

## CCNA 2-LAB3: Routers and Routing Basics v3.1 (Skills-Based Assessment)

Stand: 27.11.2006

Klasse: CCNA2-2006 Gruppennr: \_\_\_\_\_ Datum: \_\_\_\_\_

Start-Time: \_\_\_\_\_ End-Time: \_\_\_\_\_

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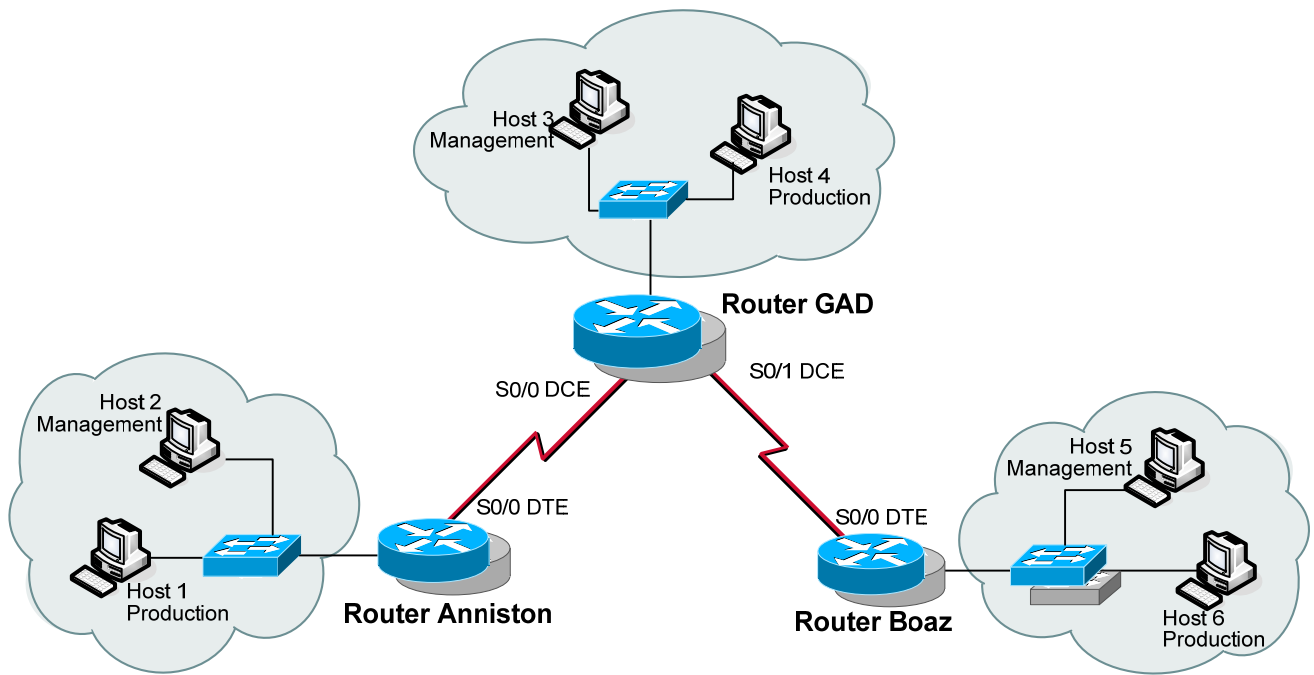
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### Document History

Version, Date	Authors email address	Changes and other notes
23.11.2006	ludwig.eckert@fh-sw.de	

### Topics

- Subnetz-Planung mit Festlegung der IP-Adressen
- Aufbau des Netzwerkes und Herstellung der OSI-Layer 1 Verkabelung
- Konfiguration und Test der IP-Interfaces (Hosts und Router)
- Konfiguration der WAN-Verbindungen (serielle Links)
- Konfiguration der Dynamischen Routing Protokolle
- Route Testing
- Zusatzaufgabe: Access List Configuration and Access List Testing



**Figure: Network-Topology**

### Step 1: Basic Planning:

In diesem LAB ist jeder Teilnehmer für jeweils ein Stub-Netzwerk verantwortlich. Ziel ist es zunächst, Verbindungen in allen Richtungen zu ermöglichen.

