GigabitEthernet 0/4
SW1(config-if)#switchport mode access
SW1(config-if)#switchport port-security
SW1(config-if)#switchport port-security mac-address 1234.5678.9ABC.EF12
SW1(config-if)#interface GigabitEthernet 0/5
SW1(config-if)#switchport mode access
SW1(config-if)#switchport port-security
```

# Konfiguration DHCP-Snooping

```
SW1#conf
SW1(config)#ip dhcp snooping
SW1(config)#interface GigabitEthernet 0/24
SW1(config-if)#ip dhcp snooping trust
```

# Troubelshooting

```
show arp
show ip interface
show ip route
show ip dhcp snooping
shwo etherchannel summary
show port-security interface gi0/4## Interface
```

Interface	Bedeutung	Abkürzung
FastEthernet 0/1	erster Fastbit Anschluss ohne Modul	fa0/1
FastEthernet 0/0/1	erster Fastbit Anschluss mit Modul	fa0/0/1
GigabitEthernet 0/1	erster Gigabit Anschluss ohne Modul	gi0/1
GigabitEthernet 0/0/1	erster Gigabit Anschluss mit Modul	gi0/0/1
port-channel 1	erster LACP	-

# Konfiguration IP-Adressen eines Router

```
R1#conf t
R1(config)#interface GigabitEthernet 0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shutdown
```

# Konfiguration Port ausschalten bei einem Range

```
SW1#conf
SW1(config)#interface range GigabitEthernet 0/1-12
SW1(config-if)#shutdown
```

# Konfiguration LACP

```
SW1#conf
SW1(config)#interface range FastEthernet 0/1-2
SW1(config-if)#channel-group 1 mode activ
SW1(config-if)#interface port-channel 1
SW1(config-if)#switchport mod trunk
```

# Configuration Portsecurity

```
SW1#conf
SW1(config)#interface GigabitEthernet 0/4
SW1(config-if)#switchport mode access
SW1(config-if)#switchport port-security
SW1(config-if)#switchport port-security mac-address 1234.5678.9ABC.EF12
SW1(config-if)#interface GigabitEthernet 0/5
SW1(config-if)#switchport mode access
SW1(config-if)#switchport port-security
SW1(config-if)#switchport port-security maximum 3
```

# Configuration DHCP-Snooping

```
SW1#conf SW1(config)#ip dhcp snooping SW1(config)#interface GigabitEthernet 0/24 SW1(config-if)#ip dhcp snooping trust
```

# Troubelshooting

```
show arp
show ip interface
show ip route
show ip dhcp snooping
shwo etherchannel summary
show port-security interface gi0/4
```

# VLAN

## Trunktype

Wert	802.1Q	ISL
Header Size	4 bytes	26 bytes
Trailer Size	-	4 bytes
Standard	IEEE	Cisco
Max. VLANs	4094	1000

## VLAN Nummer nach Cisco

ID	Bedeutung
0	Reseviert
1	Default
1002	fddi-default
1003	tr
1004	fdnet
1005	trnet
1006-4094	Erweiterte
4095	Reseviert

## Konfiguration

```
SW1#conf t
SW1(config)#vlan 100
SW1(config-vlan)#name Server
```



```
SW1(config-vlan)#vlan 101
SW1(config-vlan)#name Client
SW1(config-vlan)#exit
SW1(config)#interface range fast 0/1-20
SW1(config-if)#switchport mode access
SW1(config-if)#switchport nonegotiate
SW1(config-if)#switchport access vlan 101
SW1(config-if)#interface range fast 0/21-24
SW1(config-if)#switchport mode trunk
SW1(config-if)#switchport trunk encapsulation dot1q
SW1(config-if)#switchport trunk allowed vlan 101
SW1(config-if)#switchport trunk native vlan 100
SW1(config-if)#interface vlan100
SW1(config-if)#ip address 192.168.100.2 255.255.255.0
```

## VTP

```
SW1#conf t
SW1(config)#
SW1(config)#vtp mode {server | client | transparent}
SW1(config)#vtp domain <name>
SW1(config)#vtp password <password>
SW1(config)#vtp version {1 | 2}
SW1(config)#vtp pruning
```

{% hint style="danger" %} Für die Verwendung von VLAN ab 1005 muss folgender Befehl eingetragen werden: `SW1(config)#vtp mode transparent` {% endhint %}

## Troubleshooting

