



## Praktikum RouterLab SS 2008 Work Sheet 5: Customer Access

This Worksheet uses multiple services that we provide for you. They all run on the same machine, `loadgen103`, which is connected to port `g0/3` of switch `sc1`. This interface needs to be used in 802.1q trunk mode throughout the assignment. It is up to you to configure that switch to correctly forward data to that port, using the appropriate VLAN tag. You are not allowed to log in directly into `loadgen103` via `ssh`, which is not needed anyway to complete the assignment. Every time a VLAN on `loadgen103` is mentioned, you can access it through that port of your switch.

Each group received a Linksys WRT-54GL home-router. We will refer to it as *WRT*. You will need that device for the next few assignments. We do not provide support to load and store configurations on that devices, so you should make backups of your configuration through the configuration interface in regular intervals.

We have set up a direct link from Asterix to the routerlab. Locate the outlet 15A8:01:07/08 on the wall next to the central 4 desks in Asterix. The left (right) plug is directly patched to port 18 of switch `sc1` in the Hamburg (Munich) cloud. You can use these plugs to connect your devices. This plug is referred to as *wallplug* throughout the assignment. Note that the wallplug should always be operated in access mode. Apart from that always use trunk mode.

You should furthermore attach a client computer (such as your notebook) to the WRT. You can do this by using one of the 4 Ethernet ports labeled 1-4 or WLAN at your choice. This computer will be referred as *client* in this assignment.

Figure 1 shows the final topology after this assignment for your reference.

You can configure a monitor port on your switch. Here is an example:

```
monitor session 1 source interface Gi0/1
monitor session 1 destination interface Gi0/2
```

This will duplicate all traffic going through Port 1 to Port 2. You could now run a `tcpdump` on the machine connected to Port 2, and see everything that is going on Port 1. You are allowed to reserve one extra `loadgen` for monitoring.

Table 1: Assignment of devices to groups

Gruppe	Ham-Cloud	Muc-Cloud
Router	<code>ham-rj1</code>	<code>muc-rj1</code>
Switches	<code>ham-sc1</code>	<code>muc-sc1</code>
Infrastructure IP range	<code>10.1.0.0/16</code>	<code>10.2.0.0/16</code>
Dialin IP range	<code>105.1.0.0/16</code>	<code>105.2.0.0/16</code>
DataCenter IP range	<code>106.1.0.0/16</code>	<code>106.2.0.0/16</code>
Dialin Wallplug	<code>15A8:01:07</code>	<code>15A8:01:08</code>
Loadgens	<code>loadgen104,loadgen106</code>	<code>loadgen102, loadgen107</code>

### Question 1: (15 Points) *Connect your device to our PPP-AC*

Connect the WAN port (labelled “Internet”) of your WRT to the wallplug. Configure `sc1` such that all traffic from the wallplug is forwarded to `loadgen103`, VLAN 101.

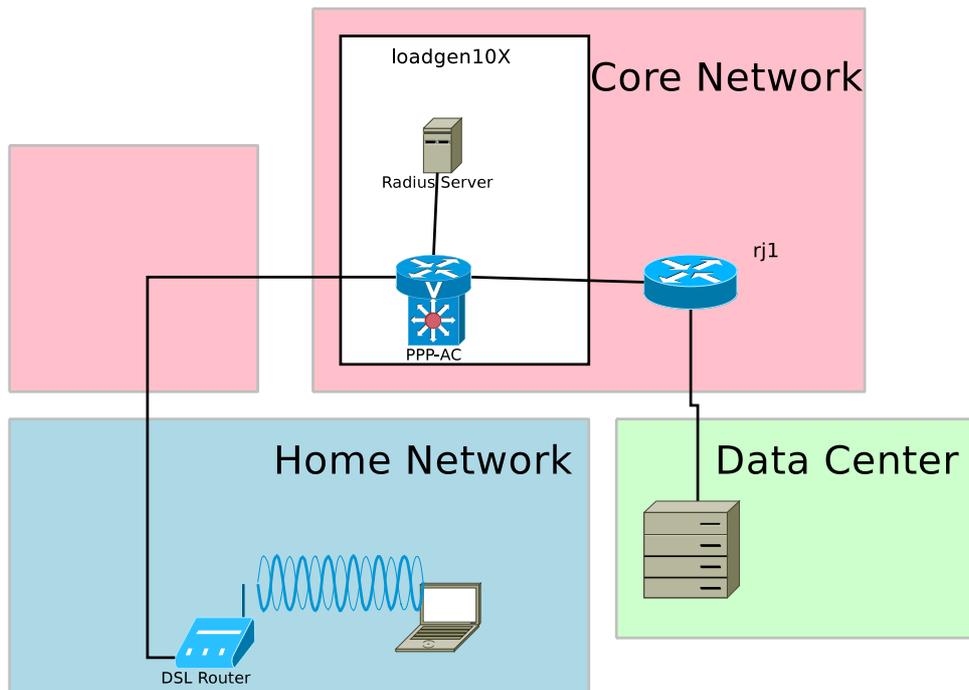


Figure 1: Topology for this assignment

You can now log into the configuration interface of the WRT by plugging in a cable to one of the free ethernet ports, switching your client to dhcp, and directing the browser to “192.168.1.1”. The user is admin, the password is admin.

Configure the WRT to connect to the “Internet” using PPPoE, username dialin, password dialin, servicetype can be left out, switch it to “Keep alive”.

Download the website <http://106.1.42.42> (<http://106.2.42.42>) to your client.