The scenario is that Gadsden (GAD) is regional headquarters of the company. Anniston and Boaz are branch offices.

A network address and specific number of hosts per subnet has been assigned for the local LAN.

From the instructor provided information, the subnet address, the subnet mask, the first and last usable addresses, and the broadcast address for each site's LAN need to be determined.

Assignments				
Router Segment	Gruppe	WAN Network Address	Router Interface Address(es)	IGRP AS
Anniston	1	192.168.1.0/24	192.168.1.1	1
Anniston	2	192.168.2.0/24	192.168.2.1	2
Anniston	3	192.168.3.0/24	192.168.3.1	3
Anniston	4	192.168.4.0/24	192.168.4.1	4
Anniston	5	192.168.5.0/24	192.168.5.1	5
Anniston	6	192.168.6.0/24	192.168.6.1	6

GAD	1	192.168.11.0/24	192.168.11.1 192.168.11.2	11
GAD	2	192.168.12.0/24	192.168.12.1 192.168.12.2	12
GAD	3	192.168.13.0/24	192.168.13.1 192.168.13.2	13
GAD	4	192.168.14.0/24	192.168.14.1 192.168.14.2	14
GAD	5	192.168.15.0/24	192.168.15.1 192.168.15.2	15
GAD	6	192.168.16.0/24	192.168.16.1 192.168.16.2	16
Boaz	1	192.168.101.0/24	192.168.101.1	101
Boaz	2	192.168.102.0/24	192.168.102.1	102
Boaz	3	192.168.103.0/24	192.168.103.1	103
Boaz	4	192.168.104.0/24	192.168.104.1	104
Boaz	5	192.168.105.0/24	192.168.105.1	105
Boaz	6	192.168.106.0/24	192.168.106.1	106
Boaz	7	192.168.107.0/24	192.168.107.1	107
Boaz	8	192.168.108.0/24	192.168.108.1	108

Using the chart below, plan the first 10 usable subnets of the LAN network address.

The WAN interface of GAD is assigned the lowest usable address in the subnetwork. Identify and use the second lowest usable WAN address for the S0, or S0/0, interface of the assigned router.

Subnet	Subnet Address	Subnet mask (/x)	First host	Last host	Broadcast
0			Do not use subnet 0		
1					
2					
3					

4					
5					
6					
7					
8					
9					
10					

For security reasons, the IP addresses of the assigned subnet are split in two groups.

- The production workstations will be assigned the lower half of the IP addresses.
- The network devices and management stations will be assigned the upper half of the IP addresses.
- The Ethernet router interface is to be assigned the highest usable address.

Identify the required IP address of the Ethernet interface on the assigned router, based on group number and your subnet assignment.

The host configurations must also be planned. Using the chart below, complete the host information.

<b>Branch:</b> Anniston, GAD or Boaz	<b>IP address range</b>
<b>Production Host Range (Lower half)</b>	
<b>Management Host Range (Upper half)</b>	

**Your Production Host:**

IP address \_\_\_\_\_

Subnet Mask \_\_\_\_\_

Default Gateway \_\_\_\_\_

## Your Management Host:

IP address \_\_\_\_\_

Subnet Mask \_\_\_\_\_

Default Gateway \_\_\_\_\_

### Step 1: Step 2: Security Planning

The task is to design IP ACLs for different purposes, e.g. to develop ACL statements for the following:

- Network to host for a specific protocol
- A range of hosts to a range of hosts all protocols
- Network to specific host all protocols

These can be accomplished using one ACL applied inbound on the Ethernet interface or applied outbound on the serial interface.