```
show vlan
show interface [status | switchport]
show interface trunk
show vtp status
show vtp password
```

# Spanning Tree

Attribut	STP	PVST	PVST+	RSTP	RPVST+	MST
Algorithmus	Legacy ST	Legacy ST	Legac ST	Rapid ST	Rapid ST	Rapid ST
Standard	802.1D-1998	Cisco	Cisco	802.1w, 802.1D-2004	Cisco	802.1s, 802.1Q-2003
Instanzen	1	1 pro VLAN	1 pro VLAN	1	1 pro VLAN	1-mehre
Trunk	-	ISL	802.1Q, ISL	-	802.1Q, ISL	802.1Q, ISL

## Link-Kosten

Speed	Kosten
4 Mbps	250
10 Mbps	100
16 Mbps	62
45 Mbps	39
100 Mbps	19
155 Mbps	14
622 Mbps	6
1 Gbps	4
10 Gbps	2
20+ Gbps	1

## Priorität

1. 0 (Notfall Wert für neu Root-Bridge)
2. 4096 (tiefester Wert bei Normaler Konfiguration)
3. 8192
4. 12288

5. 20480
6. 24576
7. 28672
8. 32768 (Standard Wert)
9. 36864
10. 40960
11. 45056
12. 49152
13. 53248
14. 57344
15. 61440 (Maximal Wert)

## Bridge-ID

Die Bridge-ID ist wie folgt Zusammengesetzt: 4 Bit Priorität + 12 System ID (VLAN) + 48 Bit MAC-Adresse

## Pfadentscheidung

1. Bridge mit der tiefsten ID wird Root-Bridge.
2. Switches mit den tieferen Pfadkosten zur Root-Bridge.
3. Switches mit der tieferen ID.
4. Tiefste Portnummer.

## Konfiguration RSTP, RPVST+

Beispiel SpanningTree

### Switch 1

```
SW1#conf t
SW1(config)spanning-tree mode rapid-pvst
SW1(config)spanning-tree vlan 1 priority 4096
SW1(config)interface range FastEthernet0/1-24
SW1(config-if)spanning-tree portfast
SW1(config-if)spanning-tree guard loop
```

```
SW1(config-if)spanning-tree guard root
SW1(config-if)spanning-tree bpduguard enable
SW1(config-if)spanning-tree bpdufilter enable
SW1(config-if)description Client
SW1(config-if)interface range GigabitEthernet0/1-2
SW1(config-if)no spanning-tree portfast
SW1(config-if)spanning-tree guard root
SW1(config-if)description Uplink
SW1(config-if)do wr
```

## Switch 2

```
SW2#conf t
SW2(config)spanning-tree mode rapid-pvst
SW2(config)spanning-tree vlan 1 priority 32768
SW2(config)interface range FastEthernet0/1-24
SW2(config-if)spanning-tree portfast
SW2(config-if)spanning-tree guard loop
SW2(config-if)spanning-tree guard root
SW2(config-if)spanning-tree bpduguard enable
SW2(config-if)spanning-tree bpdufilter enable
SW2(config-if)description Client
SW2(config-if)interface range GigabitEthernet0/1-2
SW2(config-if)no spanning-tree portfast
SW2(config-if)description Uplink
SW2(config-if)do wr
```

## Switch 3

```
SW3#conf t
SW3(config)spanning-tree mode rapid-pvst
SW3(config)spanning-tree vlan 1 priority 32768
SW3(config)interface range FastEthernet0/1-24
SW3(config-if)spanning-tree portfast
SW3(config-if)spanning-tree guard loop
SW3(config-if)spanning-tree guard root
SW3(config-if)spanning-tree bpduguard enable
```

```
SW3(config-if) spanning-tree bpdufilter enable
SW3(config-if) description Client
SW3(config-if) interface range GigabitEthernet0/1-2
SW3(config-if) no spanning-tree portfast
SW3(config-if) description Uplink
SW3(config-if) do wr
```

# Troubelshooting

