ACL (Access Control List):

- ACL stands for Access Control List, also called Access List.
- ACLs are always processed from top to down in sequential order.
- A packet is compared with ACL conditions until it finds a match.
- Once a match is found for packet, no further comparison will be done.
- Interface will take action based on match condition.
- There are two possible actions permit and deny in Access Control List.
- If permit condition match, packet will be allowed to pass from interface.
- If deny condition match, packet will be destroyed immediately.
- Every Access Control List (ACL) has a default deny statement at end of it.
- If a packet does not meet with any condition, it will be destroyed by default deny.
- Empty Access Control List (ACL) will permit all traffic by default.
- Implicit deny condition will not work with empty Access Control List (ACL).
- Implicit deny condition work only if ACL has at least one user defined condition.
- Access Control List (ACL) can filter only the traffic passing from interface.
- It cannot filter the traffic originated from router on which it has been applied.
- Standard Access Control List (ACL) can filter only the source IP address.
- Standard Access Control List should be placed near the destination devices.
- Extended Access Control List (ACL) should be placed near the source devices.
- Each Access Control List (ACL) needs or require a unique number or name.
- Only one ACL applied to an interface in each direction inbound and outbound.
- Only have a single ACL per direction, it is impossible to have 2 inbound access lists.
- ACL work on the network (Layer 3) and the transport (Layer 4) layer.
- First, create an Access-List globally and then assign it to an interface.
- Use for security, deny or permit access, filter traffic, accept or reject, allow or deny.

Advantages of ACL:

- Access Control List Limits network traffic to increase network performance.
- ACLs provide traffic flow control by restricting the delivery of routing updates.
- ACLs controls, which type of traffic, are forwarded or blocked by the router.
- ACLs helps to increase data security and confidentiality in an organization.
- ACLs monitor unauthorized access to important files Access rights.

Types of Access List:

There are many types of Access Control List (ACLs) but mainly two.

Standard ACLs:

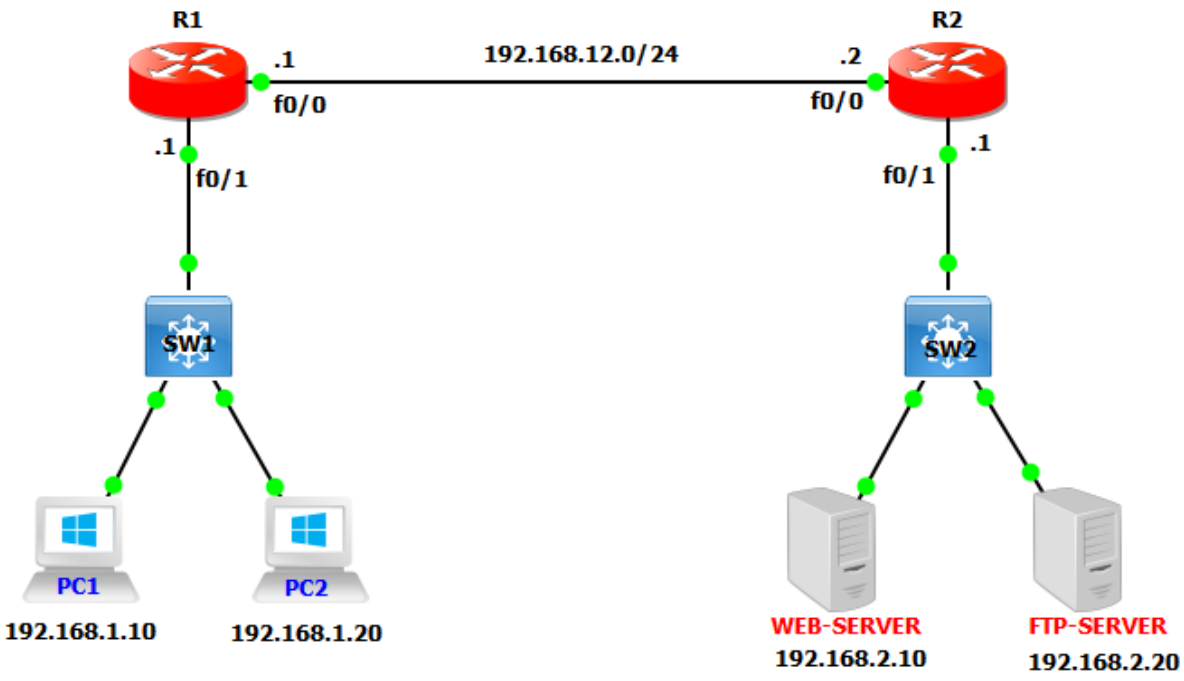
- Standard ACLs filter the packet based on its source IP address.
- Standard ACLs should be placed as close to destination devices as possible.
- Number of Standard Access Control List (ACL) is start from 1 and end 99.
- Standard Access Control List (ACL) is Old type of Access Control List (ACL).
- Standard Access Control List (ACLs) are mainly used for normal filtering.