There are several security concerns in the internetwork. Develop Access Control Lists (ACLs) to address security issues. The following are the concerns:

1. The company has an Intranet Web server host that all systems can reach at IP address 172.16.0.1 with only HTTP access. No other protocols will be permitted to this site.
2. The company also has a server pool in the 209.0.0.0/24 network. The server pool addresses are divided in half. The servers in the upper half of the address range are reachable only by management hosts using all possible IP protocols. The servers in the upper half of the address range are not reachable by production hosts using all IP protocols. The servers in the lower half of the address range are reachable by all LAN hosts using all possible IP protocols. The servers should not be accessible by any other hosts.
3. The company has discovered an Internet Web server at 198.0.0.1 that is known to contain viruses. All hosts are to be banned from reaching this site.

4. All other traffic should be permitted to any destination. These security requirements should be accomplished with a single access list. Plan the access list required to accomplish these tasks, to which interface this will be applied, and the direction the list will be applied.

Test each configured access list to ensure that the appropriate traffic is blocked, while other traffic is permitted. Document your testing in the table below. A sample has been provided.

### Step 3: Cabling

Now that the planning process is complete, it is time to construct the physical layer. Using the diagram, connect all the associated hardware for the local branch.

Device	Device Interface	Connection to Switch/Hub	S0/0 or S0/1 connection
Anniston	fa0/0 or e0 ?	Category 5 straight	Serial (DTE)
GAD			
Boaz			
Local Production Host			
Local Management Host			

### Step 4: Basic Configuration

Apply a basic configuration to the router. This configuration should include all the normal configuration items. These items include

Configure each router with all typical configuration items. These include (but not limited to):

- router names,
- logins passwords (e.g. console, telnet),
- interface descriptions,
- host table,

- and a MOTD banner to be displayed before login,
- and IP host name mapping
- routing

The management workstation and the production workstation should also be configured with the appropriate information.

Routing and connectivity should be verified also, before notifying the instructor.

### Basic Configuration Testing.

Test connectivity to all interfaces. Which interfaces are possible to connect?

- from Host 1:
- from Host 2:
- from Host 3:

### Dynamic Routing Configuration and Testing.

- Configure dynamic routing between all networks (RIP Version 2)

### Basic Configuration and Route Testing.

You should verify routing and connectivity between all interfaces before continuing.

Which interfaces are possible to connect?

- from Host 1:
- from Host 2:
- from Host 3:

Checklist	Criteria	Checked
Passwords	The console, secret, VTY, and AUX passwords should be configured. (The VTY password can prevent a Telnet session if not set.)	
Host Name	The hostname should be Anniston, GAD or Boaz.	
IP Address	The FastEthernet interface should be configured with the highest address in the subnet. The Serial interface should be configured with the second lowest usable WAN address. The interface for GAD is .1.	
Host Table	A host table entry for GAD should exist.	
Message of the Day	Make sure there is a properly functioning MOTD and that it reflects a proper security message. (Do not attempt to ...)	
Serial 0/0 (or S0) Description	The serial interface should have a description for identifying that it connects to GAD's appropriate	

	interface.	
Fa 0/0 (or E0) Description	This description should identify that Fa 0/0 connects to the LAN.	
Routing Protocol	The routing protocol should be configured as IGRP with an Autonomous System Number equal to the version number of the exam assigned. There should be two network statements, one for the WAN (192.168.X.0) and one for the network assigned to the LAN.	
Hosts	Each host should be configured with the appropriate IP address, subnetmask, and gateway. The router address (highest address in subnet) should be the gateway on both hosts.	
Connectivity	From the host command prompt, make sure that the host can ping GAD's Serial interface as well as the loopback interfaces.  172.16.0.1, 209.0.0.1, 209.0.0.254, 62.0.0.1, and 198.0.0.1.	
Browsing	Also make sure that the web browser on the host can bring up the login popup for the loopback interfaces.  172.16.0.1, 209.0.0.1, 209.0.0.254, 62.0.0.1, and 198.0.0.1.	

### Step 5: Security Configuration

After the basic functionality is in place, security needs to be added to the configuration. Using the security requirement and planning from previous steps, implement and test these basic security functions.

