

Report

# **Cloud Infrastructre Lab 1**

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## **1. Grundlegendes**

### **1.1. Tools**

1. Tftpd64 um Konfigurationen zu dumpen
2. jPerf um den Durchsatz zu messen
- 3.
- 4.

## 2. Informationsbeschaffung

In einem ersten Schritt wurden sämtliche Konfigurationen mit dem Tool Tftpd64 von den Router und Switches kopiert. Diese wurden dann in einem nächsten Schritt auf Fehlkonfigurationen analysiert. Dabei gingen wir nach folgendem Schema vor:

1.

### 2.1. Konfiguration kopieren

Für jedes Geräte wurden die Outputs der folgenden Befehle auf die lokalen Notebooks kopiert. Alle Konfiguration sind im Anhang A zu finden

```
1 copy run tftp und dann [your local ip addr]
2 show ip interface brief
3 show interface status
4 show cdp neighbors
```

### **3. Logische Topologie**

## **4. Gefundene Fehler**

### **4.1. Layer 1**

Auf OSI Layer 1 wurden keine Fehler gefunden.

### **4.2. Layer 2**

#### **4.2.1. Spanning Tree**

#### **4.2.2. VLAN**

### **4.3. Layer 3**

#### **4.3.1. Routen**

### **4.4. OSPF**

## **5. Messungen**

### **5.1. Traceroute**

Alle Durchgeführten Traceroute Messungen sind im Anhang B zu finden.

### **5.2. jPerf**



## 6. Empfehlungen

Aufgrund der vorangehenden Erkenntnissen empfehlen wir, an folgenden Punkten anzusetzen:

- 1.

### 6.1. Kostenvoranschlag

Für die Umsetzung unserer Empfehlungen würden folgende Kosten anfallen.

Beschreibung	Zeitaufwand in h	Stundenansatz in CHF	Total
<b>Total</b>			<u><u>1 Million</u></u>

Tabelle 1: Laufzeitverhalten von Suchtabellen

## A. Konfigurationen

### A.1. BR1-R1

#### A.1.1. Running Configuration

```
1 BR1_R1#show run
2 Building configuration...
3
4
5 Current configuration : 1829 bytes
6 !
7 ! Last configuration change at 16:09:57 UTC Fri Jul 4 2014
8 version 15.1
9 service timestamps debug datetime msec
10 service timestamps log datetime msec
11 no service password-encryption
12 !
13 hostname BR1_R1
14 !
15 boot-start-marker
16 boot-end-marker
17 !
18 !
19 enable secret 5 $1$iIN0$WQSejQFOMmTy6nGBblqi60
20 !
21 no aaa new-model
22 !
23 memory-size iomem 10
24 !
25 dot11 syslog
26 ip source-route
27 !
28 !
29 ip cef
30 !
31 !
32 !
33 no ipv6 cef
34 !
35 multilink bundle-name authenticated
36 !
37 !
38 !
39 !
40 !
41 !
42 !
43 !
44 !
45 !
46 !
47 voice-card 0
48 !
49 crypto pki token default removal timeout 0
50 !
51 !
52 !
53 !
54 license udi pid CISC02811 sn FCZ14322073
55 archive
```

```
56 log config
57 hidekeys
58 !
59 redundancy
60 !
61 !
62 !
63 !
64 !
65 !
66 !
67 !
68 !
69 !
70 interface Tunnel0
71 ip address 172.16.255.2 255.255.255.252
72 ip ospf 1 area 0
73 tunnel source 200.200.200.2
74 tunnel destination 200.200.200.1
75 !
76 interface FastEthernet0/0
77 ip address 200.200.200.2 255.255.255.240
78 duplex auto
79 speed auto
80 !
81 interface FastEthernet0/1
82 ip address 172.16.100.1 255.255.255.0
83 ip ospf 1 area 0
84 duplex auto
85 speed auto
86 !
87 interface Serial0/0/0
88 ip address 172.16.252.2 255.255.255.0
89 encapsulation frame-relay
90 ip ospf network point-to-multipoint
91 ip ospf 1 area 0
92 no fair-queue
93 frame-relay map ip 172.16.252.1 201 broadcast
94 no frame-relay inverse-arp IP 203
95 frame-relay lmi-type cisco
96 !
97 interface Serial0/0/1
98 no ip address
99 shutdown
100 clock rate 2000000
101 !
102 interface Serial1/0
103 no ip address
104 shutdown
105 !
106 interface Serial1/1
107 no ip address
108 shutdown
109 !
110 interface Serial1/2
111 no ip address
112 shutdown
113 !
114 interface Serial1/3
115 no ip address
116 shutdown
117 !
```

```

118 router ospf 1
119 !
120 ip forward-protocol nd
121 ip http server
122 no ip http secure-server
123 !
124 !
125 !
126 !
127 !
128 !
129 !
130 snmp-server community public R0
131 snmp-server community private RW
132 !
133 !
134 control-plane
135 !
136 !
137 !
138 !
139 mgcp profile default
140 !
141 !
142 !
143 !
144 !
145 !
146 line con 0
147 line aux 0
148 line vty 0 4
149 password ins@lab
150 login
151 transport input all
152 !
153 scheduler allocate 20000 1000
154 end

```

### A.1.2. IP Interfaces

```

1 BR1_R1#show ip interface brief
2 Interface IP-Address OK? Method Status Protocol
3 FastEthernet0/0 200.200.200.2 YES manual up up
4 FastEthernet0/1 172.16.100.1 YES manual up up
5 Serial0/0/0 172.16.252.2 YES manual up up
6 Serial0/0/1 unassigned YES unset administratively down down
7 Serial1/0 unassigned YES unset administratively down down
8 Serial1/1 unassigned YES unset administratively down down
9 Serial1/2 unassigned YES unset administratively down down
10 Serial1/3 unassigned YES unset administratively down down
11 Tunnel0 172.16.255.2 YES manual up up

```

### A.1.3. Interface Status

```

1 BR1_R1#show int stat
2 FastEthernet0/0
3 Switching path Pkts In Chars In Pkts Out Chars Out
4 Processor 23596 4007024 14953 2485289

