Übung Echtzeitsysteme WS 2013 / 2014
SNTP Client

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Exercise 0 Netcat

1. *(Netcat)* Find out what the netcat utility does. If you don't have the program *nc* installed on your virtual machine then use the command *sudo apt-get install netcat* to install it.
   - How do the flags *l, u* affect *nc*? Use *man nc* to find out.
   - You can start a client and server on your machine, use either 127.0.0.1 or localhost as hostname. How can you send a message?
   - Try to find a way to send a simple message to someone else in the course. What do you need to agree upon?

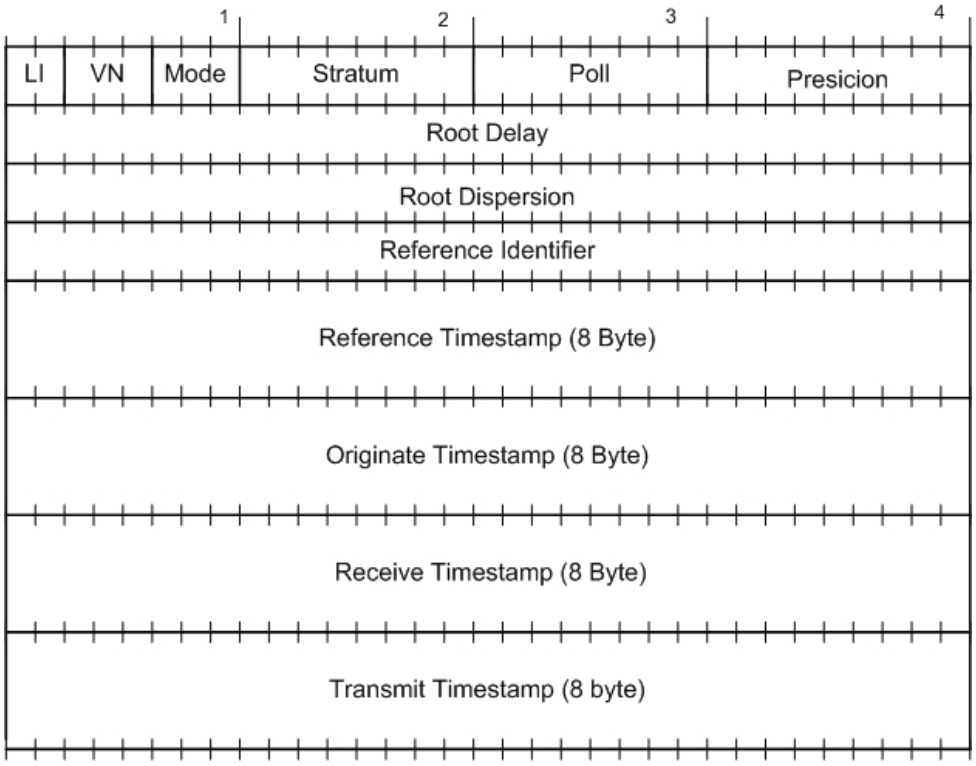
Exercise 0 UDP Client

The goal in this excercise is that you write a tiny UDP client on your own. The UDP client should just send a short text message to certain host and port.

1. *((Endianess))* What is little and big endian? Find out what the methods *ntohl, htonl* and its variants do.
2. *(DNS)* What does the *gethostbyname* function do? Look up the documentation and write a small program that uses *gethostbyname*. What does the function *inet_ntoa* do? Use it in your program.
3. *(UDP Sockets)* Create a socket using *socket(AF_INET, SOCK_DGRAM, 0)*. Find out what the parameters are for and perform error checking on the return value. Find out what the members in the *struct sockaddr_in* are for and send a text message using the function *sendto*. Perform also error checking on *sendto*. Test you program using netcat, which should be used as an UDP listener.

Exercise 1 SNTP Client

In the following we extend the simple client to a SNTP client. Information about the SNTP protocol can be found here: *http://www.networksorcery.com/enp/protocol/sntp.htm*. Below the structure of a SNTP message is shown. The structure and some functions are given in the *SNTP.h* header file.



1. *(Timing functions)* Find out what the functions *gettimeofday, localtime* do.
2. *(SNTP send/recv)* Set the minimum information in the *SNTPMessage* necessary so that it becomes a valid client request. Send the message to *ntp.in.tum.de*. The official SNTP port is 123. Recieve the answer from the server using the *recvfrom* function. Read, use and explain the functions provided in the *SNTP.h* header file. The time values stored in the *SNTP* message are the offset in second from the 1. January 1900. Linux measures the time since the 1. January of 1970. The difference between these points in time is 2208988800 seconds. *SNTP* uses a fixed point format for storing time

$$t = t_i + \frac{t_{frac}}{2^{32}}. \tag{1}$$

Here t_i refers to the time in seconds and t_{frac} is the fraction of seconds.