Test	Description	Checked
1	The web browser on both hosts can bring up the login of IP address 172.16.0.1 but neither can ping nor Telnet.	
2	Management host can browse, ping, Telnet ... 209.0.0.1 and 209.0.0.254.  Production host can browse, ping, Telnet ... 209.0.0.1 but not 209.0.0.254.	
3	Neither host can browse, ping, Telnet ... 198.0.0.1	
4	The web browser on both hosts can bring up the login of IP address 62.0.0.1 (can also ping, Telnet).	
5		



6		
7		
8		
9		
10		

## Step 6: Troubleshooting

Now that everything is successfully configured. The steps and commands are used to correct problems.

### Physical Issues

1. Pull the Category 5 cable partially out of the router or hub far enough to turn off the link lights. Or, plug a bad or wrong Category 5 cable into the LAN. Commands for troubleshooting:

***show interfaces or show ip interface brief***

2. Power off the router or remove power cord.

***visual inspection***

3. Reverse the DTE and DCE ends of the cable on the serial connection. Commands for troubleshooting:

***show interfaces or show ip interface brief***

***show controller serial***

***show cdp neighbor***

4. Move the serial cable to the router's other Serial interface (serial1 or serial0/1). Commands for troubleshooting:

***show interfaces or show ip interface brief***

***show controller serial***

***show cdp neighbors***

### Configuration Issues

1. Shutdown an interface

Example:

***router(config-if)#shutdown***

Commands for troubleshooting:

***show interfaces or  
show ip interface brief***

2. Change the IP address of the Ethernet interface to a similar one in another subnet. For example, change 172.32.24.1/24 to 172.32.42.1/24.

***router(config-if)#ip address 172.32.42.1 255.255.255.0***

Commands for troubleshooting:

***show interfaces or show ip interface brief  
show ip route***

3. Change the IP address of the Serial interface to a similar one in another network. For example, change 192.168.3.1/24 to 192.186.3.1/24.

***router(config-if)#ip address 192.186.3.1/24 255.255.255.0***

Commands for troubleshooting:

***show interfaces or show ip interface brief  
show ip route***

4. Change the network statements in the routing protocol to a similar network. For example, change 172.32.0.0 to 172.23.0.0.

***router(config-router)#no network 172.32.0.0***

***router(config-router)#network 172.23.0.0***

Commands for troubleshooting:

***show ip route  
show ip protocols***

5. Change the IGRP autonomous system number to something similar to the previous one. For example, change the AS from 102 to 120.

***router(config)#no router igrp 102***

***router(config)#router igrp 120***

***router(config-router)#network xxx.yyy.zzz.aaa***

***router(config-router)#network rrr.sss.ttt.uuu***

Commands for troubleshooting:

***show ip route  
show ip protocols***

6. Remove the IGRP routing protocol. For example removing AS 102.

***router(config-router)#no router igrp 102***

Commands for troubleshooting:

***show ip route***

***show ip protocols***

7. Use a static route to override the route from the routing protocol to send traffic to null 0 (or to some other active interface. For example, redirect route 172.16.0.0 255.255.0.0 to null 0.

***router(config)#ip route 172.16.0.0 255.255.0.0 null 0***

Commands for troubleshooting:

***show ip route***

***show ip protocols***

8. Change the secret password so the student needs to do a password recovery. For example change the secret password to sneaky.

***router(config)#enable secret sneaky***

The individual will be graded on the following performance items. These items may be performed on any of the workstations or routers. This part is pass/fail.

Performance Item	Anniston	GAD	Boaz
<b>Configure ALL routers.</b> Include MOTD banner and IP host name mapping for all routers.			
<b>Ping router interface from router.</b> Ping an interface IP address on any router from any other router.			
<b>Traceroute.</b> Traceroute between the routers.			
<b>Access List functionality.</b> Access lists have been configured and tested. Access lists block target traffic while allowing all other traffic.			
<b>Telnet to all routers by router host name.</b> Telnet from one router to each of the other routers using their host name and be able to show all telnet sessions to other routers simultaneously.			
<b>Show routing table.</b> Show the routing table entries for each router to see other neighboring router interfaces are present.			
<b>Pass / Fail</b>			