```

```

5      Route cache      52      6579      0      0
6      Total    23648  4013603  14953  2485289
7  FastEthernet0/1
8      Switching path Pkts In Chars In Pkts Out Chars Out
9      Processor    17261  4303201  17235  2534976
10     Route cache   4041   276448   3920   580387
11     Total        21302  4579649  21155  3115363
12  Serial0/0/0
13     Switching path Pkts In Chars In Pkts Out Chars Out
14     Processor    13897  899350   15232  1028337
15     Route cache   3920   541187   4041   217118
16     Total        17817  1440537  19273  1245455
17  Interface Serial0/0/1 is disabled
18
19  Interface Serial1/0 is disabled
20
21  Interface Serial1/1 is disabled
22
23  Interface Serial1/2 is disabled
24
25  Interface Serial1/3 is disabled
26
27  Tunnel0
28     Switching path Pkts In Chars In Pkts Out Chars Out
29     Processor     4904  525447   4805   500198
30     Route cache    0      0      0      0
31     Total         4904  525447   4805   500198

```

#### A.1.4. Neighbors

```

1  BR1_R1#show cdp neighbors
2  Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
3                   S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone,
4                   D - Remote, C - CVTA, M - Two-port Mac Relay
5
6  Device ID    Local Intrfce Holdtme Capability Platform Port ID
7  BR1_S1      Fas 0/1      130      R S I WS-C3560- Fas 0/1
8  Switch      Fas 0/0      120      S I WS-C2960- Fas 0/2
9  BR1_R1#

```

## A.2. BR2-R1

### A.2.1. Running Configuration

```

1  BR2_R1#show run
2  Building configuration...
3
4
5  Current configuration : 1595 bytes
6  !
7  ! Last configuration change at 23:56:23 UTC Thu Sep 22 2016
8  version 15.1
9  service timestamps debug datetime msec
10 service timestamps log datetime msec
11 no service password-encryption
12 !
13 hostname BR2_R1
14 !

```

```
15 boot-start-marker
16 boot-end-marker
17 !
18 !
19 enable secret 5 $1$tooV$GpQ3VCxj1U3jlmnAZbnQr/
20 !
21 no aaa new-model
22 !
23 memory-size iomem 10
24 !
25 dot11 syslog
26 ip source-route
27 !
28 !
29 ip cef
30 !
31 !
32 !
33 no ipv6 cef
34 !
35 multilink bundle-name authenticated
36 !
37 !
38 !
39 !
40 !
41 !
42 !
43 !
44 !
45 !
46 !
47 voice-card 0
48 !
49 crypto pki token default removal timeout 0
50 !
51 !
52 !
53 !
54 license udi pid CISC02811 sn FCZ1432207G
55 archive
56   log config
57   hidekeys
58 !
59 redundancy
60 !
61 !
62 !
63 !
64 !
65 !
66 !
67 !
68 !
69 !
70 interface Tunnel0
71   ip address 172.16.255.6 255.255.255.252
72   ip ospf 1 area 0
73   tunnel source 200.200.200.3
74   tunnel destination 200.200.200.1
75 !
76 interface FastEthernet0/0
```

```
77 ip address 200.200.200.3 255.255.255.240
78 duplex auto
79 speed auto
80 !
81 interface FastEthernet0/1
82 ip address 172.16.102.1 255.255.255.0
83 ip ospf 1 area 0
84 duplex auto
85 speed auto
86 !
87 interface Serial0/0/0
88 ip address 172.16.252.3 255.255.255.0
89 encapsulation frame-relay
90 ip ospf network point-to-multipoint
91 ip ospf 1 area 0
92 frame-relay map ip 172.16.252.1 301 broadcast
93 frame-relay lmi-type cisco
94 !
95 interface Serial0/0/1
96 no ip address
97 shutdown
98 clock rate 2000000
99 !
100 router ospf 1
101 !
102 ip forward-protocol nd
103 no ip http server
104 no ip http secure-server
105 !
106 !
107 !
108 !
109 !
110 !
111 !
112 snmp-server community public R0
113 snmp-server community private RW
114 !
115 !
116 control-plane
117 !
118 !
119 !
120 !
121 mgcp profile default
122 !
123 !
124 !
125 !
126 !
127 !
128 line con 0
129 line aux 0
130 line vty 0 4
131 password ins@lab
132 login
133 transport input all
134 !
135 scheduler allocate 20000 1000
136 end
```

### A.2.2. IP Interfaces

```

1 BR2_R1#show ip interface brief
2 Interface                IP-Address  OK? Method Status      Protocol
3 FastEthernet0/0          200.200.200.3 YES manual up          up
4 FastEthernet0/1          172.16.102.1 YES manual up          up
5 Serial0/0/0              172.16.252.3 YES manual up          up
6 Serial0/0/1              unassigned YES unset administratively down down
7 Tunnel0                  172.16.255.6 YES manual up          up

```

### A.2.3. Interface Status

```

1 war leer

```

### A.2.4. Neighbors

```

1 Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
2                   S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone,
3                   D - Remote, C - CVTA, M - Two-port Mac Relay
4
5 Device ID    Local Intrfce Holdtme Capability Platform Port ID
6 BR2_S1      Fas 0/1      134          R S I WS-C3560V Fas 0/1
7 Switch      Fas 0/0      137          S I WS-C2960- Fas 0/3

```

## A.3. BR2-S1

### A.3.1. Running Configuration

```

1 BR2_S1#show running-config
2 Building configuration...
3
4 Current configuration : 2667 bytes
5 !
6 ! Last configuration change at 13:10:42 UTC Mon Mar 1 1993
7 !
8 version 15.0
9 no service pad
10 service timestamps debug datetime msec
11 service timestamps log datetime msec
12 no service password-encryption
13 !
14 hostname BR2_S1
15 !
16 boot-start-marker
17 boot-end-marker
18 !
19 enable secret 5 $1$51.0$ebtjgur4cQu.x/Jy1FUIA1
20 !
21 username ins password 0 ins@lab
22 no aaa new-model
23 system mtu routing 1500
24 vtp domain CCIE
25 vtp mode transparent
26 ip routing
27 no ip domain-lookup