```
show spanning-tree [summary | detail | root]
show spanning-tree [interface | vlan]
show spanning-tree mst [...]
```

# Routing

Diverse Routing Protokolle

# RIP

Attribut	Wert
Type	Distanzbasiert
Algorithmus	Bellman-Ford
Standard	RFC 2080, 2453
Protokoll	IPv4, IPv6
Port	520,521
Authentifizierung	Klartext, MD5
Multicast IP	224.0.0.9/FF02::9
Update-Time	30 sek.
Invalid-Time	180 sek.
Flush-Time	240 sek.
Hold-down-Time	180 sek.

# Konfiguration

RIP Beispiel  
Image could not be loaded or type unknown

RIP Konfiguration  
Image could not be loaded or type unknown

# Router 1

```
R1#conf t
R1(config)#interface GigabitEthernet 0/0
R1(config-if)#description WAN Link
R1(config-if)#ip adresse 192. 0. 2. 41 255. 255. 255. 0
R1(config-if)#interface GigabitEthernet 0/1
R1(config-if)#description Transfernet1
R1(config-if)#ip address 172.16.10.2 255.255.255.252
R1(config-if)#interface GigabitEthernet 0/2.10
```

```
R1(config-if)#encapsulation dot1q 10
R1(config-if)#ip address 10.1.1.1 255.255.254.0
R1(config-if)#interface GigabitEthernet 0/2.20
R1(config-if)#encapsulation dot1q 20
R1(config-if)#ip address 10.1.2.1 255.255.254.0
R1(config-if)#exit
R1(config)#router rip
R1(config-router)#network 10.1.1.0
R1(config-router)#passive-interface GigabitEthernet 0/0
R1(config-router)#default-information originate
R1(config-router)#exit
R1(config)#ip route 0.0.0.0 0.0.0.0 192.0.2.1
R1(config)#do wr
```

## Router 2

```
R2#conf t
R2(config)#interface GigabitEthernet 0/0
R2(config-if)#description Transfernet1
R2(config-if)#ip address 172.16.10.3 255.255.255.252
R2(config-if)#interface GigabitEthernet 0/1
R2(config-if)#description Transfernet2
R2(config-if)#ip address 172.16.10.5 255.255.255.252
R2(config-if)#interface GigabitEthernet 0/2.10
R2(config-if)#encapsulation dot1q 10
R2(config-if)#ip address 10.2.1.1 255.255.255.128
R2(config-if)#interface GigabitEthernet 0/2.20
R2(config-if)#encapsulation dot1q 20
R2(config-if)#ip address 10.2.20.1 255.255.254.0
R2(config-if)#interface GigabitEthernet 0/2.30
R2(config-if)#encapsulation dot1q 30
R2(config-if)#ip address 10.2.200.1 255.255.255.0
R2(config-if)#exit
R2(config)#router rip
R2(config-router)#network 10.2.1.0
R2(config-router)#network 10.2.20.0
R2(config-router)#network 10.2.200.0
R2(config-router)#exit
R2(config)#do wr
```



# Router 3

```
R3#conf t
R3(config)#interface GigabitEthernet 0/0
R3(config-if)#description Transfernet2
R3(config-if)#ip address 172.16.10.6 255.255.255.252
R3(config-if)#interface GigabitEthernet 0/2.10
R3(config-if)#encapsulation dot1q 10
R3(config-if)#ip address 10.3.1.1 255.255.255.0
R3(config-if)#interface GigabitEthernet 0/2.20
R3(config-if)#encapsulation dot1q 20
R3(config-if)#ip address 10.3.2.1 255.255.255.0
R3(config-if)#exit
R3(config)#router rip
R3(config-router)#network 10.3.1.0
R3(config-router)#exit
R3(config)#do wr
```

# Troubelshooting

```
show ip[v6] protocols
show ip[v6] rip database
debug ip rip { database | events }
debug ipv6 rip [interface]
```

# OSPF

Attribut	Wert
Type	Link-State
Algorithmus	Dijkstra
Metric	Cost (Bandbreite)
Standard	RFC 3228, 2740
Protokoll	IP
Port	89
Authenifizierung	Klartext, MD5
AllSPF Adresse	224.0.0.5
AllDR Adresse	224.0.0.6
Hello Timers	30
Dead Timers	120

# Konfiguration

OSPF Beispiel  
Image not found or type unknown

OSPF Beispiel  
Image not found or type unknown

# Router 1