**Question 2:** (30 Points) *Set up your own PPP-AC*

- (a) Set up a PPP-AC on your own loadgen. Install the ppp and pppoe packages using

```
apt-get install ppp pppoe
```

This package is configured through the files in /etc/ppp. The most important file is the options file. Make sure that the lines

```
mtu 1492
mru 1492
```

are in the file and not commented out. You also need to edit the pap-secrets file and add

```
user1 * "" *
```

Now generate the user “user1” with the

```
adduser
```

programm, and give it a valid password. Note: Due to the setup of the loadgens adduser needs the parameter “-home /tmp” to work properly.

You also need to create the file `/etc/ppp/pppoe-server-options` with the following content:

```
auth
require-pap
default-mru
default-asynmap
lcp-echo-interval 60
lcp-echo-failure 5
noipdefault
noipx
nodefaultroute
noproxyarp
noktune
netmask 255.255.255.255
logfile /var/log/pppd.log
```

Now reconfigure the switch to forward the VLAN 101 to your own loadgen10X only, and bring the respective VLAN-interface up without assigning it an IP Address and start the ppp daemon by entering

```
/usr/sbin/pppoe-server -F -T 60 -I <interface>.<vlan> -N 25 -C ppp-ac -S <service
name> -R 105.(1/2).0.1 -L 105.(1/2).0.254
```

Send one ping packet from the client to the PPP-AC.

- (b) Briefly comment the contents of `/var/log/pppd.log`
- (c) Start a tcpdump on the interface and take a trace of the ppp session, including startup, the ping and teardown phase. Explain the purpose and contents of the different packets. Note that you can force the WRT to connect and disconnect in the *Status* tab of the config interface.
- (d) Explain what the mtu/mru lines in the configurations do. Explain why they are set to 1492.
- (e) What happens if you configure VLAN 101 to be forwarded to your loadgen10X *and* to loadgen103 at the same time? Take a trace of the PPPoE handshake by setting up a monitoring interface on the switch. Explain the -S option of pppoe-server. How do you have to configure your WRT to connect to our PPP-AC in this configuration?

### Question 3: (25 Points) *Configure RADIUS Support*

Install a RADIUS Server for proper authentication and accounting support. You need the `freeradius` and `radiusclient1` packages installed on your loadgen for that. You must also make sure that the line

```
127.0.0.1 localhost
```

is in your `/etc/hosts`.

The RADIUS Server is configured by the files in `/etc/freeradius/`. The file `radiusd.conf` contains the main configuration, fortunately it comes with sensible defaults and should not need any changes.

Generate a user named "user2" with password in `/etc/freeradius/users`. Note that you only need to set the `User-Password` attribute. Set a proper RADIUS secret in `/etc/freeradius/clients.conf`. Note: the secret is not used by the user, but by the ppp daemon to authenticate itself at the RADIUS Server.

Add the lines

```
plugin radius.so
plugin radattr.so
```

to the end of the `/etc/ppp/options` file to enable RADIUS Support in ppp.

Add a line for localhost in `/etc/radiusclient/servers` to let the pppd know the RADIUS secret.

Now you can start the RADIUS Server with

```
/etc/init.d/freeradius start
```

and restart your pppoe-server.

Now you should be able to connect the WRT to the PPP-AC using the “user2” account.

- (a) Run one tcpdump each on the loopback and the ethernet interface at the same time, while you establish a ppp connection. Describe what you see. How are the packets related? Hint: look at the timestamps.
- (b) Look at the ppp and RADIUS serverlogs: can you find related entries?

**Question 4:** (30 Points) *Route the dialin traffic to the datacenter*

The datacenter is simulated by a simple webserver running on loadgen103, VLAN 102, IP: 106.1.42.42/16 (106.2.42.42/16 for ham) . Connect rj1 with loadgen103 and configure it appropriately to provide a gateway to the rest of your network. The webserver expects its gateway on 106.1.42.1 (106.2.42.1).

Connect rj1 and your PPP-AC, and make sure that they exchange the routes to the PPP customers and the datacenter via OSPF. Submit a topology map that shows the assigned IP addresses and used VLANs. You’ll have to setup quagga on your loadgen10x for that. By default, Linux machines do not forward IP packets. To enable IP forwarding, use the following command:

```
echo 1 > /proc/sys/net/ipv4/ip_forward
```

- (a) Map the topology of Figure 1 to your devices. Assign VLAN IDs, IP Addresses and whatever else may be needed.
- (b) Download the website <http://106.1.42.42> (<http://106.2.42.42>) to your client.
- (c) After downloading this website look in `/var/log/freeradius/radacct/127.0.0.1/detail-*`. Find the two blocks that correspond to one session. Can you think of a reason why German ADSL sessions are forcibly disconnected after 24 hours? Remember: When that system was build most accounts were billed by traffic volume.

**Submission details: read the FAQ**

[http://www.net.t-labs.tu-berlin.de/teaching/ss08/RL\\_labcourse/faq.shtml](http://www.net.t-labs.tu-berlin.de/teaching/ss08/RL_labcourse/faq.shtml)

Submit the following:

- The physical topology with used *routers*, *switches*, *loadgens* and assigned IP addresses.
- All configuration inputs on routers, switches and loadgens (no trials, only the final ones!), except for the WRT configuration.
- The outputs of the tcpdump, pppoe-server, freeradius programs, the logfiles of these programs, together with the explanations you were asked.

**Due Date: June 13th, 2008, 8.00am**