```



```
28 ip dhcp excluded-address 172.16.103.1
29 ip dhcp excluded-address 172.16.103.10 172.16.103.12
30 !
31 ip dhcp pool BRANCH2
32 network 172.16.103.0 255.255.255.0
33 default-router 172.16.103.1
34 !
35 !
36 !
37 !
38 crypto pki trustpoint HTTPS_SS_CERT_KEYPAIR
39 enrollment selfsigned
40 serial-number
41 revocation-check none
42 rsa-keypair HTTPS_SS_CERT_KEYPAIR
43 !
44 !
45 crypto pki certificate chain HTTPS_SS_CERT_KEYPAIR
46 certificate self-signed 01
47 quit
48 !
49 !
50 !
51 !
52 !
53 spanning-tree mode pvst
54 spanning-tree extend system-id
55 !
56 vlan internal allocation policy ascending
57 !
58 vlan 2-5
59 !
60 vlan 10
61 name HR
62 !
63 vlan 11
64 name IT
65 !
66 vlan 17,19,46,1006
67 !
68 !
69 !
70 !
71 !
72 !
73 !
74 !
75 !
76 !
77 !
78 !
79 !
80 !
81 interface FastEthernet0/1
82 no switchport
83 ip address 172.16.102.2 255.255.255.0
84 ip ospf 1 area 0
85 !
86 interface FastEthernet0/2
87 switchport trunk encapsulation dot1q
88 switchport mode trunk
89 !
```

```
90 interface FastEthernet0/3
91   switchport trunk encapsulation dot1q
92   switchport mode trunk
93   !
94 interface FastEthernet0/4
95   switchport trunk encapsulation dot1q
96   switchport mode trunk
97   !
98 interface FastEthernet0/5
99   switchport trunk encapsulation dot1q
100  switchport mode trunk
101  !
102 interface FastEthernet0/6
103   switchport trunk encapsulation dot1q
104   switchport mode trunk
105   !
106 interface FastEthernet0/7
107   switchport trunk encapsulation dot1q
108   switchport mode trunk
109   !
110 interface FastEthernet0/8
111   !
112 interface FastEthernet0/9
113   !
114 interface FastEthernet0/10
115   !
116 interface FastEthernet0/11
117   !
118 interface FastEthernet0/12
119   !
120 interface FastEthernet0/13
121   !
122 interface FastEthernet0/14
123   !
124 interface FastEthernet0/15
125   !
126 interface FastEthernet0/16
127   !
128 interface FastEthernet0/17
129   !
130 interface FastEthernet0/18
131   !
132 interface FastEthernet0/19
133   !
134 interface FastEthernet0/20
135   !
136 interface FastEthernet0/21
137   !
138 interface FastEthernet0/22
139   !
140 interface FastEthernet0/23
141   !
142 interface FastEthernet0/24
143   !
144 interface GigabitEthernet0/1
145   !
146 interface GigabitEthernet0/2
147   !
148 interface Vlan1
149   ip address 172.16.103.1 255.255.255.0
150   ip ospf 1 area 0
151   shutdown
```

```

152 !
153 interface Vlan103
154   ip address 172.16.23.1 255.255.255.0
155   ip ospf 1 area 0
156 !
157 router ospf 1
158 !
159 ip http server
160 ip http secure-server
161 !
162 !
163 ip sla enable reaction-alerts
164 snmp-server community private RW
165 snmp-server community public R0
166 !
167 !
168 line con 0
169 line vty 0 4
170   password cisco
171   login
172 line vty 5 15
173   password cisco
174   login
175 !
176 end

```

### A.3.2. IP Interfaces

```

1 BR2-S1#show ip interface brief
2 Interface      IP-Address  OK? Method Status      Protocol
3 Vlan1          172.16.103.1 YES manual administratively down down
4 Vlan103        172.16.23.1 YES manual down        down
5 FastEthernet0/1 172.16.102.2 YES manual up          up
6 FastEthernet0/2 unassigned   YES unset up          up
7 FastEthernet0/3 unassigned   YES unset up          up
8 FastEthernet0/4 unassigned   YES unset up          up
9 FastEthernet0/5 unassigned   YES unset up          up
10 FastEthernet0/6 unassigned   YES unset up          up
11 FastEthernet0/7 unassigned   YES unset up          up
12 FastEthernet0/8 unassigned   YES unset down        down
13 FastEthernet0/9 unassigned   YES unset down        down
14 FastEthernet0/10 unassigned   YES unset down        down
15 FastEthernet0/11 unassigned   YES unset down        down
16 FastEthernet0/12 unassigned   YES unset down        down
17 FastEthernet0/13 unassigned   YES unset down        down
18 FastEthernet0/14 unassigned   YES unset down        down
19 FastEthernet0/15 unassigned   YES unset down        down
20 FastEthernet0/16 unassigned   YES unset down        down
21 FastEthernet0/17 unassigned   YES unset down        down
22 FastEthernet0/18 unassigned   YES unset down        down
23 FastEthernet0/19 unassigned   YES unset down        down
24 FastEthernet0/20 unassigned   YES unset down        down
25 FastEthernet0/21 unassigned   YES unset down        down
26 FastEthernet0/22 unassigned   YES unset down        down
27 FastEthernet0/23 unassigned   YES unset down        down
28 FastEthernet0/24 unassigned   YES unset down        down
29 GigabitEthernet0/1 unassigned YES unset down        down
30 GigabitEthernet0/2 unassigned YES unset down        down