```
R1#conf t
R1(config)#interface GigabitEthernet 0/0
R1(config-if)#description WAN Link
R1(config-if)#ip adresse 192. 0. 2. 41 255. 255. 255. 0
R1(config-if)#interface GigabitEthernet 0/1
R1(config-if)#description Transfernet1
R1(config-if)#ip address 172.16.10.2 255.255.255.252
R1(config-if)#interface GigabitEthernet 0/2.10
```

```
R1(config-if)#encapsulation dot1q 10
R1(config-if)#ip address 10.1.1.1 255.255.254.0
R1(config-if)#interface GigabitEthernet 0/2.20
R1(config-if)#encapsulation dot1q 20
R1(config-if)#ip address 10.1.2.1 255.255.254.0
R1(config-if)#exit
R1(config)#router ospf 100
R1(config-router)#network 10.1.1.0 0.0.3.255 area 0
R1(config-router)#router-id 1.1.1.1
R1(config-router)#default-information originate
R1(config-router)#passive-interface GigabitEthernet 0/0
R1(config-router)#exit
R1(config)#ip route 0.0.0.0 0.0.0.0 192.0.2.1
R1(config)#do wr
```

## Router 2

```
R2#conf t
R2(config)#interface GigabitEthernet 0/0
R2(config-if)#description Transfernet1
R2(config-if)#ip address 172.16.10.3 255.255.255.252
R2(config-if)#interface GigabitEthernet 0/1
R2(config-if)#description Transfernet2
R2(config-if)#ip address 172.16.10.5 255.255.255.252
R2(config-if)#interface GigabitEthernet 0/2.10
R2(config-if)#encapsulation dot1q 10
R2(config-if)#ip address 10.2.1.1 255.255.255.128
R2(config-if)#interface GigabitEthernet 0/2.20
R2(config-if)#encapsulation dot1q 20
R2(config-if)#ip address 10.2.20.1 255.255.254.0
R2(config-if)#interface GigabitEthernet 0/2.30
R2(config-if)#encapsulation dot1q 30
R2(config-if)#ip address 10.2.200.1 255.255.255.0
R2(config-if)#exit
R2(config)#router ospf 100
R2(config-router)#network 10.2.1.0 0.0.0.127 area 0
R2(config-router)#network 10.2.20.0 0.0.1.255 area 0
R2(config-router)#network 10.2.200.0 0.0.0.255 area 0
R2(config-router)#router-id 1.1.1.2
```

```
R2(config-router)#exit
R2(config)#do wr
```

## Router 3

```
R3#conf t
R3(config)#interface GigabitEthernet 0/0
R3(config-if)#description Transfernet2
R3(config-if)#ip address 172.16.10.6 255.255.255.252
R3(config-if)#interface GigabitEthernet 0/2.10
R3(config-if)#encapsulation dot1q 10
R3(config-if)#ip address 10.3.1.1 255.255.255.0
R3(config-if)#interface GigabitEthernet 0/2.20
R3(config-if)#encapsulation dot1q 20
R3(config-if)#ip address 10.3.2.1 255.255.255.0
R3(config-if)#exit
R3(config)#router ospf 100
R3(config-router)#network 10.3.1.0 0.0.1.255 area 0
R3(config-router)#router-id 1.1.1.3
R3(config-router)#exit
R3(config)#do wr
```

## Troubelshooting

```
clear ip[v6] ospf process
show ip[v6] ospf [process] interface
show ip[v6] ospf [process] neighbor
show ip[v6] ospf border-routers
show ip[v6] ospf database [LSA-type]
show ip[v6] ospf virtual-links
debug ip[v6] ospf [...]
```

# EIGRP

Attribut	Wert
Type	Distanzbasiert
Algorithmus	DUAL
Standard	Cisco, Proprietär
Protokoll	IP, IPX, Appletalk
Port	88
Authentifizierung	MD5
Multicast IP	224.0.0.10
Hello Timmers	5/60
Hold Timers	15/180

# Konfiguration

EIGRP Beispiel

EIGRP Beispiel

# Router 1