Extended ACLs:

- Extended IP ACLs check both the source & destination, ports, & protocols.
- Extended ACLs should be placed as close to the source devices as possible.
- Number of Extended Access Control List (ACL) is start from 100 end 199.
- Extended Access Control List is more powerful than standard Access List.

Time-Based ACL:

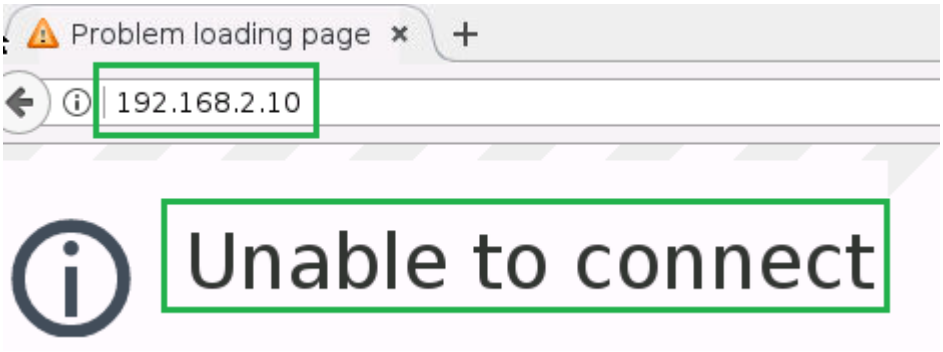
- Time-based ACLs that allow for network access based on time or day.
- Time-based ACLs are only active during a specified time range.
- For TACL set the time range to be either periodic or absolute.
- Configure time-based ACL, specify time range & then apply ACL.
- To verify, run show access-lists and check if the ACL is active.
- If it is in the time range and the ACL is filtering traffic.

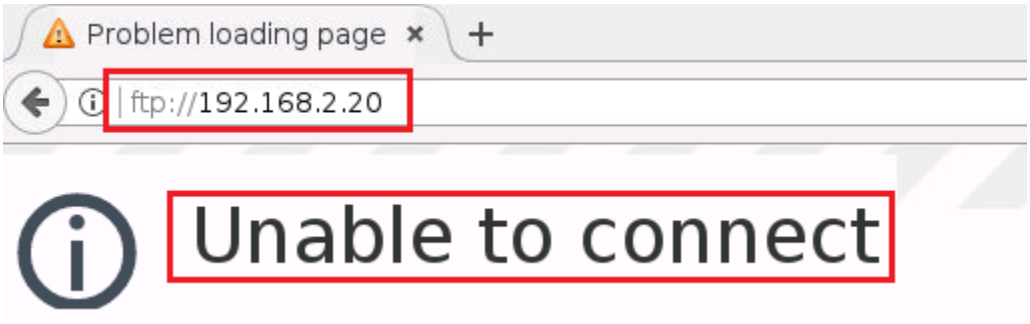


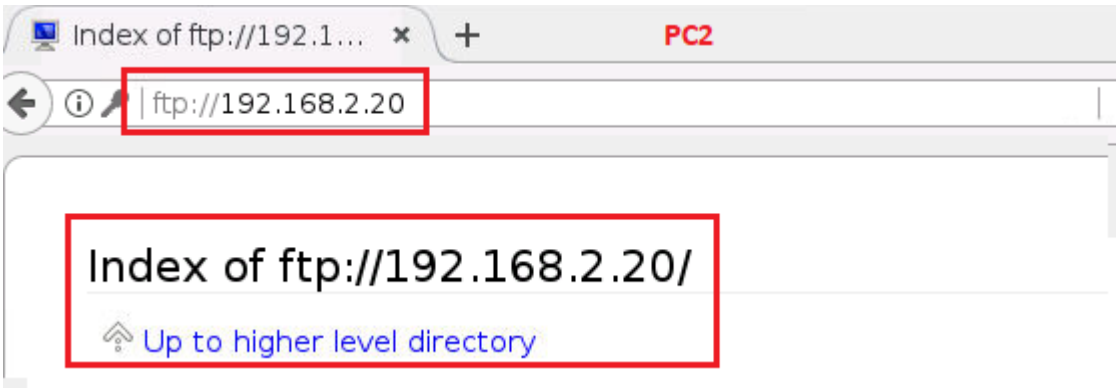
R1 Configuration	
R1(config)#interface f0/0 R1(config-if)#ip add 192.168.12.1 255.255.255.0 R1(config-if)#no shutdown	R1(config)#int f0/1 R1(config-if)#ip add 192.168.1.1 255.255.255.0 R1(config-if)#no shutdown
R1(config)#ip route 0.0.0.0 0.0.0.0 192.168.12.2	
R2 Configuration	
R2(config)#interface f0/0 R2(config-if)#ip add 192.168.12.2 255.255.255.0 R2(config-if)#no shutdown	R2(config)#inter f0/1 R2(config-if)#ip add 192.168.2.1 255.255.255.0 R2(config-if)#no shutdown
R2(config)#ip route 0.0.0.0 0.0.0.0 192.168.12.1	