```

**A.3.3. Interface Status**

```

1 BR2_S1#show int stat
2 Interface Vlan1 is disabled
3
4 Vlan103
5     Switching path Pkts In Chars In Pkts Out Chars Out
6         Processor    0      0      0
7         Route cache   0      0      0
8         Total         0      0      0
9
10 FastEthernet0/1
11     Switching path Pkts In Chars In Pkts Out Chars Out
12         Processor  6087  578068  10408  1136458
13         Route cache    0      0      0
14         Total      6087  578068  10408  1136458
15
16 FastEthernet0/2
17     Switching path Pkts In Chars In Pkts Out Chars Out
18         Processor    0      0  214509 14998495
19         Route cache   0      0      0
20         Total         0      0  214509 14998495
21
22 FastEthernet0/3
23     Switching path Pkts In Chars In Pkts Out Chars Out
24         Processor    0      0  10423  1112441
25         Route cache   0      0      0
26         Total         0      0  10423  1112441
27
28 FastEthernet0/4
29     Switching path Pkts In Chars In Pkts Out Chars Out
30         Processor    0      0  288995 19894189
31         Route cache   0      0      0
32         Total         0      0  288995 19894189
33
34 FastEthernet0/5
35     Switching path Pkts In Chars In Pkts Out Chars Out
36         Processor    0      0  267067 18446985
37         Route cache   0      0      0
38         Total         0      0  267067 18446985
39
40 FastEthernet0/6
41     Switching path Pkts In Chars In Pkts Out Chars Out
42         Processor    0      0  266983 18437453
43         Route cache   0      0      0
44         Total         0      0  266983 18437453
45
46 FastEthernet0/7
47     Switching path Pkts In Chars In Pkts Out Chars Out
48         Processor    0      0  266999 18438475
49         Route cache   0      0      0
50         Total         0      0  266999 18438475
51
52 FastEthernet0/8
53     Switching path Pkts In Chars In Pkts Out Chars Out
54         Processor    0      0   1938  146004
55         Route cache   0      0      0
56         Total         0      0   1938  146004
57
58 FastEthernet0/9
59     Switching path Pkts In Chars In Pkts Out Chars Out
60         Processor    0      0      0
61         Route cache   0      0      0
62         Total         0      0      0
63
64 FastEthernet0/10
65     Switching path Pkts In Chars In Pkts Out Chars Out
66         Processor    0      0      0
67         Route cache   0      0      0
68         Total         0      0      0
69
70 FastEthernet0/11

```

60	Switching path	Pkts	In	Chars	In	Pkts	Out	Chars	Out
61	Processor	0		0		0		0	
62	Route cache	0		0		0		0	
63	Total	0		0		0		0	
64	FastEthernet0/12								
65	Switching path	Pkts	In	Chars	In	Pkts	Out	Chars	Out
66	Processor	0		0		0		0	
67	Route cache	0		0		0		0	
68	Total	0		0		0		0	
69	FastEthernet0/13								
70	Switching path	Pkts	In	Chars	In	Pkts	Out	Chars	Out
71	Processor	0		0		0		0	
72	Route cache	0		0		0		0	
73	Total	0		0		0		0	
74	FastEthernet0/14								
75	Switching path	Pkts	In	Chars	In	Pkts	Out	Chars	Out
76	Processor	0		0		0		0	
77	Route cache	0		0		0		0	
78	Total	0		0		0		0	
79	FastEthernet0/15								
80	Switching path	Pkts	In	Chars	In	Pkts	Out	Chars	Out
81	Processor	0		0		0		0	
82	Route cache	0		0		0		0	
83	Total	0		0		0		0	
84	FastEthernet0/16								
85	Switching path	Pkts	In	Chars	In	Pkts	Out	Chars	Out
86	Processor	0		0		0		0	
87	Route cache	0		0		0		0	
88	Total	0		0		0		0	
89	FastEthernet0/17								
90	Switching path	Pkts	In	Chars	In	Pkts	Out	Chars	Out
91	Processor	0		0		0		0	
92	Route cache	0		0		0		0	
93	Total	0		0		0		0	
94	FastEthernet0/18								
95	Switching path	Pkts	In	Chars	In	Pkts	Out	Chars	Out
96	Processor	0		0		0		0	
97	Route cache	0		0		0		0	
98	Total	0		0		0		0	
99	FastEthernet0/19								
100	Switching path	Pkts	In	Chars	In	Pkts	Out	Chars	Out
101	Processor	0		0		0		0	
102	Route cache	0		0		0		0	
103	Total	0		0		0		0	
104	FastEthernet0/20								
105	Switching path	Pkts	In	Chars	In	Pkts	Out	Chars	Out
106	Processor	0		0		0		0	
107	Route cache	0		0		0		0	
108	Total	0		0		0		0	
109	FastEthernet0/21								
110	Switching path	Pkts	In	Chars	In	Pkts	Out	Chars	Out
111	Processor	0		0		0		0	
112	Route cache	0		0		0		0	
113	Total	0		0		0		0	
114	FastEthernet0/22								
115	Switching path	Pkts	In	Chars	In	Pkts	Out	Chars	Out
116	Processor	0		0		0		0	
117	Route cache	0		0		0		0	
118	Total	0		0		0		0	
119	FastEthernet0/23								
120	Switching path	Pkts	In	Chars	In	Pkts	Out	Chars	Out
121	Processor	0		0		0		0	

```

122         Route cache      0      0      0      0
123         Total            0      0      0      0
124 FastEthernet0/24
125     Switching path Pkts In Chars In Pkts Out Chars Out
126     Processor      0      0      0      0
127     Route cache     0      0      0      0
128     Total           0      0      0      0
129 GigabitEthernet0/1
130     Switching path Pkts In Chars In Pkts Out Chars Out
131     Processor      0      0      0      0
132     Route cache     0      0      0      0
133     Total           0      0      0      0
134 GigabitEthernet0/2
135     Switching path Pkts In Chars In Pkts Out Chars Out
136     Processor      0      0      0      0
137     Route cache     0      0      0      0
138     Total           0      0      0      0

```

### A.3.4. Neighbors

```

1 BR2_S1# show cdp neighbors
2 Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
3 S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone,
4 D - Remote, C - CVTA, M - Two-port Mac Relay
5
6 Device ID    Local Intfcae Holdtme Capability Platform Port ID
7 BR2_S4       Fas 0/7      150          S I WS-C2960- Fas 0/24
8 BR2_S4       Fas 0/6      150          S I WS-C2960- Fas 0/23
9 BR2_S2       Fas 0/3      143          S I WS-C3560V Fas 0/24
10 BR2_S2       Fas 0/2      143          S I WS-C3560V Fas 0/23
11 BR2_S3       Fas 0/5      175          S I WS-C2960- Fas 0/24
12 BR2_S3       Fas 0/4      175          S I WS-C2960- Fas 0/23
13 BR2_R1       Fas 0/1      131          R S I 2811   Fas 0/1
14 BR2_S1#