```
R1#conf t
R1(config)#interface GigabitEthernet 0/0
R1(config-if)#description WAN Link
R1(config-if)#ip adresse 192.0.2.41 255.255.255.0
R1(config-if)#interface GigabitEthernet 0/1
R1(config-if)#description Transfernet1
R1(config-if)#ip address 172.16.10.2 255.255.255.252
R1(config-if)#interface GigabitEthernet 0/2.10
R1(config-if)#encapsulation dot1q 10
R1(config-if)#ip address 10.1.1.1 255.255.254.0
```

```
R1(config-if)#interface GigabitEthernet 0/2.20
R1(config-if)#encapsulation dot1q 20
R1(config-if)#ip address 10.1.2.1 255.255.254.0
R1(config-if)#exit
R1(config)#router eigrp 100
R1(config-router)#network 10.1.1.0
R1(config-router)#passive-interface GigabitEthernet 0/0
R1(config-router)#exit
R1(config)#ip route 0.0.0.0 0.0.0.0 192.0.2.1
R1(config)#do wr
```

## Router 2

```
R2#conf t
R2(config)#interface GigabitEthernet 0/0
R2(config-if)#description Transfernet1
R2(config-if)#ip address 172.16.10.3 255.255.255.252
R2(config-if)#interface GigabitEthernet 0/1
R2(config-if)#description Transfernet2
R2(config-if)#ip address 172.16.10.5 255.255.255.252
R2(config-if)#interface GigabitEthernet 0/2.10
R2(config-if)#encapsulation dot1q 10
R2(config-if)#ip address 10.2.1.1 255.255.255.128
R2(config-if)#interface GigabitEthernet 0/2.20
R2(config-if)#encapsulation dot1q 20
R2(config-if)#ip address 10.2.20.1 255.255.254.0
R2(config-if)#interface GigabitEthernet 0/2.30
R2(config-if)#encapsulation dot1q 30
R2(config-if)#ip address 10.2.200.1 255.255.255.0
R2(config-if)#exit
R2(config)#router eigrp 100
R2(config-router)#network 10.2.1.0
R2(config-router)#network 10.2.20.0
R2(config-router)#network 10.2.200.0
R2(config-router)#exit
R2(config)#do wr
```

## Router 3

```
R3#conf t
R3(config)#interface GigabitEthernet 0/0
R3(config-if)#description Transfernet2
R3(config-if)#ip address 172.16.10.6 255.255.255.252
R3(config-if)#interface GigabitEthernet 0/2.10
R3(config-if)#encapsulation dot1q 10
R3(config-if)#ip address 10.3.1.1 255.255.255.0
R3(config-if)#interface GigabitEthernet 0/2.20
R3(config-if)#encapsulation dot1q 20
R3(config-if)#ip address 10.3.2.1 255.255.255.0
R3(config-if)#exit
R3(config)#router eigrp 100
R3(config-router)#network 10.3.1.0
R3(config-router)#exit
R3(config)#do wr
```

# Troubelshooting

```
show ip eigrp interfaces
show ip eigrp neighbors
show ip eigrp topology
show ip eigrp traffic
clear ip eigrp neighbors
debug ip eigrp [packet | neighbors]
```

# Diverses

Verschiedenste Themen welche sich nicht eindeutig einem Kapitel zuordnen lassen.



# SNMP

Attribut	Wert v1	Wert v2	Wert v3
Einführung	1988	1993	1999
Standard	RFC 1155-1157	RFC 1901-8, 2578	RFC 1905-06, 3411-18
Protokoll	UDP	UDP	UDP
Port	161	161	161
Authentifizierung	Community	Community	Username, MD5, SHA
Encryption	Keine	Keine	DES, AES
64-Bit Zähler	Ja	Nein	Ja
Standard Community	public	public	Keine

## Konfiguration v2

```
SW1#conf t
SW1(config)#snmp-server community cisco-snmp ro
SW1(config)#snmp-server location Rack 10, 1 UG
SW1(config)#snmp-server contact network@holzfeind.ch
SW1(config)#snmp-server host 192.168.10.20 version 2c cisco-snmp
SW1(config)#snmp-server host 192.168.10.20 informs version 2c cisco-snmp alarms
SW1(config)#do wr
```

## Konfiguration v3

```
SW1#conf t
SW1(config)#snmp-server location Rack 10, 1 UG
SW1(config)#snmp-server contact network@holzfeind.ch
SW1(config)#snmp-server group monitor-group v3 priv
SW1(config)#snmp-server user monitor-user monitor-group v3 priv auth sha 12345 priv ascs 128
```

54321