Standard ACL on R2 to deny PC1
R2(config)#access-list 1 deny host 192.168.1.10 R2(config)#access-list 1 permit any
R2(config-if)#ip access-group 1 out

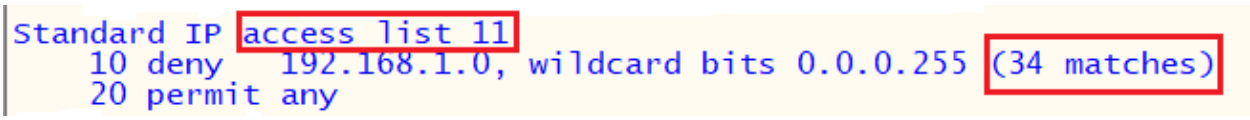
```
R2#show access-lists
Standard IP access list 1
    10 deny   192.168.1.10 (18 matches)
    20 permit any
```

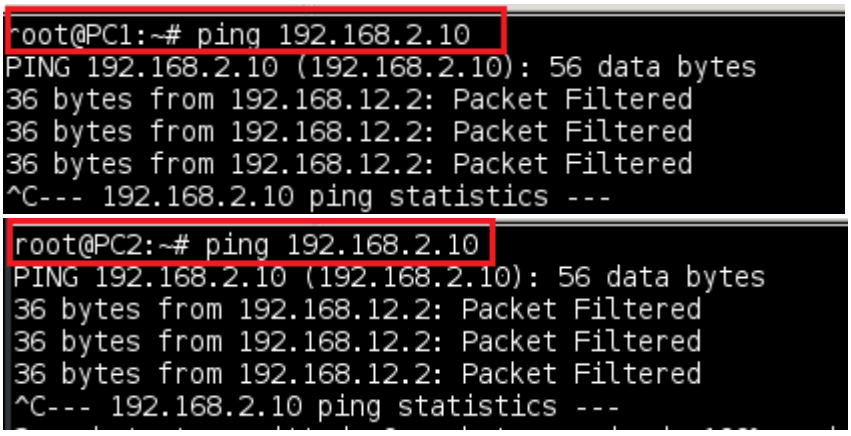






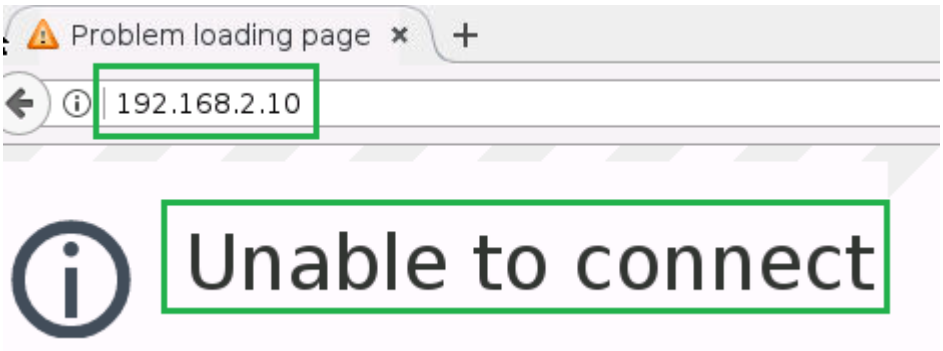
Standard ACL on R2 to deny Whole Network
R2(config)#access-list 11 deny 192.168.1.0 0.0.0.255 R2(config)#access-list 11 permit any
R2(config-if)#ip access-group 11 out