```

## A.4. FrameRelaySwitch

### A.4.1. Running Configuration

```

1 CCNA-CCNP-FRSwitch#show run
2 Building configuration...
3
4 Current configuration : 2648 bytes
5 !
6 version 12.3
7 service timestamps debug datetime msec
8 service timestamps log datetime msec
9 no service password-encryption
10 !
11 hostname CCNA-CCNP-FRSwitch
12 !
13 boot-start-marker
14 boot-end-marker
15 !
16 !
17 memory-size iomem 10
18 no aaa new-model
19 ip subnet-zero

```

```
20 | !
21 | !
22 | !
23 | ip cef
24 | frame-relay switching
25 | !
26 | !
27 | !
28 | !
29 | !
30 | !
31 | !
32 | !
33 | !
34 | !
35 | !
36 | !
37 | !
38 | !
39 | !
40 | interface Ethernet0/0
41 |   no ip address
42 |   shutdown
43 |   half-duplex
44 |   no cdp enable
45 |   no clns route-cache
46 | !
47 | interface Ethernet0/1
48 |   no ip address
49 |   shutdown
50 |   half-duplex
51 |   no cdp enable
52 |   no clns route-cache
53 | !
54 | interface Serial1/0
55 |   description 102 103 104
56 |   no ip address
57 |   encapsulation frame-relay
58 |   clockrate 64000
59 |   no fair-queue
60 |   no clns route-cache
61 |   frame-relay intf-type dce
62 |   frame-relay route 102 interface Serial1/1 201
63 |   frame-relay route 103 interface Serial1/2 301
64 |   frame-relay route 104 interface Serial1/3 401
65 | !
66 | interface Serial1/1
67 |   description 201 203
68 |   no ip address
69 |   encapsulation frame-relay
70 |   clockrate 64000
71 |   no clns route-cache
72 |   frame-relay intf-type dce
73 |   frame-relay route 201 interface Serial1/0 102
74 |   frame-relay route 203 interface Serial1/2 302
75 | !
76 | interface Serial1/2
77 |   description 301 302
78 |   no ip address
79 |   encapsulation frame-relay
80 |   clockrate 64000
81 |   no clns route-cache
```

```
82 frame-relay intf-type dce
83 frame-relay route 301 interface Serial1/0 103
84 frame-relay route 302 interface Serial1/1 203
85 !
86 interface Serial1/3
87 description 301 302
88 no ip address
89 encapsulation frame-relay
90 clockrate 64000
91 no clns route-cache
92 frame-relay intf-type dce
93 frame-relay route 301 interface Serial1/0 103
94 frame-relay route 302 interface Serial1/1 203
95 !
96 interface Serial1/4
97 description 102 103 104
98 no ip address
99 encapsulation frame-relay
100 clockrate 64000
101 no fair-queue
102 no clns route-cache
103 frame-relay intf-type dce
104 frame-relay route 102 interface Serial1/5 201
105 frame-relay route 103 interface Serial1/6 301
106 frame-relay route 104 interface Serial1/7 401
107 !
108 interface Serial1/5
109 description 201 203
110 no ip address
111 encapsulation frame-relay
112 clockrate 64000
113 no clns route-cache
114 frame-relay intf-type dce
115 frame-relay route 201 interface Serial1/4 102
116 frame-relay route 203 interface Serial1/6 302
117 !
118 interface Serial1/6
119 description 301 302
120 no ip address
121 encapsulation frame-relay
122 clockrate 64000
123 no clns route-cache
124 frame-relay intf-type dce
125 frame-relay route 301 interface Serial1/4 103
126 frame-relay route 302 interface Serial1/5 203
127 !
128 interface Serial1/7
129 description 401
130 no ip address
131 encapsulation frame-relay
132 clockrate 64000
133 no clns route-cache
134 frame-relay intf-type dce
135 frame-relay route 401 interface Serial1/4 104
136 !
137 no ip http server
138 ip classless
139 !
140 !
141 no cdp run
142 !
143 !
```



```

144 !
145 !
146 !
147 !
148 line con 0
149 line aux 0
150 line vty 0 4
151 login
152 !
153 !
154 end

```

#### A.4.2. IP Interfaces

```

1 CCNA-CCNP-FRSwitch#show ip interface brief
2 Interface      IP-Address  OK? Method Status      Protocol
3 Ethernet0/0    unassigned YES NVRAM administratively down down
4 Ethernet0/1    unassigned YES NVRAM administratively down down
5 Serial1/0      unassigned YES NVRAM up          up
6 Serial1/1      unassigned YES NVRAM up          up
7 Serial1/2      unassigned YES NVRAM down        down
8 Serial1/3      unassigned YES manual up          up
9 Serial1/4      unassigned YES NVRAM down        down
10 Serial1/5      unassigned YES NVRAM down        down
11 Serial1/6      unassigned YES NVRAM down        down
12 Serial1/7      unassigned YES NVRAM down        down

```

#### A.4.3. Interface Status

```

1 CCNA-CCNP-FRSwitch#show int sta
2 Interface Ethernet0/0 is disabled
3
4 Interface Ethernet0/1 is disabled
5
6 Serial1/0
7   Switching path Pkts In Chars In Pkts Out Chars Out
8     Processor    6055   80073   6024   102162
9     Route cache  11641  1618848  10962  1342326
10    Total        17696  1698921  16986  1444488
11 Serial1/1
12   Switching path Pkts In Chars In Pkts Out Chars Out
13     Processor    6049   80432   6017   94029
14     Route cache  9743   940370   9632  1196100
15    Total        15792  1020802  15649  1290129
16 Serial1/2
17   Switching path Pkts In Chars In Pkts Out Chars Out
18     Processor      0        0        0        0
19     Route cache      0        0        0        0
20    Total           0        0        0        0
21 Serial1/3
22   Switching path Pkts In Chars In Pkts Out Chars Out
23     Processor    1950   60176   1281   20109
24     Route cache      0        0        0        0