```
SW1(config)#snmp-server host 192.168.10.20 version 3 monitor-user
```

```
SW1(config)#snmp-server host 192.168.10.20 informs version 3 monitor-user alarms
```

```
SW1(config)#do wr
```

# Troubelshooting

```
show snmp
```

```
show snmp host
```

```
show snmp community
```

```
show snmp contact
```

```
show snmp location
```

```
show snmp view
```

```
show snmp group
```

```
show snmp user [username ]
```

```
show snmp engineID
```

```
show snmp sessions
```

```
show snmp pending
```

```
show snmp mib ifmib traps
```

# ACL

## Action

- permit
- deny
- remark

## ACL Nummern

Range	Bedeutung
1-99	IP Standard
100-199	IP Erweiterte
200-299	Protokoll
300-399	DECnet
400-499	XNS
500-599	XNS Erweiterte
600-699	Appletalk
700-799	MAC
800-899	IPX Standard
900-999	IPX Erweiterte
1000-1099	IPX SAP
1100-1199	MAC Erweiterte
1200-1299	IPX Zusammenfassung

## Quelle und Ziel

Ziel	Beschreibung
any	alle
host 192.168.1.1	einzelner Host
192.168.1.0 0.0.0.255	Netz mit Wildcard-Maske

# Standard Syntax

```
SW1(config)#access-list <number> {permit | deny} <source> [log]
```

# Erweiterte Syntax

```
SW1(config)#access-list <number> {permit | deny} <protocol> <source> [<ports>] <destination>
[<ports>] [<options>]
```

# Konfiguration

```
SW1#conf t
SW1(config)#access-list 101 remark Diese ACL definiert den Ausgehenden Verkehr
SW1(config)#access-list 101 permit permit tcp 192.168.1.0 0.0.0.255 host 198.51.100.187 eq www

SW1(config)#access-list 101 permit permit tcp 192.168.1.0 0.0.0.255 host 198.51.100.187 eq 443

SW1(config)#access-list 101 permit permit icmp 192.168.1.0 0.0.0.255 198.51.100.0 0.0.0.255
SW1(config)#access-list 101 deny ip any any
SW1(config)#ip access-list extended in_network
SW1(config-ext-nacl)#remark Diese ACL definiert den Eingehenden Verkehr
SW1(config-ext-nacl)#permit tcp host 192.168.10.20 192.168.1.0 0.0.0.255 eq 10000 log
SW1(config-ext-nacl)#deny ip any any
SW1(config-ext-nacl)#exit
SW1(config)#interface range GigabitEthernet0/1-12
SW1(config-if)#ip access-group 101 out
SW1(config-if)#ip access-group in_network in
SW1(config-if)#do wr
```

# Troubleshooting