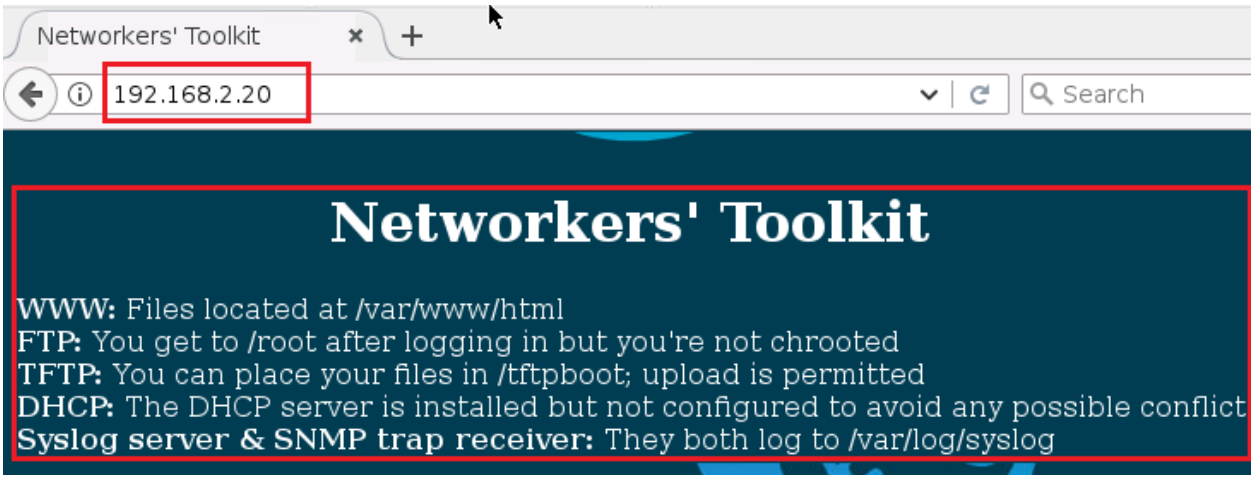




Extended ACL on R1 to Deny PC1 to Web-Server only HTTP
R1(config)#access-list 100 deny tcp host 192.168.1.10 host 192.168.2.10 eq 80 R1(config)#access-list 100 permit ip any any
R1(config)#interface f0/1 R1(config-if)#ip access-group 100 in

```
R1#show access-lists
Extended IP access list 100
    10 deny tcp host 192.168.1.10 host 192.168.2.10 eq www (3 matches)
    20 permit ip any any (42 matches)
```



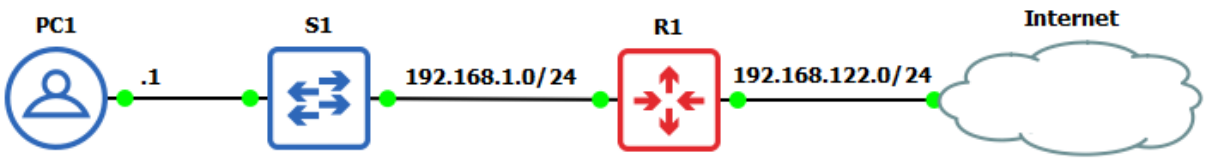



```
root@PC1:~# ping 192.168.1.10
PING 192.168.1.10 (192.168.1.10): 56 data bytes
64 bytes from 192.168.1.10: icmp_seq=0 ttl=64 time=0.066 ms
64 bytes from 192.168.1.10: icmp_seq=1 ttl=64 time=0.046 ms
```

Time ACL Configuration on R1
R1(config)# time-range TEST-TIME R1(config-time-range)# periodic weekdays 12:00 to 23:00 R1(config-time-range)# exit
R1(config)# access-list 100 permit ip 192.168.1.0 0.0.0.255 any time-range TEST-TIME R1(config)# access-list 100 deny ip any any
R1(config)# interface FastEthernet 0/1 R1(config-if)# ip access-group 100 in

Infrastructure ACL (iACLs):

- Using Infrastructure iACLs is a technique that was developed by ISPs.
- It is now a common practice by enterprises and other organizations.
- IACLs involves use of ACLs that prevent direct attacks to infrastructure devices.
- Configure these ACLs to specifically allow only authorized traffic to infrastructure.



Infrastructure ACL
R1(config)#!--CMP Packet Filtering R1(config)#ip access-list extended INF R1(config-ext-nacl)#permit icmp any any echo-reply R1(config-ext-nacl)#permit icmp any any unreachable R1(config-ext-nacl)#permit icmp any any time-exceeded R1(config-ext-nacl)#deny icmp any any
R1(config-ext-nacl)#!--Deny Special-Use Address Sources R1(config-ext-nacl)#deny ip host 0.0.0.0 any R1(config-ext-nacl)#deny ip 127.0.0.0 0.255.255.255 any R1(config-ext-nacl)#deny ip 192.0.2.0 0.0.0.255 any R1(config-ext-nacl)#deny ip 224.0.0.0 15.255.255.255 any
R1(config-ext-nacl)#!--Filter Private Space. R1(config-ext-nacl)#deny ip 10.0.0.0 0.255.255.255 any R1(config-ext-nacl)#deny ip 172.16.0.0 0.15.255.255 any R1(config-ext-nacl)#deny ip 192.168.0.0 0.0.255.255 any
R1(config-ext-nacl)#!--Deny Access to Internal infrastructure Addresses. R1(config-ext-nacl)#deny ip any 192.168.122.0 0.0.0.255
R1(config-ext-nacl)#!--Permit Transit Traffic. R1(config-ext-nacl)#permit ip any any