```

#### A.4.4. Neighbors

```
1 CCNA-CCNP-FRSwitch#show cdp neighbors
2 % CDP is not enabled
3 CCNA-CCNP-FRSwitch#
```

## A.5. HQ FrameRelay Router (HQ-FRR)

### A.5.1. Running Configuration

```
1 HQ_FRR#show run
2
3 Building configuration...
4
5
6 Current configuration : 1810 bytes
7 !
8 ! Last configuration change at 22:56:57 UTC Thu Sep 22 2016
9 version 15.1
10 service timestamps debug datetime msec
11 service timestamps log datetime msec
12 no service password-encryption
13 !
14 hostname HQ_FRR
15 !
16 boot-start-marker
17 boot-end-marker
18 !
19 !
20 enable secret 5 $1$FscR$wXNeNkzJuiZqfM2mESMKM/
21 !
22 no aaa new-model
23 !
24 memory-size iomem 10
25 !
26 dot11 syslog
27 ip source-route
28 !
29 !
30 ip cef
31 !
32 !
33 !
34 no ipv6 cef
35 !
36 multilink bundle-name authenticated
37 !
38 !
39 !
40 !
41 !
42 !
43 !
44 !
45 !
46 !
47 !
48 voice-card 0
49 !
50 crypto pki token default removal timeout 0
51 !
```

```
52 | !
53 | !
54 | !
55 | license udi pid CISC02811 sn FCZ1432207U
56 | archive
57 |   log config
58 |     hidekeys
59 | !
60 | redundancy
61 | !
62 | !
63 | !
64 | !
65 | !
66 | !
67 | !
68 | !
69 | !
70 | !
71 | interface FastEthernet0/0
72 |   ip address 172.16.254.62 255.255.255.252
73 |   ip ospf 1 area 0
74 |   duplex auto
75 |   speed auto
76 | !
77 | interface FastEthernet0/1
78 |   no ip address
79 |   shutdown
80 |   duplex auto
81 |   speed auto
82 | !
83 | interface Serial0/0/0
84 |   no ip address
85 |   encapsulation frame-relay
86 |   no fair-queue
87 |   frame-relay lmi-type cisco
88 | !
89 | interface Serial0/0/0.123 multipoint
90 |   ip address 172.16.252.1 255.255.255.0
91 |   ip ospf network point-to-multipoint
92 |   ip ospf 1 area 0
93 |   snmp trap link-status
94 |   frame-relay map ip 172.16.252.3 103 broadcast
95 |   frame-relay map ip 172.16.252.4 104 broadcast
96 |   frame-relay map ip 172.16.252.2 102 broadcast
97 | !
98 | interface Serial0/0/1
99 |   no ip address
100 |   shutdown
101 |   clock rate 2000000
102 | !
103 | interface Serial1/0
104 |   no ip address
105 |   shutdown
106 | !
107 | interface Serial1/1
108 |   no ip address
109 |   shutdown
110 | !
111 | interface Serial1/2
112 |   no ip address
113 |   shutdown
```

```

114 !
115 interface Serial1/3
116   no ip address
117   shutdown
118 !
119 router ospf 1
120 !
121 ip forward-protocol nd
122 ip http server
123 no ip http secure-server
124 !
125 !
126 !
127 !
128 !
129 !
130 !
131 snmp-server community public R0
132 snmp-server community private RW
133 !
134 !
135 control-plane
136 !
137 !
138 !
139 !
140 mgcp profile default
141 !
142 !
143 !
144 !
145 !
146 !
147 line con 0
148 line aux 0
149 line vty 0 4
150   password ins@lab
151   login
152   transport input all
153 !
154 scheduler allocate 20000 1000
155 end      R S I 2811   Fas 0/1
156 HQ_FRR#

```

### A.5.2. IP Interfaces

```

1 HQ_FRR#show ip interface brief
2 Interface      IP-Address  OK? Method Status      Protocol
3 FastEthernet0/0 172.16.254.62 YES manual up          up
4 FastEthernet0/1 unassigned YES unset administratively down down
5 Serial0/0/0     unassigned YES unset up          up
6 Serial0/0/0.123 172.16.252.1 YES manual up          up
7 Serial0/0/1     unassigned YES unset administratively down down
8 Serial1/0       unassigned YES unset administratively down down
9 Serial1/1       unassigned YES unset administratively down down
10 Serial1/2       unassigned YES unset administratively down down
11 Serial1/3       unassigned YES unset administratively down down

```

### A.5.3. Interface Status

```

1 HQ_FRR#show int stat
2 FastEthernet0/0
3     Switching path Pkts In Chars In Pkts Out Chars Out
4     Processor      11417 2039747 15264 2269864
5     Route cache    7789 864229 8372 558345
6     Total          19206 2903976 23636 2828209
7 Interface FastEthernet0/1 is disabled
8
9 Serial0/0/0
10    Switching path Pkts In Chars In Pkts Out Chars Out
11    Processor      10981 1113980 11642 1052162
12    Route cache    8372 474625 7789 755301
13    Total          19353 1588605 19431 1807463
14 Interface Serial0/0/1 is disabled
15
16 Interface Serial1/0 is disabled
17
18 Interface Serial1/1 is disabled
19
20 Interface Serial1/2 is disabled
21
22 Interface Serial1/3 is disabled

```

### A.5.4. Neighbors

```

1 HQ_FRR#show cdp neighbors
2 Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
3                   S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone,
4                   D - Remote, C - CVTA, M - Two-port Mac Relay
5
6 Device ID         Local Intrfce Holdtme Capability Platform Port ID
7 HQ_WER1           Fas 0/0      145

```

## A.6. HQ-IER1

### A.6.1. Running Configuration

```

1 BR1_R1#show run
2 Building configuration...
3
4
5 Current configuration : 1829 bytes
6 !
7 ! Last configuration change at 16:09:57 UTC Fri Jul 4 2014
8 version 15.1
9 service timestamps debug datetime msec
10 service timestamps log datetime msec
11 no service password-encryption
12 !
13 hostname BR1_R1
14 !
15 boot-start-marker
16 boot-end-marker
17 !
18 !