```
show access-lists [<number> | <name>]  
show ip access-lists [<number> | <name>]  
show ip access-lists interface <interface>  
show ip access-lists dynamic  
show ip interface [<interface>]  
show time-range [<name>]
```

# IP-Adressen

# IPv4

## IPv4 Adressen

Range	Bedeutung
10.0.0.0/8	Privates Netzwerk
127.0.0.0/8	Localnet
169.254.0.0/16	Zeroconf
172.16.0.0/12	Privates Netzwerk
192.0.2.0/24	Dokumentation und Beispielcode
192.168.0.0/16	Privates Netzwerk
198.51.100.0/24	Dokumentation und Beispielcode
203.0.113.0/24	Dokumentation und Beispielcode
224.0.0.0/4	Multicast

## IPv4 Subnet

CIDR	Subnet Mask	Adresse	Wildcard
/32	255.255.255.255	1	0.0.0.0
/31	255.255.255.254	2	0.0.0.1
/30	255.255.255.252	4	0.0.0.3
/29	255.255.255.248	8	0.0.0.7
/28	255.255.255.240	16	0.0.0.15
/27	255.255.255.224	32	0.0.0.31
/26	255.255.255.192	64	0.0.0.63
/25	255.255.255.128	128	0.0.0.127
/24	255.255.255.0	256	0.0.0.255
/23	255.255.254.0	512	0.0.1.255

CIDR	Subnet Mask	Adresse	Wildcard
/22	255.255.252.0	1'024	0.0.3.255
/21	255.255.248.0	2'048	0.0.7.255
/20	255.255.240.0	4'096	0.0.15.255
/19	255.255.224.0	8'192	0.0.31.255
/18	255.255.192.0	16'384	0.0.63.255
/17	255.255.128.0	32'768	0.0.127.255
/16	255.255.0.0	65'536	0.0.255.255
/15	255.254.0.0	131'072	0.1.255.255
/14	255.252.0.0	262'144	0.3.255.255
/13	255.248.0.0	524'288	0.7.255.255
/12	255.240.0.0	1'048'576	0.15.255.255
/11	255.224.0.0	2'097'152	0.31.255.255
/10	255.192.0.0	4'194'304	0.63.255.255
/9	255.128.0.0	8'388'608	0.127.255.255
/8	255.0.0.0	16'777'216	0.255.255.255
/7	254.0.0.0	33'554'432	1.255.255.255
/6	252.0.0.0	67'108'864	3.255.255.255
/5	248.0.0.0	134'217'728	7.255.255.255
/4	240.0.0.0	268'435'456	15.255.255.255
/3	224.0.0.0	536'870'912	31.255.255.255
/2	192.0.0.0	1'073'741'824	63.255.255.255
/1	128.0.0.0	2'147'483'648	127.255.255.255
/0	0.0.0.0	4'294'967'296	255.255.255.255



# IPv6

## IPv6 Adressen

Range	Bedeutung	IPv4 Gegenstück
::1	Localhost	127.0.0.1
::/27	WAN	0.0.0.0
fe80:: bis febf::	Link-Lokal	10.0.0.0/8, 172.16.0.0/12 192.168.0.0/16
2001:db8::/32	Dokumentation und Beispielcode	192.0.2.0/24, 198.51.100.0/24, 203.0.113.0/24
fc00::/7	Unique-Local Unicast	-
fc00::/8	Multicast	224.0.0.0/4

## IPv6 Notation

### Regeln

1. Alle führenden Nullen eines Blocks werden grundsätzlich weggelassen.
2. Einer oder mehrere aufeinanderfolgende 4er Nullerblöcke werden durch zwei Doppelpunkte ("::") gekürzt. 2b. Die Kürzung zu zwei Doppelpunkte ("::") darf nur einmal bei der längsten Folge von Nullerblöcken durchgeführt werden. Oder bei gleicher Länge, die erste von links.

### Beispiel

Lange Schreibweise: 2001:0db8:0000:0000:f054:00ff:0000:02eb führende Nullen entfernen:  
2001:db8:0:0:f054:ff:0:2eb Null-Blöcke zusammenfassen: 2001:db8::f054:ff:0:2eb

# IPv6 Subnet

Prefix	Beispiel
4	1::
8	12::
12	123::
16	1234::
20	1234:5::
24	1234:56::
28	1234:567::
32	1234:5678::
36	1234:5678:9::
40	1234:5678:90::
44	1234:5678:90a::
48	1234:5678:90ab::
52	1234:5678:90ab:c::
56	1234:5678:90ab:cd::
60	1234:5678:90ab:cde::
64	1234:5678:90ab:cdef::
68	1234:5678:90ab:cdef:1::
72	1234:5678:90ab:cdef:12::
76	1234:5678:90ab:cdef:123::
80	1234:5678:90ab:cdef:1234::
84	1234:5678:90ab:cdef:1234:5::
88	1234:5678:90ab:cdef:1234:56::
92	1234:5678:90ab:cdef:1234:567::
96	1234:5678:90ab:cdef:1234:5678::
100	1234:5678:90ab:cdef:1234:5678:9::
104	1234:5678:90ab:cdef:1234:5678:90::
108	1234:5678:90ab:cdef:1234:5678:90a::
112	1234:5678:90ab:cdef:1234:5678:90ab::
116	1234:5678:90ab:cdef:1234:5678:90ab:c::
120	1234:5678:90ab:cdef:1234:5678:90ab:cd::

Prefix	Beispiel
124	1234:5678:90ab:cdef:1234:5678:90ab:cde::
128	1234:5678:90ab:cdef:1234:5678:90ab:cdef