```

```
19 enable secret 5 $1$iIN0$WQSejQFOMmTy6nGBblqi60
20 !
21 no aaa new-model
22 !
23 memory-size iomem 10
24 !
25 dot11 syslog
26 ip source-route
27 !
28 !
29 ip cef
30 !
31 !
32 !
33 no ipv6 cef
34 !
35 multilink bundle-name authenticated
36 !
37 !
38 !
39 !
40 !
41 !
42 !
43 !
44 !
45 !
46 !
47 voice-card 0
48 !
49 crypto pki token default removal timeout 0
50 !
51 !
52 !
53 !
54 license udi pid CISC02811 sn FCZ14322073
55 archive
56   log config
57   hidekeys
58 !
59 redundancy
60 !
61 !
62 !
63 !
64 !
65 !
66 !
67 !
68 !
69 !
70 interface Tunnel0
71   ip address 172.16.255.2 255.255.255.252
72   ip ospf 1 area 0
73   tunnel source 200.200.200.2
74   tunnel destination 200.200.200.1
75 !
76 interface FastEthernet0/0
77   ip address 200.200.200.2 255.255.255.240
78   duplex auto
79   speed auto
80 !
```

```
81 interface FastEthernet0/1
82 ip address 172.16.100.1 255.255.255.0
83 ip ospf 1 area 0
84 duplex auto
85 speed auto
86 !
87 interface Serial0/0/0
88 ip address 172.16.252.2 255.255.255.0
89 encapsulation frame-relay
90 ip ospf network point-to-multipoint
91 ip ospf 1 area 0
92 no fair-queue
93 frame-relay map ip 172.16.252.1 201 broadcast
94 no frame-relay inverse-arp IP 203
95 frame-relay lmi-type cisco
96 !
97 interface Serial0/0/1
98 no ip address
99 shutdown
100 clock rate 2000000
101 !
102 interface Serial1/0
103 no ip address
104 shutdown
105 !
106 interface Serial1/1
107 no ip address
108 shutdown
109 !
110 interface Serial1/2
111 no ip address
112 shutdown
113 !
114 interface Serial1/3
115 no ip address
116 shutdown
117 !
118 router ospf 1
119 !
120 ip forward-protocol nd
121 ip http server
122 no ip http secure-server
123 !
124 !
125 !
126 !
127 !
128 !
129 !
130 snmp-server community public R0
131 snmp-server community private RW
132 !
133 !
134 control-plane
135 !
136 !
137 !
138 !
139 mgcp profile default
140 !
141 !
142 !
```

```

143 !
144 !
145 !
146 line con 0
147 line aux 0
148 line vty 0 4
149 password ins@lab
150 login
151 transport input all
152 !
153 scheduler allocate 20000 1000
154 end

```

### A.6.2. IP Interfaces

```

1 BR1_R1# show ip int brief
2 Interface IP-Address OK? Method Status Protocol
3 FastEthernet0/0 200.200.200.2 YES manual up up
4 FastEthernet0/1 172.16.100.1 YES manual up up
5 Serial0/0/0 172.16.252.2 YES manual up up
6 Serial0/0/1 unassigned YES unset administratively down down
7 Serial1/0 unassigned YES unset administratively down down
8 Serial1/1 unassigned YES unset administratively down down
9 Serial1/2 unassigned YES unset administratively down down
10 Serial1/3 unassigned YES unset administratively down down
11 Tunnel0 172.16.255.2 YES manual up up
12 BR1_R1#

```

### A.6.3. Interface Status

```

1 BR1_R1#show int stat
2 FastEthernet0/0
3     Switching path Pkts In Chars In Pkts Out Chars Out
4     Processor 22380 3923705 14760 2464011
5     Route cache 52 6579 0 0
6     Total 22432 3930284 14760 2464011
7 FastEthernet0/1
8     Switching path Pkts In Chars In Pkts Out Chars Out
9     Processor 16927 4264320 16764 2498748
10    Route cache 4041 276448 3920 580387
11    Total 20968 4540768 20684 3079135
12 Serial0/0/0
13    Switching path Pkts In Chars In Pkts Out Chars Out
14    Processor 13211 843517 13447 908579
15    Route cache 3920 541187 4041 217118
16    Total 17131 1384704 17488 1125697
17 Interface Serial0/0/1 is disabled
18
19 Interface Serial1/0 is disabled
20
21 Interface Serial1/1 is disabled
22
23 Interface Serial1/2 is disabled
24
25 Interface Serial1/3 is disabled
26
27 Tunnel0
28    Switching path Pkts In Chars In Pkts Out Chars Out

```



29	Processor	4812	515851	4715	490834
30	Route cache	0	0	0	0
31	Total	4812	515851	4715	490834

#### A.6.4. Neighbors

```

1 BR1_R1#show cdp neighbors
2 Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
3                   S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone,
4                   D - Remote, C - CVTA, M - Two-port Mac Relay
5
6 Device ID      Local Intrfce Holdtme Capability Platform Port ID
7 BR1_S1        Fas 0/1      143          R S I WS-C3560- Fas 0/1
8 Switch        Fas 0/0      133          S I WS-C2960- Fas 0/2
9 BR1_R1#

```

### A.7. HQ-WER1

#### A.7.1. Running Configuration

```

1 HQ_WER1#show running-config
2 Building configuration...
3
4
5 Current configuration : 1524 bytes
6 !
7 ! Last configuration change at 23:58:14 UTC Thu Sep 22 2016
8 version 15.1
9 service timestamps debug datetime msec
10 service timestamps log datetime msec
11 no service password-encryption
12 !
13 hostname HQ_WER1
14 !
15 boot-start-marker
16 boot-end-marker
17 !
18 !
19 enable secret 5 $1$RJx0$6QppMo5PI1VrlwnDvu//l1
20 !
21 no aaa new-model
22 !
23 memory-size iomem 10
24 !
25 dot11 syslog
26 ip source-route
27 !
28 !
29 ip cef
30 !
31 !
32 !
33 no ipv6 cef
34 !
35 multilink bundle-name authenticated
36 !
37 !
38 !

```

```
39 | !
40 | !
41 | !
42 | !
43 | !
44 | !
45 | !
46 | !
47 | voice-card 0
48 | !
49 | crypto pki token default removal timeout 0
50 | !
51 | !
52 | !
53 | !
54 | license udi pid CISC02811 sn FCZ104770XM
55 | archive
56 |   log config
57 |   hidekeys
58 | !
59 | redundancy
60 | !
61 | !
62 | !
63 | !
64 | !
65 | !
66 | !
67 | !
68 | !
69 | !
70 | interface FastEthernet0/0
71 |   ip address 172.16.254.58 255.255.255.252
72 |   ip ospf 1 area 0
73 |   duplex auto
74 |   speed auto
75 | !
76 | interface FastEthernet0/1
77 |   ip address 172.16.254.61 255.255.255.252
78 |   ip ospf 1 area 0
79 |   duplex auto
80 |   speed auto
81 | !
82 | interface Serial0/0/0
83 |   no ip address
84 |   shutdown
85 |   no fair-queue
86 |   clock rate 2000000
87 | !
88 | interface Serial0/0/1
89 |   no ip address
90 |   shutdown
91 |   clock rate 2000000
92 | !
93 | interface Serial1/0
94 |   no ip address
95 |   shutdown
96 | !
97 | interface Serial1/1
98 |   no ip address
99 |   shutdown
100 | !
```

```

101 interface Serial1/2
102   no ip address
103   shutdown
104   !
105 interface Serial1/3
106   no ip address
107   shutdown
108   !
109 router ospf 1
110   !
111   ip forward-protocol nd
112   ip http server
113   no ip http secure-server
114   !
115   !
116   !
117   !
118   !
119   !
120   !
121   snmp-server community public R0
122   snmp-server community private RW
123   !
124   !
125   control-plane
126   !
127   !
128   !
129   !
130   mgcp profile default
131   !
132   !
133   !
134   !
135   !
136   !
137   line con 0
138   line aux 0
139   line vty 0 4
140     password ins@lab
141     login
142     transport input all
143   !
144   scheduler allocate 20000 1000
145 end

```

### A.7.2. IP Interfaces

```

1 HQ_WER1#show ip interface brief
2 Interface      IP-Address  OK? Method Status      Protocol
3 FastEthernet0/0 172.16.254.58 YES manual up          up
4 FastEthernet0/1 172.16.254.61 YES manual up          up
5 Serial0/0/0     unassigned YES unset administratively down down
6 Serial0/0/1     unassigned YES unset administratively down down
7 Serial1/0       unassigned YES unset administratively down down
8 Serial1/1       unassigned YES unset administratively down down
9 Serial1/2       unassigned YES unset administratively down down
10 Serial1/3       unassigned YES unset administratively down down

```

**A.7.3. Interface Status**

```

1 HQ_WER1#show int status
2 HQ_WER1#
3 HQ_WER1#show int stat
4 FastEthernet0/0
5     Switching path Pkts In Chars In Pkts Out Chars Out
6         Processor 25850 6849093 15600 2284014
7         Route cache 7084 813091 7104 483627
8         Total 32934 7662184 22704 2767641
9 FastEthernet0/1
10     Switching path Pkts In Chars In Pkts Out Chars Out
11         Processor 11567 2042240 16272 2336919
12         Route cache 7104 514628 7084 784531
13         Total 18671 2556868 23356 3121450
14 Interface Serial0/0/0 is disabled
15
16 Interface Serial0/0/1 is disabled
17
18 Interface Serial1/0 is disabled
19
20 Interface Serial1/1 is disabled
21
22 Interface Serial1/2 is disabled
23
24 Interface Serial1/3 is disabled
25

```

**A.7.4. Neighbors**

```

1 HQ_WER1#show cdp neighbors
2 Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
3                   S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone,
4                   D - Remote, C - CVTA, M - Two-port Mac Relay
5
6 Device ID    Local Intrfce Holdtme Capability Platform Port ID
7 HQ_FRR       Fas 0/1      125          R S I 2811  Fas 0/0
8 HQ_CS2       Fas 0/0      155          R S I WS-C3560V Fas 0/21

```

## B. Messungen

### B.1. Von X nach Y

```
1 BR2_R1#show run
2 Building configuration...
3
4
5 Current configuration : 1595 bytes
6 !
7 ! Last configuration change at 23:56:23 UTC Thu Sep 22 2016
8 version 15.1
9 service timestamps debug datetime msec
10 service timestamps log datetime msec
11 no service password-encryption
12 !
13 hostname BR2_R1
14 !
15 boot-start-marker
16 boot-end-marker
17 !
18 !
19 enable secret 5 $1$tooV$GpQ3VCxj1U3jlmnAZbnQr/
20 !
21 no aaa new-model
22 !
23 memory-size iomem 10
24 !
25 dot11 syslog
26 ip source-route
27 !
28 !
29 ip cef
30 !
31 !
32 !
33 no ipv6 cef
34 !
35 multilink bundle-name authenticated
36 !
37 !
38 !
39 !
40 !
41 !
42 !
43 !
44 !
45 !
46 !
47 voice-card 0
48 !
49 crypto pki token default removal timeout 0
50 !
51 !
52 !
53 !
54 license udi pid CISC02811 sn FCZ1432207G
55 archive
56   log config
57   hidekeys
```

```
58 | !
59 | redundancy
60 | !
61 | !
62 | !
63 | !
64 | !
65 | !
66 | !
67 | !
68 | !
69 | !
70 | interface Tunnel0
71 | ip address 172.16.255.6 255.255.255.252
72 | ip ospf 1 area 0
73 | tunnel source 200.200.200.3
74 | tunnel destination 200.200.200.1
75 | !
76 | interface FastEthernet0/0
77 | ip address 200.200.200.3 255.255.255.240
78 | duplex auto
79 | speed auto
80 | !
81 | interface FastEthernet0/1
82 | ip address 172.16.102.1 255.255.255.0
83 | ip ospf 1 area 0
84 | duplex auto
85 | speed auto
86 | !
87 | interface Serial0/0/0
88 | ip address 172.16.252.3 255.255.255.0
89 | encapsulation frame-relay
90 | ip ospf network point-to-multipoint
91 | ip ospf 1 area 0
92 | frame-relay map ip 172.16.252.1 301 broadcast
93 | frame-relay lmi-type cisco
94 | !
95 | interface Serial0/0/1
96 | no ip address
97 | shutdown
98 | clock rate 2000000
99 | !
100 | router ospf 1
101 | !
102 | ip forward-protocol nd
103 | no ip http server
104 | no ip http secure-server
105 | !
106 | !
107 | !
108 | !
109 | !
110 | !
111 | !
112 | snmp-server community public R0
113 | snmp-server community private RW
114 | !
115 | !
116 | control-plane
117 | !
118 | !
119 | !
```

```
120  !
121  mgcp profile default
122  !
123  !
124  !
125  !
126  !
127  !
128  line con 0
129  line aux 0
130  line vty 0 4
131  password ins@lab
132  login
133  transport input all
134  !
135  scheduler allocate 20000 1000
136  end
```